

DESIGNED TO EXCEL

ODISHA CONSTRUCTION CORPORATION LTD.

(A Govt. of Odisha Undertaking)

Gopabandhu Nagar, Unit-VIII, Bhubaneswar.

COVER – I

(TECHNICAL BID)

(PERCENTAGE RATE TENDER)

E-procurement Notice No.02/OCCL/2026-27(on-line)

Bid identification No. OCCL-LSSP/01/2026-27

NAME OF WORK

Conastruction of Spillway of Upper Lanth Irrigation Project, Belpada.

**Managing Director,
OCC Ltd. Bhubaneswar**

PARTICULARS OF TENDER

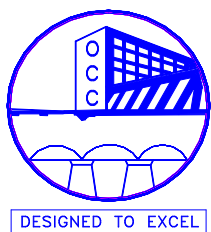
1	Name of work:	Construction of Spillway of Upper Lanth Irrigation Project, Belpada
2	Approximate value of the work:	Rs. 143.98 Crores (excluding GST)
3	E.M.D (to be transferred on-line through the process as mentioned in Bid document)	Rs. 1,43,98,000/-
4	Period of Completion	24 (twenty four) Calendar months including rainy season
5	Class of Contractor	C-I class of contractor in OCC Ltd. If not, enlisted agency is to get enlisted in OCC Ltd as C-I class of contractor preferably before submission of tender but Mandatory before drawl of agreement. The enlistment form of OCCL is available in the website of OCC Ltd. i.e. www.odishaconstruction.com or may be collected from OCC Ltd. Head Office and should be submitted at the same office along with the necessary documents and fees before uploading the bid in portal positively failing which it will not be considered for the present work. In case intending bidder applied for such Certificate but not received up to the time of submission of bid, he has to upload certificate of Registration of concerned State Government/ Railway/ CPWD/ Government bodies along with copy of the application for C-I enlistment in OCCL
6	Cost of Bid Documents	Rs.11,800.00 (Non-refundable) (including GST)
7	Availability of Tender in website	From 09.06.2026, 3.30 PM to 08.07.2026, 5.30 PM
8	Submission of Bid On-line	From 09.06.2026, 3.30 PM to 08.07.2026, 5.30 PM
9	Pre-Bid Meeting	23.06.2026, 11.30 A.M in the conference Hall of Head Office, OCCL (Virtual mode)
10	Date of Opening of Technical Bid	09.07.2026 at 12.00 Noon at Head Office, OCC Ltd, Bhubaneswar.
11	Date of opening of Financial Bid	To be intimated to qualified bidders after evaluation of Technical Bid by registered post/Speed Post/E-mail.

TABLE OF CONTENTS

Sl. No.	Description	Pages	
		From	To
1.	Notice Inviting Tender & DTCN (Section-I)	4	34
2.	Instructions to Bidders (Section-II)	35	50
3.	Special Conditions of Contract (Section-III)	51	58
4.	General Conditions of Contract (Section-IV)	59	99
5.	Technical Specification (Section-V)	100	200
6	Price adjustment/Variation (Section-VI)	201	209
9	DRAWINGS (Section-VII)	210	214

SECTION-I

NOTICE INVITING TENDER
&
DETAILED TENDER CALL NOTICE



ODISHA CONSTRUCTION CORPORATION LIMITED
 (A Government of Odisha Undertaking)
 REGD. OFFICE : UNIT – VIII, GOPABANDHU NAGAR
 POST BOX NO. - 82, BHUBANESWAR – 751 012 (ODISHA)
 E-mail : theoccltd@odishaconstruction.com
 Website: www.odishaconstruction.com
 0674-2562020/2562118/2562068
 GSTIN- 21AAACO2571K2ZM

Letter No.5425 (WE)

Date.21/05/2026

To

The Deputy Secretary to Govt.
 Department of information & Public Relation,
 Odisha, Bhubaneswar
 E-mail Id: ipr.advt@gmail.com

Sub. : **Publication of e-procurement Notice No. 02/OCCL/2026-27 (on-line).**

Sir,

The e-procurement Notice No.02/OCCL/2026-27 (on-line) relating to one work of **Odisha Construction Corporation Limited** is enclosed with this letter and it is requested that the same may please be published in **one National English daily** and **two leading Odia Daily News Papers**.

Action may please be taken for publication of the same in minimum space on or before **31.05.2026**, so as to float the bid documents in Government website with effect from 01.06.2026 at 03.30 P.M.

Yours faithfully,

Encl. : Advertisement notice for e-Procurement Notice No. :
 02/OCCL/2026-27 (on-line) - 01 (One) set.

Sd/-
Managing Director
OCC Ltd., Bhubaneswar.

Memo No.

Date...../2026

Copy submitted to the Principal Secretary to Government, Department of Water Resources, Odisha, Bhubaneswar for favour of kind information and necessary action.

Sd/-
Managing Director

Memo No.

Date...../2026

Copy forwarded to the Head State Portal, Information & Technology Department, Odisha Secretariat , Bhubaneswar (Email ID: tendersorissa@gmail.com) for information & necessary action. It is requested to hoist the tender call notice with identification No **OCCL-LSSP/01/2026-27** in official web site of Govt of Odisha names <http://www.odisha.gov>.from **Date. 01.06.2026, 03.30 P.M.**

Sd/-
Managing Director

PTO

//2//

Memo No.

Date...../2026

Copy forwarded to the Chief Engineer, Monitoring, Office of the Engineer-in-Chief, Water Resources, Odisha, Bhubaneswar to display the Tender Call Notice in the authorized Govt. website of Water Resources Department www.dowrodisha.gov.in from **Date. 01.06.2026, 03.30 P.M.**

Sd/-

Managing Director

Memo No.

Date...../2026

Copy forwarded to the Director, Printing, Stationary & Publication, Government Press, Madhupatna (O) Cuttack-753010 and with a request to publish this notice in the next issue of the Odisha Gazette.

Sd/-

Managing Director

Memo No.

Date...../2026

Copy submitted to the Engineer-In-Chief, W.R. Odisha, Bhubaneswar/ Engineer-In-Chief, (P&D), Odisha, Bhubaneswar / Engineer-In-Chief, Procurement, Odisha, Bhubaneswar / Engineer-in-Chief (Civil), Works Deptt/ Chief Engineer, Rural Works-I, BBSR/ Chief Engineer, Roads, Nirman Soudh, BBSR/ Chief Engineer, NH/ Chief Engineer, PH (Urban)/ Managing Director, IDCO/OBCC/OLIC for favour of information and necessary action.

Sd/-

Managing Director

Memo No.

Date...../2026

Copy to FA-cum-Additional Secretary to Govt., Department of Water Resources, Odisha, Bhubaneswar for favour of kind information and necessary action.

Sd/-

Managing Director

Memo No.

Date...../2026

Copy forwarded to all Chief Engineers/ Chief Construction Engineers of W.R Department.

Sd/-

Managing Director

Memo No.

Date...../2026

Copy forwarded to all General Manager (Civil), OCCL/ Senior Manager (Civil), OCCL for information and necessary action.

Sd/-

Managing Director

<p align="center">ODISHA CONSTRUCTION CORPORATION LIMITED BHUBANESWAR, ODISHA PIN: 751012, Tel No.(0674) 2562020, e-Mail: theoccltd@odishaconstruction.com GSTIN- 21AAAC02571K2ZM</p> <p align="center"><u>"e- Procurement Notice No- 02/OCCL/2026-27 (on-line)</u></p> <p>On-line percentage rate tender is invited for the following work;</p>							
SI No	Name of Work	Bid Identification No	Approx value of work (Rs. In Crores)	Bid Security (through on-line transfer/as per DTCN) (in Rs.)	Period of Completion	Availability of Tender (on-line)	Submission of tender (on-line)
01	Construction of Spillway of Upper Lanth Irrigation Project, Belpada	OCCL-LSSP/01/2026-27	Rs. 143.98 Crores	Rs. 1,43,98,000/-	24 (twenty four) calendar months	From 01.06.2026, 03.30 PM to 30.06.2026, 5.30 PM	From 01.06.2026, 03.30 PM to 30.06.2026, 5.30 PM

Procurement Officer:
Date of Opening of the Technical Bid:
Further details can be seen from the

Managing Director, OCCL
01.07.2026, 12.00 Noon
e-procurement portal: <https://www.tendersodisha.gov.in>

MANAGING DIRECTOR



ODISHA CONSTRUCTION CORPORATION LIMITED

(A Government of Odisha Undertaking)

REGD. OFFICE : UNIT – VIII, GOPABANDHU NAGAR
POST BOX NO. - 82, BHUBANESWAR – 751 012 (ODISHA)

E-mail : theoccltd@odishaconstruction.com

Website: www.odishaconstruction.com

0674-2562020/2562118/2562068

GSTIN- 21AAACO2571K2ZM

Letter No.5602 (WE)

Date.29/05/2026

E-mail & SPEED POST

To

The Deputy Secretary to Govt.
Department of information & Public Relation,
Odisha, Bhubaneswar
E-mail Id: ipr.advt@gmail.com

Sub. : Publication of **1st corrigendum** to e-procurement Notice No. **02/OCCL/2026-27 (on-line)**.

Ref: - (i) This office letter No.5425 (WE), dated. 21.05.2026
(ii) Your letter No.34001/34120/1/26-27/0005, dated. 24.05.2026.

Sir,

The **1st corrigendum** to the e-procurement Notice No.02/OCCL/2026-27 (on-line) is enclosed with this letter and it is requested to publish the 1st corrigendum in the same news papers which had published the original e-procurement notice.

An early action in this regard is appreciated.

Yours faithfully,

Encl. : 1st corrigendum to the e-Procurement Notice No. :
02/OCCL/2026-27 (on-line) - 01 (One) set.

**Managing Director
OCC Ltd., Bhubaneswar.**

**ODISHA CONSTRUCTION CORPORATION LIMITED
BHUBANESWAR, ODISHA**

PIN: 751012, Tel No.(0674) 2562020,
e-Mail: theoccltd@odishaconstruction.com

GSTIN- 21AAAC02571K2ZM

1st CORRIGENDUM

"e- Procurement Notice No- 02/OCCL/2026-27 (on-line)

1. The availability of tender on-line start date is hereby extended to 09.06.2026, 03.30 PM instead of 01.06.2026, 03.30 PM.
2. The availability of tender on-line end date is hereby extended to 08.07.2026, 05.30 PM instead of 30.06.2026, 5.30 PM.
3. The date of opening of the tender (on-line) is hereby postponed to 09.07.2026, 12.00 Noon onwards instead of 01.07.2026, 12.00 Noon onwards.

All other terms and conditions remain unaltered.

Further details can be seen from the e-procurement portal:

<https://www.tendersodisha.gov.in>

MANAGING DIRECTOR

**ODISHA CONSTRUCTION CORPORATION LTD.
(A Govt. of Odisha Undertaking)**

Gopabandhu Nagar, Unit-VIII, Bhubaneswar.

DIST-Khordha-751012, Tel-0674-2562020, e-mail:theoccltd@odishaconstruction.com

(GSTIN-21AAACO2571K2ZM)

NOTICE INVITING TENDER

e-procurement Notice No – **02/OCCL/2026-27(on-line)**
Bid Identification No – **OCCL-LSSP/01/2026-27**

The Managing Director, OCCL, Bhubaneswar on behalf of Odisha Construction Corporation Limited invites **on-line percentage rate tender** through e-Procurement in **double cover** system for execution of the following work. The agency must be enlisted as C-I class of contractor in OCC Ltd. If not enlisted, agency is to get enlisted in OCC Ltd as C-I class of contractor preferably before submission of tender but Mandatory before drawl of agreement. The enlistment form of OCCL is available in the website of OCC Ltd. i.e. www.odishaconstruction.com or may be collected from OCC Ltd. Head Office and should be submitted at the same office along with the necessary documents and fees before uploading the bid in portal positively failing which it will not be considered for the present work. In case intending bidder applied for such Certificate but not received up to the time of submission of bid, he has to upload certificate of Registration of concerned State Government/ Railway/ CPWD/ Government bodies along with copy of the application for C-I enlistment in OCCL.

Sl No	Type of Work	Bid Identification No.	Amount put to tender	Period of completion	Tender Fee (through on-line transfer)	EMD/ Bid Security (to be transferred online/ as per procedure mentioned below)
1	2	3	4	5	6	7
01	Construction of Spillway of Upper Lanth Irrigation Project, Belpada	OCCL-LSSP/01/2026-27	Rs. 143.98 Crores	24 (twenty four) calendar months	Rs. 11,800/- inclusive GST (Non Refundable)	Rs. 1,43,98,000/-

- Bidders shall transfer online the Earnest money deposit / Bid Security of the amount specified for the work on the table column 6 above as part of its bid in shape of N.S.C./ Post Office Saving Bank Account/ Post Office Time Deposit Account/ Kisan Vikash Patra Bank Guarantee in favour of Odisha Construction Corporation Limited from any nationalized scheduled bank in India counter guaranteed by its local branch at Bhubaneswar/ e-Bank Guarantee executed on the National e-Governance Services Limited (NeSL) digital document execution portal/ Insurance Surety Bond issued by an Insurance Company authorized by the Insurance Regulatory and Development Authority of India (IRDAI).

[Vide Works Dept. OM No. WORKS-FA-MISCSB-0003-2026-4909/W, dtd. 12.03.2026.]

- The bidder shall transfer online cost of bid documents of Rs.11,800.00 for each work as shown in column 6 above through a process as mentioned in DTCN.

2. **Procurement Details:**

Procurement Officer	Availability of Tender On-line	Submission of Bid On-line	Date & Time of opening of Tender	
			Technical Bid	Financial Bid
1	2	3	5	6
Managing Director, OCCL, Bhubaneswar.	From 09.06.2026, 03.30 P. M to 08.07.2026, 5.30 P.M	From 09.06.2026, 03.30 P. M to 08.07.2026, 5.30 P.M	09.07.2026 at 12.00 Noon at Head Office, OCCL, Bhubaneswar	To be intimated to qualified bidders after evaluation of Technical Bid.

4. Tender should be submitted On-line in www.tendersodisha.gov.in only. Bid document consisting of qualification, information and eligibility criteria of bidders, specification and Bill of Quantities of the works are available in the web-sites www.tendersodisha.gov.in & www.odishaconstruction.com and the set of terms and conditions of contract and other necessary documents can be seen in the web-site till last date of submission of Bid.
5. Bid validity period of the Tender is for a period of **90 (ninety) days** from the last date of submission of bid. **Conditional bid is subjected to penalty which shall be imposed as deemed fit.** If any bidder withdraws his Bid/ Tender before the said period or makes any modification in the terms and condition of the bid, penalty shall be imposed. Validity of tenders can also be extended if required without any monetary compensation.
6. No Engineer of Gazetted rank or other Gazetted Officer employed in Engineering or Administrative duties in any Engineering Department of the State Government/Corporation is allowed to work as a Contractor for a period of two years after his retirement from Government Service/Corporation service, without Government/Corporation permission.
7. The scanned copy(s) of **(i) proof towards on-line transfer of cost of Bid documents, (ii) proof towards on-line transfer/instrument deposited as prescribed against EMD/Bid Security (iii) Affidavit duly registered before NOTARY regarding authenticity of documents (Annexure-A), (iv) No Relation Certificate (Annexure-B), (v) Undertaking to pay minimum wages (Annexure-E), (vi) Undertaking to pay royalty as per prevailing rate during the time of execution (Annexure-D) , (vii) GST Registration Certificate, (viii) PAN Card, (ix) EPF registration certificate, (x) Valid OCC Ltd enlistment certificate and all other required documents as per the relevant clauses of DTCN and ITB should be uploaded in web-site www.tendersodisha.gov.in at the time of submission of Bid.** The above mentioned affidavit, No relationship Certificate, undertakings as specified in Annexure C & Annexure-E must be as per the formats prescribed in the bid documents only. ***If the affidavit, No relationship Certificate & the undertakings are submitted in any other format, then the tender inviting officer may reject the bid. The bid will be rejected if the bidder fails to upload the valid EPF Registration Certificate.***

The bidders not registered under GST in Odisha are required to **submit an undertaking** in the form of an affidavit that, they are not registered under GST act in the state

of Odisha as they have not started any business in the state and they have no liabilities under the said act. The successful bidders have to produce their documents regarding GST registration documents in the State of Odisha before drawal of the agreement.

The successful L-1 bidder has to submit the original documents as cited above from Sl.No (iii) to Sl.No. (vi) under clause no. 7 of NIT along with other necessary documents before acceptance of the tender

8. **Additional Performance Security** shall be submitted by the bidder when the bid amount is less than the estimated cost put to tender. In such an event, only the successful bidder who has quoted less bid price/rates than the estimated cost put to tender shall have to furnish an amount as stipulated below towards Additional Performance Security (APS) in shape of Demand Draft in favour of Odisha Construction Corporation Ltd." payable at Bhubaneswar / Term Deposit Receipt (TDR) pledged in favour of Odisha Construction Corporation Limited/ Bank Guarantee in prescribed format (**Annexure-C**) in favour of Odisha Construction Corporation Limited from any nationalized/scheduled bank in India counter guaranteed by its local branch at Bhubaneswar within seven days of issue of Letter of Acceptance (LoA) by Odisha Construction Corporation Limited (by email) to the successful bidder otherwise the bid of the successful bidder shall be cancelled and further proceedings for blacklisting shall be initiated against the bidder.

- ❖ Amended vide **O.M. No.173 Dt.03.01.2026 & O.M. No.632 dtd.09.01.2026** of Works Dept., Govt. of Odisha to fix the following rate of Additional Performance Security (APS).

Sl. No.	Range of difference between the estimated cost put to tender and bid amount	Additional Security to be deposited by the successful bidder
1	Below 0.0 % but not below 10.00%	No additional Security
2	Below 10.00% and not below 20.00%	The Additional Performance Guarantee/ Security percentage shall be incremented by 0.1% for every percentage of bid price below 10% of the project cost put to bid starting at 11% with the additional bid performance guarantee being 0.1% and this additional performance guarantee percentage shall be applied on the bid price.
3	Below 20%	The additional performance guarantee percentage shall be incremented by 0.2% for every percentage of bid price below 20% of the project cost put to bid in addition to 1% of the bid price and this additional performance guarantee percentage shall be applied on the bid price.

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

9. The technical bid documents will be opened by the undersigned/authorized officer(s) on **dated. 09.07.2026 at 12.00 Noon** in the Head Office of the Odisha Construction Corporation Limited, Unit-VIII, Bhubaneswar in presence of the bidders or their authorized representatives who wish to attend. If the Office happened to be closed on the date of opening of the bid the same will be opened on the next working day at the same time and venue. After evaluation of the documents contained in technical bid, the financial bids of the technically responsive bidders will be opened. The date, time and place of opening the financial bid will be intimated to the eligible qualified bidders through e-mails/letters.
10. The bidders have to quote the **percentage rate** excluding GST (Goods and Service Tax) for each of the work as mentioned in the above table. GST as applicable will be paid extra.
11. The bidder may be asked in email/letters to clarify on the uploaded documents provided in the Technical Bid. If necessary, with respect to any doubts or illegible documents, the authority inviting bid reserves the right to accept any additional document.
13. The bidders seeking clarification, if any regarding the tender can contact office of the undersigned during office hour on any working days from **09.06.2026, 3.30 P.M to 5.30 P.M of 22.06.2026 (in writing though e-mail/speed post).**
14. **Pre-Bid Meeting**
A pre-bid meeting shall be conducted on virtual mod (google-meet) in the conference Hall of OCCL (1st floor), OCCL Head Office, Unit-VIII, Gopabandhunagar, Bhubaneswar on dated. **23.06.2026, 11.30 AM.** The intending/prospective bidders may attend the said meeting on virtual mode. The meeting ID and Password shall be provided to the intending/prospective bidders who would like to attend the meeting on request to the official e-mail ID of OCCL (theoocltd@odishaconstruction.com) before 30 minutes of the meeting.
15. Authority reserves the right to reject / Cancel the tender without assigning any reason thereof.
16. Other details can be seen in the bid documents, which is available in web-site www.tendersodisha.gov.in & www.odishaconstruction.com.
17. The agency must be enlisted as C-I class of contractor in OCC Ltd. If not, enlisted agency is to get enlisted in OCC Ltd as C-I class of contractor preferably before submission of tender but Mandatory before drawl of agreement. The enlistment form of OCCL is available in the website of OCC Ltd. i.e. www.odishaconstruction.com or may be collected from OCC Ltd. Head Office and should be submitted at the same office along with the necessary documents and fees before uploading the bid in portal positively failing which it will not be considered for the present work. In case intending bidder applied for such Certificate but not received up to the time of submission of bid, he has to upload certificate of Registration of concerned State Government/ Railway/ CPWD/ Government bodies along with copy of the duly filled in application form as submitted at OCC Ltd Head Office for C-I enlistment in OCCL.
18. **Combined Evaluation**
Not applicable
19. **Qualification Criteria**
The qualification criteria of the above tender are mentioned in the relevant clauses of Instructions to Bidders (ITB), Section-II. To qualify for the Technical Bid, the bidder must upload all the documents required as per relevant clauses of NIT, DTCN & ITB of the above e-procurement notice.

20. Price Adjustment/Price variation shall be applicable to this contract subject to receipt of the same from the client/Department/Requisitioning authority as per prevailing guidelines of Govt. of Odisha i.e. Works Department Office Memorandum no.15847/W, dated. 19.11.2019 subject to approval of the same from the requisitioning authority i.e. DoWR.
21. The addendum/Corrigendum if any will be hoisted in the State e-Procurement Portal i.e www.tendersodisha.gov.in only.
22. Any dispute arising out of the above tender call notice shall be subject to Jurisdiction of Hon'ble High Court of Odisha at Cuttack and their subordinate Courts at Bhubaneswar only.

Managing Director

ODISHA CONSTRUCTION CORPORATION LTD.

(A Govt. of Odisha Undertaking)

Gopabandhu Nagar, Unit-VIII, Bhubaneswar.

DETAILED TENDER CALL NOTICE

1. The Managing Director, Odisha Construction Corporation Limited invites on-line percentage rate tender through e-procurement in prescribed form. Enlisted C-I contractors of OCC Ltd can submit the bid. Any Contractor of special / super class registered with works Department, Government of Odisha or equivalent class registered with CPWD / Railway / MES or other State Governments or Central or State PSUs are also invited for participation in the bid. But they have to get themselves enlisted in OCC Ltd preferably before submission of tender but mandatory before drawl of agreement. The enlistment form of OCC Ltd is available in the website of OCC Ltd. i.e. www.odishaconstruction.com or may be collected from OCC Ltd., Head Office and should be submitted at the same office along with the necessary documents and fees before uploading the bid in portal positively failing which it will not be considered for the present work. In case intending bidder applied for such Certificate but not received up to the time of submission of bid, he has to upload certificate of Registration of concerned State Government/ Railway/ CPWD/ Government bodies along with copy of the application for C-I enlistment in OCC Ltd. All the Contractors are to be registered in the State Govt. portal and must possess compatible digital signature certificate for online bidding. The website for online bidding is www.tendersodisha.gov.in for the work **"Construction of Spillway of Upper Lanth Irrigation Project, Belpada."**
2. The tender documents can be downloaded from the Govt. website www.tendersodisha.gov.in & www.odishaconstruction.com from date. **09.06.2026 at 03.30 PM to 08.07.2026 up to 5.30 P.M.** for the work- **"Construction of Spillway of Upper Lanth Irrigation Project, Belpada on online transfer of Rs.11,800/-** (Rupees eleven thousand eight hundred only) **through a process as mentioned in DTCN.** The bid will be received through e-procurement portal, www.tendersodisha.gov.in from dt. **09.06.2026 at 03.30 PM to 08.07.2026 up to 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 bid cover-I will be opened on **09.07.2026 at 12.00 Noon** in the Head Office of OCC Ltd, Unit-VIII, Bhubaneswar in presence of the bidders or their authorized agents. The bidders who participated in the on-line bidding can also witness opening of the bid from any system logging in to the portal away from opening place. The bids can only be opened by the pre-designated officials 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 same time and same venue in the next working day. Date, time and place of opening of cover-II (price bid) shall be intimated separately to those bidders who will be found eligible after evaluation of cover-I (Technical bid). The intimation letter will be sent both through their e-mail address and postal address.
3. The approx. value of the work tendered for **Rs. 143.98 Crores (excluding GST)**
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. **Tender must be submitted on-line in the website www.tendersodisha.gov.in only.**
5. No tenderer will be permitted to furnish their bid in their own manuscript.

6. **BID SECURITY:**

Bidders shall transfer online the Earnest money deposit / Bid Security of the amount specified for the work on the table column 6 above as part of its bid in shape of N.S.C./ Post Office Saving Bank Account/ Post Office Time Deposit Account/ Kisan Vikash Patra Bank Guarantee in favour of Odisha Construction Corporation Limited from any nationalized scheduled bank in India counter guaranteed by its local branch at Bhubaneswar/ e-Bank Guarantee executed on the National e-Governance Services Limited (NeSL) digital document execution portal/ Insurance Surety Bond issued by an Insurance Company authorized by the Insurance Regulatory and Development Authority of India (IRDAI).

[Vide Works Dept. OM No. WORKS-FA-MISCSB-0003-2026-4909/W, dtd. 12.03.2026.]

7. The tender is to be submitted on-line in the web-site www.tendersodisha.gov.in containing scanned copies of valid OCCL enlistment certificate, PAN card, GST No, affidavit duly notarised regarding authenticity of document, undertaking & No-relationship certificate as per the relevant clauses of this DTCN and special conditions. 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 clauses shall be taken if he does not provide the required documents or provided illegible documents. Clarity of the documents may be ensured by taking out a sample print out."
8. If any further necessary information is required, the bidder can seek clarification on the bids within **09.06.2026, 03.30 P.M to 5.30 P.M of 22.06.2026** from the Managing Director/ authorized officer of OCC Ltd at Head Office of the Odisha Construction Corporation Limited, Bhubaneswar (in writing/through e-mail/Speed post only).
9. The tender accepting authority will verify the originals of all the scanned documents of the successful lowest bidder only before acceptance of the tender.
10. In the event of failure on the part of the bidder to produce the original documents, he will be debarred in future from participating in any tender for 3 years and will be blacklisted by the competent authority.
11. All charges towards quality control test will be borne by the Contractor.
12. **The work is required to be completed in all respect within the period of completion as mentioned in the Notice Inviting Tender which shall be applicable from the date of issue of Work Order. Failure to complete the work in due time without sufficient reason, the contract may be rescinded with penalty or as deemed proper by the competent authority.**
13. 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 as applicable will be imposed
14. The date of commencement of the work shall be as notified in the work order.
15. The specification and scope for the work can be seen from the Govt. website www.tendersodisha.gov.in during the period of availability of the tender.

16. The tenderers shall carefully study the tentative drawing and specification applicable to the contract and documents which will form as part of the agreement to be entered into by the accepted tenderers. The detailed standard specifications for Odisha and other said relevant specification and drawings are available in the office of the concerned Senior Manager (Civil).
17. Before quoting their rates, every tenderer is expected to inspect the proposed work site. He should also inspect the quarries and locality of the work and satisfy himself about the quality and availability of construction materials including the medical aids, labour and food stuff etc. In every case the construction materials must comply with the relevant specifications. The tenderer will be deemed to have satisfied himself that the percentage Rate quoted by them in the tender will be adequate to complete the work according to the specifications and conditions attached to and that they have taken into account all conditions, difficulties that may be encountered during its progress and to have quoted labour rates and materials including cost of dewatering & haul road with all taxes including royalty excluding GST as applicable, lead, lifts, de-lifts, loading and unloading and freight for materials and all other charges necessary for 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 will not be entertained. It should be understood clearly that no claim whatsoever will be entertained afterwards on the plea of non availability of proper quantity and quality of materials including food stuff or for any other reasons.
18. Each tenderer must quote a definite percentage rate for the work in the BoQ (**upto 2 decimal only**), which will form a part of the contract. (Tenders containing indefinite terms such as estimated rates will not be considered.) Submission of Bids through the e-Procurement portal www.tendersodisha.gov.in, an intelligent Bill of Quantity in Microsoft Excel format shall be made available to the bidder. The bidder shall fill percentage rate in prescribed proforma and should not leave any cell blank.
19. ~~If the rate quoted by the bidder is less than 15% of the amount put to tender, then such a bid shall be rejected and the tender shall be finalized basing on merits of rest bids. But, 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 lender accepting authority will finalize the tender through a transparent lottery system, where all bidders / their authorized representatives, the General Manager (Civil) OCCL, H.O, SM (Civil), Project Management and F.A & C.A.O (OFS-SAG) will remain present.~~
20. Sample of Soil, coarse aggregates and fine aggregates to be used for the work are to be collected and deposited at office of the respective quality control division of Department of Water Resources, Odisha before procurement for testing and acceptance, quoting the name of the quarry with dated signature of the contractor and Senior Manager (Civil) in charge of the work. All the charges of quality control test of materials will be borne by the Contractor.
21. Bidders are to submit only the original BoQ (in Excel format) uploaded by procurement Officer (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 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.**
22. The bidders shall write their 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 mention percentage excess or less **up to two decimal places only.**

23. Submission of Bids through the e-Procurement Portal i.e. www.tendersodisha.gov.in, the bidder can submit the scanned copy of the documents in the designated locations of Technical Bid and Financial Bid. Submission of document shall be effected by using DSC of appropriate class and thus shall be in encrypted form.
24. 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 & their registration in the portal shall be blocked and the bidder is liable to be blacklisted.
25. The scanned copy(s) of **(i) proof towards on-line transfer of cost of Bid documents, (ii) proof towards on-line transfer/instruments as prescribed against EMD/Bid Security (iii) Affidavit duly registered before NOTARY regarding authenticity of documents (Annexure-A), (iv) No Relation Certificate (Annexure-B), (v) Undertaking to pay minimum wages, (vi) Undertaking to pay royalty as per prevailing rate during the time of execution , (vii) GST Registration Certificate, (viii) PAN Card, (ix) EPF registration certificate, (x) Valid OCC Ltd enlistment certificate and all other required documents as per the relevant clauses of DTCN and ITB should be uploaded in web-site www.tendersodisha.gov.in at the time of submission of Bid.**
26. **The successful L-1 bidder has to submit the original documents as cited above from Sl.No (iii) to Sl.No. (vi) under clause no. 7 of NIT & clause No.25 of DTCN along with other necessary documents before acceptance of the tender.**
27. The tender containing extraneous condition not covered by the tender call notice are liable for rejection and tender should be strictly in accordance with the tender call notice, any change in the wording will not be accepted.
28. It is allowed to modify the bid through the e-procurement portal. 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 internet congestion. If the bidder fails to submit his modified bids within the designated time of receipt, the bids already in the system shall be considered for evaluation. Withdrawal of bid is also allowed in the e-procurement portal. The bidder has to click on the "withdraw" button and record the necessary justification for the same in the space provided. In addition to this, he has to write a letter addressed to the Officer inviting the bid and 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.

29. Items of work not covered in the BoQ shall be paid at the prevailing Schedule of rates, Govt of Odisha and those not covered by the said schedule rates will be paid, on actual analysis approved by the competent authorities.
30. On no account the contract work should be sublet to any contractor. In such an event the contract may be rescinded with penalty as will be deemed proper as per decision of the competent authority.
31. Letter etc, raising and lowering the rates or dealing with any point in connection with the tender will not be considered.
32. Schedule of Quantity accompanies tender notice:- It shall be definitely understood that the Corporation does not accept any responsibility for the correctness and completeness of this schedule and this schedule is liable for alternations or omissions, deductions or additions as set forth in the condition of contract and such omission, deductions additions or alternations shall in no way invalidate the contract and no extra monetary compensation will be entertained.
33. The authority reserves the right to make such increase or decrease in the quantity of items of works mentioned in the schedule attached to the tender notice as may be considered necessary for the satisfactory completion of the work. All such increase or decrease shall in no way invalidate the rates. The Contractor shall not be entitled for any compensation on this account, except extension of time where considered necessary.
34. All taxes, such as income tax, labour cess, fees, royalty, DMF, EMF, Additional charges etc. payable under the local rule excluding GST as applicable will be borne by the Contractor. GST will be paid to the contractor as per the prevailing rates.
35. DELETED
36. The work may be splitted up and distributed among several Contractors if considered necessary on the emergency of the circumstances of the work and the Contractor is not entitled to any compensation on this account.
37. The Corporation reserves the right of authority to reject any or all tenders received without assigning any reason, thereof.
38. The tender inviting officer is not responsible for any failure, malfunction of breakdown of the electronic system used during the e-procurement process.
39. That for the purpose of jurisdiction in the event of any dispute if any the contract would be deemed to have been entered in to within the State of Odisha and it is agreed that neither party to the contract will be competent to bring a suit in regard to the matter by this contract at any place outside the State of Odisha.
40. The tenderer whose tender is selected for acceptance shall within a period of seven days of issue of Letter of Acceptance shall make an **Initial Security Deposit** in the form of Demand Draft/Term Deposit Receipt/Bank Guarantee in prescribed proforma from any nationalized or schedule Bank in favour of Odisha Construction Corporation. The TDR shall

be duly pledged in favour of the Odisha Construction Corporation Limited and it shall be **2%** of the tendered amount and sign the agreement in the required P.W.D. form for the fulfillment of the contract in the concerned project office of OCC Ltd or as directed. Submission of Bids through the e-Procurement Portal **www.tendersodisha.gov.in**, the system shall generate the award of Contract letter and intimate the bidders in their e-mail. Failure to enter in to the required agreement and to deposit the ISD as above shall entail penalty. No tender shall be finally accepted until the required amount of ISD is deposited. The agreement to be entered in between the Contractor and the OCC Ltd shall be the foundation of the rights of both the Contractor and the OCC Ltd and the contract shall be deemed to be incomplete until the agreement has first been signed by the Contractor and then by the authorized Officer of the Odisha Construction Corporation Limited. The security deposits deducted from the bills will be refunded one year after satisfactory completion of the work and payment of the final bill or completion of defect liability period whichever is later subject to the condition that no defect is noticed in the work and will not carry any interest.

41. Security for the due fulfillment of a contract should be invariably taken. The security may be taken in shape of NSC/Post Office Saving Bank Account. Post Office Time Deposit Account/ Kisan Vikash Patra/ Bank Guarantee in favour of Odisha Construction Corporation Limited from any nationalized scheduled bank in India counter guaranteed by its local branch at Bhubaneswar/e-Bank Guarantee executed on the National e-Governance Services Limited (NeSL) digital document execution portal towards EMD/Initial Security Deposit/any other security deposit from the contractor /supplier.
42. Under section 12 of contract labour (Regulation and Abolition Act 1970) the Contractor who undertakes execution of work, should produce valid Labour License from Labour Department before commencement of the work.
43. The Contractor shall be liable to fully indemnify the OCC Ltd under workmen compensation Act VIII of 1993 on account of the workmen employed by the Contractor and full amount of compensation paid will be recovered from the Contractor.
44. Tenderers are required to abide by the minimum wages Act as introduced by Govt. of Odisha and will not pay less than the minimum wages fixed by Govt., to the labours engaged by him for the work.
45. In case of any complaint by the labourers working about the nonpayment of wages as per prevailing minimum wages Act, the Senior Manager (Civil) will have the right to investigate and if the Contractor is found to be at fault, the Senior Manager (Civil) may recover such amount from the Contractor's dues and pay such amount to the labourers directly under intimation to the local Labour Office of the Govt. The decision of the Senior Manager (Civil) is final and binding on the Contractor.

46. The Contractor will have to submit the monthly return of labourers of all categories employed by him on the work to the District Labour Officer & the Senior Manager (Civil) in charge of the work.
47. The Contractor should keep himself in touch with the Engineer-in-charge for smooth execution of the work and arrange adequate labourers depending on the workload and working space available. No claim for idle labour on any account will be entertained.
48. No compensation will be paid by the OCC Ltd for any damage done by rain, flood, cyclone, tide or by any other natural calamities during the execution of the work.
49. No claim what-so-ever will be entertained in regard to extra items of work or extra quantity of any item besides agreement quantity and 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.
50. The tenderers shall have to abide by the C.P.W.D. safety code rules introduced by the Govt. of India, Ministry of Works Housing and Supply in their standing order No.44150 dt.25.01.1957, which can be seen in the Office of the Senior Manager (Civil) in charge of the office on working day, during office hours.
51. The tenderers shall bear various incidentals sundries and contingencies necessary for the work in full within the following /similar category.
52. (a) Rent, Royalties and other charges of materials etc, all other taxes excluding GST as applicable, conveyance charges and other cost on account of land and building & temporary electric connection to worksite. Maintenance of coffer dam, service road, diversion road till completion of work required by the tenderer for collection of materials, storage, housing of staff or other purpose of the work. No tenderer will however be liable to pay for temporary occupation of land owned by Govt. at the site of the work.
 (b) Labour camps or hutments necessary to a suitable scale including sanitary arrangements up to the satisfaction of the local health authorities.
 (c) Suitable water supply for the staff and labour engaged in the work.
 (d) Fees and duties levied by the canal or water supply authorities.
 (e) Suitable equipment and wearing apparatus for the labour engaged in risky operations and medical aid to the labourer engaged for the work.
 (f) Suitable fencing, barriers, signals including paraffin and electric signals where necessary at work and approaches in order to protect public and employees from accident.
 (g) Compensation including cost of any suit for injury to persons or property due to negligence of any precautions also becomes payable under workmen compensation Act.
 (h) The Contractor has to arrange adequate lighting arrangement for the work wherever necessary at his own cost.
53. All preliminary works such as survey, site clearance, vats, mixing platforms etc. are to be done by the Contractor at his own cost. No payment will be made for bench marks. Level

pillars, profiles, benching and leveling the ground wherever required. The percentage rates to be quoted should be for finished items of work inclusive of carriage of all materials and incidental items of works.

54. After the work is completed, all surplus materials & debris should be removed clear away from the site of the work as directed by the Engineer-in-charge. Preliminary work such as vats, mixing platforms etc. should be dismantled and all materials removed from the site and premises left neat and clean and this should be inclusive of the rates.
55. If any further information is required, Senior Manager (Civil) in charge of the work will furnish the same.
56. In case of delay in acquisition of land no compensation will be admissible but extension of time will be allowed.
57. The OCC Ltd will have the right to supply at any time in the interest of the work any departmental materials to be used in the work and the Contractor shall use such materials at the stock issue rate by the OCC Ltd or market rate whichever is higher.
58. Over and above these conditions including the Technical specifications of the items, conditions, rules and regulations, specification laid down in relevant IS codes are also binding on the part of the Contractor.
59. For submission of bids through e-Procurement Portal www.tendersodisha.gov.in, the bidder shall upload the scanned copy/copies of valid OCC Ltd enlistment certificate, PAN card, GST No, Affidavit regarding authenticity, genuineness of documents & 'No relationship' certificate in prescribed proforma. If the bidder has not registered their GST in the State of odisha, they have to get themselves registered under GST in the Govt. of Odisha before drawal of agreement.
60. No Relation Certificate.
The Contractor shall have to furnish certificate along with the tender to the effect that they are not related to any officer of Govt. of Odisha/OCCL in the rank to an Asst. Executive Engineer and above and any officer of the rank of Under Secy. and above in the W.R. 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. **(The proforma for no relation certificate is contained in a separate sheet of I.T.B.).**
61. The Contractor shall submit signed documents of final acceptance of the plans, sections and agreements for the work prior to take up the work for execution.
62. The Contractor is to supply necessary labour and materials for the purpose of layout during alignment fixing whenever required at his own cost.
63. The Contractor should arrange necessary tools and plants as may be required for the efficient execution of work at their own cost. The running charges of such plant and cost of consumables and conveyance are to be borne by the Contractor.

64. In the event of delay in supply of approved drawings reasonable extension of time will be granted on the application of the Contractor. But no claim for monetary compensation will be entertained under any circumstance.
65. Under no circumstance, Interest chargeable for the dues or any additional dues if any payable for the work.
66. Conditional tenders will not be taken into consideration.
67. Penalty shall be imposed, if the tenderer backs out from offer before acceptance of the tender by the competent authority and if the tenderer fails to sign the agreement after acceptance and not willing to deposit the required ISD and Additional Performance Security, if any for the unbalance tender amount.
68. If L1 bidder does not turn up for agreement after finalization of the tender, then they shall be debarred from participation in bidding for any other tender for three years and action will be taken to blacklist the Contractor. In that case, the L2 bidder, if fulfils other required criteria would be called for drawing agreement for execution of work subject to the condition that L2 bidder negotiates at par with the rate quoted by the L1 bidder otherwise the tender will be cancelled. In case a Contractor is black listed, it will be widely published and intimated to all departments of Govt. and also to Govt. of India agencies working in the State.
69. When in response to a notice calling for tenders, only a single tender is received in the first time, the tender shall be cancelled without opening of the bid and fresh tender be invited publicly. If single tender is received even after re-tendering, then the approval of the next higher authority should be obtained, if the tender is otherwise in order and acceptable.
70. Protection against flood: 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 work site is normal after flood. No extension of time for the completion of the work may be considered by the Department/Corporation if the discontinuance of the work is beyond the reasonable attempts of the Contractor to such eventualities.
71. 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 their 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 their own cost.
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.

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/OCCL.

72. Dewatering from the foundation for dams, spillways, bridges, culverts, retaining walls, canal/drain bed lining, building work sites etc. and watering for consolidation in roads embankments wherever necessary during execution will have to be done by the Contractor and no extra payment will be made on that account. The terms dewatering shall mean the execution or operation of the items due to standing water as well as due to percolation water by any suitable means.
73. Income Tax as applicable over the gross amount of the bill is to be deducted from the Contractors bill towards income tax & as amended from time to time.
74. (a) The bidders have to quote the **percentage rate** excluding GST (Goods and Service Tax).
 (b) The **percentage rate** quoted by the Contractor in the tender for works shall exclude GST that may be levied on turnover on works contract according to the Laws and Regulations as applicable & as amended from time to time.
 (c) GST as applicable on works contract will be deposited by the Contractor after passing of each bill and the Contractor is to intimate to the Corporation subsequently.
 (d) TDS on works contract as applicable towards GST will be deducted from the bill and credited to Govt. account by the Corporation.
 (e) **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.
75. The amount of royalty, EMF, DMF, Additional charges (as applicable) of different materials as utilized by the Contractor in the work will be recovered from their bill, basing on the rate fixed by the Govt. or as amended from time to time during the period of execution.
76. **Additional Performance Security** shall be submitted by the bidder when the bid amount is less than the estimated cost put to tender. In such an event, only the successful bidder who has quoted less bid price/rates than the estimated cost put to tender shall have to furnish an amount as stipulated below towards Additional Performance Security (APS) in shape of Demand Draft in favour of "Odisha Construction Corporation Ltd." payable at Bhubaneswar / Term Deposit Receipt (TDR) pledged in favour of Odisha Construction Corporation Limited/ Bank Guarantee in prescribed format (Annexure-C) in favour of Odisha Construction Corporation Limited from any nationalized/scheduled bank in India counter guaranteed by its local branch at Bhubaneswar within seven days of issue of Letter of Acceptance (LoA) by Odisha Construction Corporation Limited (by email) to the successful bidder otherwise the bid of the successful bidder shall be cancelled and further proceedings for blacklisting shall be initiated against the bidder.

❖ Amended vide **O.M. No.173 Dt.03.01.2026 & O.M. No.632 dtd.09.01.2026** of Works Dept., Govt. of Odisha to fix the following rate of Additional Performance Security (APS).

Sl. No.	Range of difference between the estimated cost put to tender and bid amount	Additional Security to be deposited by the successful bidder
---------	---	--

1	Below 0.0 % but not below 10.00%	No additional Security
2	Below 10.00% and not below 20.00%	The Additional Performance Guarantee/ Security percentage shall be incremented by 0.1% for every percentage of bid price below 10% of the project cost put to bid starting at 11% with the additional bid performance guarantee being 0.1% and this additional performance guarantee percentage shall be applied on the bid price.
3	Below 20%	The additional performance guarantee percentage shall be incremented by 0.2% for every percentage of bid price below 20% of the project cost put to bid in addition to 1% of the bid price and this additional performance guarantee percentage shall be applied on the bid price.

- ❖ 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.
 - ❖ The additional performance security shall be treated as part of the performance security.
 - ❖ 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.
77. 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 authority inviting bid may reserve the right to accept any additional document.
78. The Contractors would be responsible for procurement of materials conforming to the required specification from authorized sources and voluntarily disclose the source of procurement.
79. Miscellaneous:

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

(b) Shuttering and centering shall be made with steel material the inside of which shall be lined with suitable sheeting and make leak proof and water tight and to obtain a good finished surface as per the item specified in the BoQ as well as to get a good aesthetic view of the exposed concrete surface.

80. Tenderers are also required to go through each clause of **P.W.D. form P1** carefully in addition to the clause mentioned herein before tendering.
81. All the forms and Annexure attached to section 2 of this ITB must be filled in properly along with the authenticated documentary evidence required therein, failing which the bid shall be treated as 'Non-responsive' and be rejected.
82. If a Contractor removes any Govt. material or stores supplied to him from the site of the work in contravention of the provision of this clause with a view to dispose of the same dishonestly, they shall be in addition to any other liability civil or criminal arising out of this contract be liable to pay penalty equivalent to 5 (five) times of the price of the materials cost. The penalty so imposed shall be recoverable at any time from the sum that may be due then or at any time thereafter become due to the Contractor or from their security deposit or from their other available dues with the Department / OCCL.
83. Price Adjustment/Price variation shall be applicable to this contract subject to receipt of the same from the client/Department/Requisitioning authority as per prevailing guidelines of Govt. of Odisha.
84. **GENERAL INSTRUCTION TO CONTRACTORS as per DoWR letter No.20415 dt.14.09.2015.**
 - (i) 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 their disposal to complete the work as per schedule.
 - (ii) 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.
 - (iii) 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 likewise lift more quantity of soil/ other materials during dry period, so as to complete the work as per schedule.
 - (iv) 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.
 - (v) 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.
- (vi) 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.
 - (vii) Only the day(s) of elections to the Local Bodies / Assembly / Parliament will be treated as non working day(s)

85. **Definitions**

In the contract (as hereinafter defined) the following words and expressing will have the meanings here by assigned to them.

- a) **MD, OCCL:** Managing Director, Odisha Construction Corporation Limited, Bhubaneswar.
- b) **Bidder:** individual/firm/ Limited Company/Corporation, as eligible for bidding.
- c) **Contractor/ Agency:** Shall mean the Bidder whose bid will be accepted by the Owner for award of the Work and shall include such successful Bidder's legal representatives, successors and permitted assignees.
- d) **Government / Owner / Employer:** Means the Government of Odisha / OCCL (or Employer or Owner).
- e) **Approved / Approval :** Means approved / approval in writing.
- f) **Construction Plant:** Means all equipments, appliances or a thing 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.
- g) **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.
- h) **Drawing:** Means the drawing referred to in the specifications any modifications of such drawings approved in writing by the Senior Manager (Civil) in charge of the work and such other drawings are may from time to time be furnished or approved in writing by the Engineer-in-charge.
- i) **Engineer-in-charge:** Means the Senior Manager (Civil) -in-charge of the work specified or parts of the works under the contract or such other OCC Ltd. assistants of sub-ordinates to whom the Senior Manager (Civil), may have delegated certain duties acting separately within the scope of particular duties entrusted to them.
- j) **Contract Price:** Means the agreed amount stated in the Contract Agreement for the execution and completion of the works on item rate /percentage rate basis and the remedying of any defects, and includes adjustments (if any) in accordance with the contract.
- k) **Agency's Equipment:** Means all apparatus, machinery, vehicles and other things required & brought to site by the agency, for the execution and completion of the works and the remedying of any defects. However, Agency's Equipment excludes Temporary works, Employer's equipment (if any) plant, materials and any other things intended to form or forming part of the permanent works.
- l) **Goods:** Means Agency's Equipment, Materials, Plant and Temporary Works, or any of them as appropriate.
- m) **Materials:** Means things of all kinds (other than Plant) intended to form or forming part of the Permanent Works, including the supply of materials (if any) to be supplied by the Agency under the Contract.

- n) **Permanent Works:** Means the permanent works to be designed and executed by the Agency under the Contract.
 - o) **Month:** Means from the beginning of a given date of a calendar month to the end of preceding date of the next calendar month.
 - p) **Week:** Means seven consecutive days.
 - q) **Rupees`:** Means Rupees of Indian Currency.
 - r) **Site:** Means the lands and other places on, under, in or through which, the works are to be executed or carried out and any other lands or places provided by the Owner for the purposes of the contract together with such other places as may be specifically designated in the Contract or subsequently approved as forming part of the site.
 - s) **'Consulting Engineer'/'Consultant'** shall mean any firm or person duly appointed as such from time to time by the Owner.
 - t) **'Guarantee Period'/Maintenance Period'** shall mean the period during which the Agency shall remain liable for repair or replacement of any defective part of the Works performed under the Contract.
 - u) **FOT:** Famers' Organisation and Training i.e formation of Pani-Panchayat (WUA) and training them / organization for operation and maintenance of the system.
 - v) **Government :** Means Government of Odisha, Department of Water Resources.
 - w) **I.S.S./ B.I.S :** Means Indian Standard Specification/ Bureau of Indian Standard.
 - x) **Temporary Works:** Means all temporary works of every kind required for the performance of the contract.
 - y) **Specification:** Whenever the term 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.
86. **Procedure for Electronic receipt, accounting and reporting of Cost of Tender Paper and Earnest Money Deposit on submission of bids. (Vide Works Department O.M.No. 6785 /W. Dtd. 09.05.2017 & 17254, dated. 05.12.2017)**
- i. 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>".
 - ii. 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-1). 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 ii above would be faster.

- iii. 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.
- iv. 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.
- v. 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.

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.

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.

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.

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. 1. 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.

Forfeiture of EMD :

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

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-102P.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-0097Misc, 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.

Exemption of EMD is not allowed. The bidder who wishes to submit EMD in shape of Bank Guarantee or other off-line instruments instead of on-line transfer, during uploading of his bid, he has to select "Yes" against the option of "EMD through BG/ST or EMD Exemption allowed" of EMD Fee Details. If the system asks for percentage of EMD exemption allowed, the bidder must fill in "100%". The bidder has to upload the scanned copy of the Bank Guarantee in the required field, if the system asks for document towards exemption of EMD.

The EMD amount, besides on-line transfer of EMD, the bidders are also allowed to furnish EMD off-line in shape of Bank Guarantee (BG) from the schedule bank having its branch in Odisha. For this purpose, the bidders should upload scanned copy of the BG to the portal in designated location and submit the original BG before the Tender Inviting Authority within 5 (five) days of opening of technical bid failing which their bids shall be treated as non responsive & liable for rejection. (Format attached). The intending bidders, who want to deposit the EMD money through Bank Guarantee (BG) should draw the BG in favour of the Managing Director, OCCL, Bhubaneswar and submit the original during opening of the Technical Bid.

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.

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.

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.

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.

Redressal of Public grievances :

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.

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.

ANNEXURE-1**Back-end Transaction Matrix of Electronic receipt and remittance of Cost of Tender Paper and Earnest Money Deposit on submission of bids.**

	Cost of Tender Paper on submission of bids	Earnest Money Deposit on submission of bids
Government Departments	<p>I. The payment towards the cost of Tender Paper, 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-0097Misc. 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 Earnest Money Deposit on submission of bids shall be collected in a pooling account opened for this purpose at Focal Point Branch called e-FPB of respective designated banks at Bhubaneswar and the banks will remit the amount to respective bidder's account within two working days on receipt of instruction from TIA through refund and settlement of e-procurement system.</p> <p>II. In case of forfeiture of Earnest Money Deposit on submission of bids, the e-Procurement portal will direct the Bank to transfer the EMD value from the Pooling Account of SPC to the registered account of the tender inviting authority within two working days of receipt of instruction from TIA.</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 Cost of Tender Paper, 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 Paper cost 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>Statutory Corporations, Autonomous Bodies and Local Bodies.</p> <p>I. Amount towards EMD on submission of bids shall be collected in a separate pooling account of Focal Point Branch called e-FPB of respective designated banks at Bhubaneswar and the banks will remit the amount to respective bidder's 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 Earnest Money deposit on submission of bids, the e-Procurement portal will direct the Bank to transfer the EMD value from the Pooling Account of SPC to the registered account of the tender inviting authority within two working days of receipt of instruction from TIA.</p>

SECTION-II

INSTRUCTIONS TO BIDDERS

INSTRUCTIONS TO BIDDERS

1. Preparation of Tender Documents.

The intending tenderer shall log in to the e-procurement portal identified as <https://www.tendersodisha.gov.in> and download the Technical Bid (Cover-I) and Financial bid (Cover-II) in shape of bill of quantity in an intelligent MS Excel Format. As per the requirement of the bid document, the bidder will fill up required information and **the Percentage excess / less** at required cell on the intelligent MS Excel sheet. The bidder is to scan his OCCL enlistment Certificate, PAN card, Affidavit in prescribed proforma duly registered before NOTARY, No relation certificate in prescribed proforma, GST Registration Certificate, EPF Registration Certificate and certificate issued by competent authorities required for fulfilling the minimum qualifying criteria specified in the bid document for the work.

2. Method of submission of Tender Documents.

- 2.1 The bidder shall upload the scanned copy/ copies of the documents & information as per requirement of the bid document through the e-procurement portal. All documents & scanned copies are to be uploaded in the designated location of the Technical Bid (Cover-I) except the filled up intelligent MS 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 the Technical & Financial Bid failing which the Bid will be rejected. All the uploaded documents should be clear & 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 bidders shall digitally sign on the all statements, documents, clarification uploaded by them owning responsibility for their correctness /authenticity. If any of the information furnished by the bidder is found to be false/ fabricated/ bogus the bidder will be black listed & EMD / Bid Security will be forfeited.
- 2.2 The information required as per bid documents may be provided in the specified format annexed to the bid document.
- 2.3 If the intending tenderer is an individual, the documents shall be signed by the individual above his full type written name and current address.
- 2.4 If the intending tenderer is a proprietary firm, it shall be signed by the proprietor above his full name and with his current address.
- 2.5 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.
- 2.6 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.
- 2.7 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.
- 2.8 **The Period of execution of the above work is 24 (twenty four) Calendar months .**

3. Opening of Technical Bid Document.

The tender documents will be opened on dated **09.07.2026 at 12.00 Noon** in the Corporate office of Odisha Construction Corporation Limited, at Gopabandhu Nagar, Unit-VIII, Bhubaneswar in the presence of tenderers or their authorized representative, who wish to be present.

3. SPECIAL ATTENTION.

OCCL has been entrusted with the work of “**Construction of Spillway of Upper Lanth Irrigation Project, Belpada**” The tender is invited on Percentage rate basis who are registered as Special/Super Class agency with Govt. of Odisha. Agencies registered in equivalent grade outside Odisha are also eligible. However, the Bidders are to get themselves enlisted in OCC Ltd as C-I class of contractors preferably before submission of tender but Mandatory before drawl of agreement. The enlistment form of OCCL is available in the website of OCC Ltd. i.e. www.odishaconstruction.com or may be collected from OCC Ltd. Head Office and should be submitted at the same office along with the necessary documents and fees before uploading the bid in portal positively failing which it will not be considered for the present work. In case intending bidder applied for such Certificate but not received that up to the time of submission of bid, he has to upload certificate of Registration of concerned State Government / Railway / CPWD / Government bodies along with copy of the application for C-I enlistment in OCCL. **The work is to be completed in all respect within the scheduled period of completion i.e. 24 (twenty four) Calendar months failing which, suitable penalty as per codal provision and further action as deemed fit shall be initiated against the agency. The prospective bidders have to quote their percentage rates taking into consideration various site conditions & nature of work after visiting the site for timely and smooth execution of the work within the stipulated period.**

5. Minimum Qualifying Criteria

A. (a) SATISFACTORY COMPLETION OF SIMILAR WORK:

To qualify for award of the contract, each bidder in its name should have satisfactorily completed (not less than 80% of the original contract value if the work is incomplete) as a prime contractor of at least one similar work such as **Concrete/ Masonry Dam/Barrage/Spillway of value not less than Rs. 57.59 Crore at FY 2026-27 price level** in last five years (5 years prior to the FY of invitation of tender i.e. **FY 2021-22 to 2025-26** & including current FY i.e. **FY 2026-27**) (Self attested copy of certificate of authenticity is to be enclosed from the concerned Executive Engineer/competent officer in charge of execution. The detailed correspondence address/Fax no/ e-mail ID of the authority issuing certificate shall be furnished). Weightage of 10% per year shall be given on cost of satisfactorily completed works of previous years to bring them to the current price level. Failure to submit proof in support will result in non-consideration of the tender.

(b) ANNUAL TURN-OVER

To qualify for award of the contract, each bidder in its name should have in the last five years (**from FY 2021-22 to FY 2025-26**) achieved a minimum annual turnover (**in all classes of Civil Engineering Construction works only**) of **Rs. 107.99 Crore at 2026-27 price level** in any one financial year (Attested copy of certificate of authenticity is to be enclosed from the appropriate authority). Weightage of 10% per year shall be given on financial turnover of the previous years to bring them to the price level of current financial year i.e. **2026-27**.

Note: (appropriate authority means: statutory auditor who has audited the Profit-loss account of the last financial year). The attested copies of certificate towards Annual Turnover (in all classes of Civil Engineering Construction works only) **from statutory auditor who has audited the Profit-loss account of the last financial year of the bidder shall only be considered.**

(c) **SATISFACTORY COMPLETION OF SIMILAR MAJOR ITEMS OF WORK**

To qualify for award of the contract, the bidder should have executed the following minimum quantities in any one financial year during the last 5 years i.e. **from FY 2021-22 to FY 2025-26** and including current financial year i.e. FY **2026-27:-**

Qualifying Quantity

- | | | |
|---|---|------------|
| 1. Earthwork (Excavation in AKS/D.I/MHR/H.R & Filling) | = | 34,455 Cum |
| 2. Temperature Controlled Cement Concrete of all grades | = | 25,958 Cum |
| 3. Cement Concrete of all grades | = | 3,553 Cum |
| 4. Steel reinforcement | = | 4,917 Qntl |
- The quantity means the sum total of similar items in all the works executed in one FY.
 - These items might have been executed in different years separately, in last 5 years including the FY of invitation of tender.

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

B. Availability of Plant & Machinery:

The bidder should produce documentary evidence regarding availability of the following key plant, machineries and equipments in good working condition required for execution of the work (either owned in his name or obtained on hire purchase scheme or by hiring from the reputed firms/contractors' firms). If the machineries are to be procured for specific period for completion of the work on lease / rental basis, then a copy of MOU/ Affidavit must be attached. In case of hiring machineries by making MoU with the machine owner, the proof of ownership of the MoU partnership must be attached. **The contractor should attach an affidavit that the plant and machineries/equipments are free and will be available during execution of the work.**

Sl.No.	Name of the equipment	Capacity	Minimum Number required
1.	Excavator	0.90 cum bucket capacity	06
2.	Tipper / Hyva	10 Ton & above	12
3.	Dozer	D-50, A-15	03
4.	Tower Crane	10 Tonne	02
5.	Vibratory Roller	8-10 Tonne	02
6.	Batching Plant	30 Cum/Hr. & above	02

7.	Transit Mixer	10 Ton	09
8.	Water Tanker	6000 Litre	03
9.	Diesel Air compresor	400 CFM	04
10.	Generator	50 KVA & above	02
11.	Stone Crusher	40 Cum/hr & above	02
12.	Drilling Machine with diamond core NX/BX size drill holes	-	04
13.	Grout Pump	-	02
14.	Concrete Pump	20 Cum / Hr. & above	02
15.	Water Pump (Electric / Diesel)	i) 10 HP ii) 20 HP iii) 40 HP	i) 02 ii) 02 iii) 02
16.	Air Cooled Batching Chiller	Minimum 120 TR	01
17.	Ice Plant	40 TPD	01

Note: The bidder has to provide documents showing the capacities of the machineries furnished. Otherwise the documents furnished towards possession of machineries will not be considered.

C. CREDIT FACILITY

The firm must possess credit facilities of not less than twenty percent (20%) of the amount put to Tender i.e. **Rs. 28.80 Crores** and furnish the credentials from any nationalized / scheduled commercial bank along with the bid against the specific work by mentioning the name of work and tender identification number in prescribed proforma as given in below;

BANK CREDIT FACILITY CERTIFICATE

This is to certify that M/s _____ is a reputed company with a good financial standing. If the contract for the work, namely "**Construction of Spillway of Upper Lanth Irrigation Project, Belpada**" having e-procurement notice no. 02/OCCL/2026-27 (on-line) and Bid identification No. OCCL-LSSP/01/2026-27 is awarded to the above firm, we shall be able to provide overdraft/credit facilities to the extent of Rs. 28.80 Crores (Rupees twenty eight crores eighty lakhs) only to meet their working capital requirements for executing the above work.

**Signature & Seal of the Bank Manager
Name & Address of the Bank**

D. Contractor / SUB-Contractor's EXPERIENCE

Experience Certificate issued by the Executive Engineer to State / central PSUs and Experience Certificates issued by the State / central PSUs to their Sub-Contractor, shall be taken into consideration, while examining the qualifying criteria. The Experience Certificate issued by the State / central PSUs must carry **counter signature of the concerned Engineer-in-Charge not below the rank of Executive Engineer**. In that case, the original State / central PSU and the authorized Sub-Contractor will be treated at par as prime Contractor.

E. BID CAPACITY

Bidders will be qualified only if their available bid capacity at the time of bidding is more than the total estimated cost of the work (**i.e. Rs. 143.98 Crores**). The available bid capacity will be calculated as under: -

Assessed Available Bid Capacity = $(A \times N \times 2 - B)$, where,

- A = Maximum value of works executed in any one financial year during the last five years (updated to the current price level). The rate of inflation may be taken as 10 percent per year (escalation factor) which will be taken in to account for the completed works as well as works in progress.
- B = Value at Current Price Level of the existing commitments and ongoing works to be completed during the next **24 months**.
- N = Number of years prescribed for completion of the works for which the bids are invited (**24/12 years**)

Note: The statement showing the value of existing commitments and ongoing works as well as stipulated period of completion remaining for each of the works listed should be countersigned by the Engineer-in-Charge not below the rank of Executive Engineer or An Affidavit towards existing commitment clearly stating the value at Current Price Level of the existing commitments and ongoing works must be furnished as per the prescribed proforma.

5. Joint Venture is not allowed.

6. Final Decision making authority

The **Managing Director** of the Corporation is the competent authority who reserves the right to accept or reject or disqualify any of the tender without assigning any reasons thereof and his decision shall be final and binding on all the bidders.

7. Further Clarification

The **Managing Director, OCC Ltd, Unit-VIII, Bhubaneswar** or his **authorized representative** may be contacted during any working days **from 09.06.2026, 03.30 P.M to 3.30 P.M of 22.06.2026** for any further clarification (through Telephone/e-mail).

8. Trial Boring: The level as indicated in the body of the general arrangement drawing is purely tentative and for the general guidance only. The Corporation / Department has no responsibility for the suitability of actual strata at the foundation level. The Contractor has to conduct boring before starting the work at his own cost to ascertain the 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. ISSUE OF ADDENDA / CORRIGENDA/ CANCELLATION NOTICE:

The Officer inviting the tender may publish any addendum / corrigendum/ cancellation of tender in the notice board and in the web-sites www.tendersodisha.gov.in & www.odishaconstruction.com and such notice shall form part of the bidding documents.

Sd/-

MANAGING DIRECTOR

FORM – A
STRUCTURE AND ORGANISATION

1. Name of Tenderer
 2. Nationality of Tenderer
 3. Office Address
 4. Telephone No.
 - Land phone
 - Mobile
 - Fax No
 - e-mail id
 5. Location of establishment
 6. The tenderer is
 - a. An individual
 - b. A proprietary firm
 - c. A limited company or limited corporation
 - d. A member of a group of companies (If yes, give names, address and present description of other companies.
 - e. A subsidiary of large organization
(If yes, give names, address of the present organization)
 - f. If the company is subsidiary state what involvement if any, will the parent company have in the project.
- Attach the organization chart showing the structure of the organization including the names of the Directors position of officer.
7. Number of year of experience
 - a. As a prime Contractor
 - I In own country
 - II Other country (specify country)

ANNEXURE-A**(AFFIDAVIT)**

(To be submitted in original in legal stamp paper duly registered)

1. The undersigned hereby certifies that, all the statements made in the required attachments are true and correct.
2. The undersigned also hereby certify that, neither our firm _____ nor any of its construction partners have abandoned any project work in India nor any contract awarded to us for such works have been rescinded during the last five years prior to the date of this bid.
3. The undersigned hereby authorized and request (s) bank, firm or Corporation to furnish pertinent information as deemed necessary and as requested by the Corporation to verify this statement or regarding my (our) competency and general reputation.
4. The undersigned understands and agrees that further qualifying information may be requested and agree to furnish any such information at the request of the Corporation.
5. The undersigned also certifies as follows;
 - (a) As on date i.e. __th day of ____, 2026, we have an existing commitments and ongoing work i.e. work in hand of Rs. _____ Lakhs against execution of _____ nos. of works under various Divisions/organisations, the statement duly notarised is attached herewith. **(Prescribed Format for determination of Value of B is to be enclosed separately in shape of affidavit as prescribed in Annexure-G)**
 - (b) As per Clause No. 5 A (a) of Instructions to Bidders (ITB), section-II of this tender call notice we have satisfactorily completed not less than 80% of the original contract value the following similar works during the last five financial years i.e. 2021-22 to 2025-26 and 2026-27. The certificate against each work is enclosed herewith.

Sl No	Name of Work	Name of Division/client, address, email Id and telephone No	Agreement No with date of commencement and date of completion	Agreement value	Executed value	% of work completed	Certificate issued by (Pl. enclose certificate)
1							

- (c) As per Clause No. 5 A (b) of Instructions to Bidders (ITB), section-II of this tender call notice The Annual Financial Turnover of Last 5 years i.e. from 2021-22 to 2025-26 are mentioned below which are duly audited/certified by the Registered Chartered Accountant firm.

Financial Year	Annual Turnover in Civil Engineering Works only	Name of the Chartered Accountant with detail address and e-mail Id.	Whether Audited (mention UDIN No.)
1			

- (d) As per Clause No. 5 A (c) of Instructions to Bidders (ITB), section-II of this tender call notice we have executed following major items of works during the financial years as mentioned below. The certificate against each work is enclosed herewith.

Sl No	Items	Highest Quantity executed in any one year during the last 5 FY and current FY as per Instructions to Bidders	Executed Financial Year
1			
2			

- (e) As per Clause No. 5 B of Instructions to Bidders (ITB), section-II of this tender call notice we have possession of the following plants, machineries and equipments in good working condition required for execution of the work (both hired and owned). Further we certify that the plants and machineries as mentioned below are free and will be available during execution of the work.

Sl.No.	Name of the Equipment/plant machinery	Capacity	Nos	Name of the Owner	Owned/hired	Invoice/ RC copy enclosed (Yes/No)
1						
2						

- (f) The undersigned also certifies that I/we have executed _____ Rmt of "*Pressure drilling with diamond core drill machines of minimum 35 mm dia drill holes (NX/BX)*" during the Financial Year _____ under _____ (Name of the employer, department, State). The credentials towards the same is being enclosed herewith for necessary verification.

All the information furnished above are true to the best of my/our knowledge. During verification, if any of the information are found to be false/Incorrect, action as deemed fit as per codal provision may be initiated against us.

Signature of the Bidder with seal

Address:

ANNEXURE-B**CERTIFICATE OF NO-RELATIONSHIP**

I/We hereby certify that I/We am/are not related to any officer of Govt. of Odisha/OCC Ltd of the rank of Asst. Executive Engineer and above and any officer of the rank of Under Secretary and above in the W.R. Department. I/We am/are aware that if the facts subsequently proved to be false my/our contract will be rescinded with forfeiture of EMD & security deposit and I/We shall be liable to make good the loss or damage resulting from such cancellation.

I/We also note that, non- submission of this certificate will render my/our tender liable for rejection.

Signature of the Contractor

Name _____

Address _____

Date : _____

ANNEXURE-C**BANK GUARANTEE FOR ADDITIONAL PERFORMANCE SECURITY (APS)**

To

----- (name of Employer)

WHEREAS the bid of ----- (name and address of Contractor) (hereinafter called "the Contractor") has been accepted vide letter of acceptance (LoA) No. _____ dated _____ of Odisha Construction Corporation Ltd., ----- to execute the work _____ [name of work] (hereinafter called "the contract")

AND WHEREAS it has been stipulated by you for the said Contract that the Contractor shall furnish you with a Bank Guarantee by a Nationalized/Scheduled Bank in India, counter guaranteed by its local branch at Bhubaneswar towards Additional Performance Security (APS), for compliance with his obligations in accordance with the conditions of Contract.

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee.

NOW THEREFORE we hereby affirm that we are the Guarantors and responsible to you, on behalf of the Contractor, up to a total of Rs _____ [amount of guarantee] _____ [in words], such sum being payable in the types and proportions of currencies in which the contract price is payable, and we undertake to pay you upon your first written demand declaring the Contractor to be in default under the contract and without cavil or argument, any sum or sums within the limits of _____ [amount of guarantee] as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed there under or of any of the contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid up to _____ day of _____ 20 _____ i.e. up to 3 (three) months beyond the date stipulated for completion of work. We also agree for extension of this guarantee for a further period in response to the Employer's written request for such extension, which should be presented to us before the expiry of the guarantee.

We _____ (Name of Bank) hereby also undertake to have it counter guaranteed by our local branch at Bhubaneswar, _____ (name and address of Local Branch at Bhubaneswar, Odisha).

(Signature of the authorized officer of the Bank)

.....

Name and designation of the officer

.....

Seal, name & address of the Bank and address of the Branch

We _____ (name and address of Local Branch at Bhubaneswar, Odisha) are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee depending on the filing of claim and only if it is served upon to us by the employer at our Bhubaneswar Branch by a written claim or demand and received by us at our Bhubaneswar branch on or before Dt. _____ (subject to further extension on the Employer's written request for such extension before expiry of this guarantee), otherwise bank shall be discharged of all liabilities under this guarantee thereafter.

(Signature of the authorized officer of the Bank)

.....

Name and designation of the officer

.....

Seal, name & address of the Bank and address of the Branch

ANNEXURE-D**UNDERTAKING TO PAY ROYALTY**

We do hereby undertake that, Royalty, DMF, EMF and additional charges as applicable for stone products, sand, moorum and Borrow earth etc. are to be recovered from work bills as per prevailing Govt. Notification during the time of execution.

Signature of the Bidder

Name _____

Address _____

Date : _____

ANNEXURE-E**UNDERTAKING TO PAY MINIMUM WAGES**

We do hereby undertake that, we shall pay wages of each labour at the rate not less than the wages as per Minimum Wages Act in force during the time of execution and as may be amended from time to time. The "Engineer-in-Charge" has the right to enquire into and decide on any complaint of the Labourers relating to non-payment or less payment of wages to them and his decision will be final and binding on us.

Signature of the Bidder

Name _____

Address _____

Date : _____

ANNEXURE F**BANK GUARANTEE TOWARDS BID SECURITY****[Bid Identification No. _____]**

Whereas (Name of Bidder)
 (Hereinafter called the "bidder") has submitted their offer dated for the work of
 (hereinafter called the "Bid") against the employer's Bid
 Identification No. KNOW ALL MEN by these presents that WE
 of
 (Name of Bank) having our registered office at
 are bound unto Managing Director, OCCL, _____ (on behalf of

OCC Ltd.) (hereinafter called the "employer") unconditionally & irrevocably for the sum of /
 (Rupees.....) for which payment will and
 truly to be made to the said employer, the Bank binds itself, its successors and assigns by the presents.

Sealed with the

Common Seal of the said Bank this day of20

THE CONDITIONS OF THIS OBLIGATION ARE:

- (1) If the Bidder withdraws or amends, impairs or derogates from the bid in any respect within the period of validity of this bid.
- (2) If the Bidder having been notified of the acceptance of his Bid by the employer during the period of its validity in accordance with Instruction to Bidders of the Bid document.
 - a) If the Bidder fails to furnish the initial Security Deposit for the due performance of the contract.
 - b) Fails or refuses to accept/execute the contract.

WE undertake to pay the employer up to the above amount upon receipt of its first written demand, without the employer having to substantiate its demand, provided that in its demand the employer will note that the amount claimed by it, is due to it, owing to the occurrence of one or both the two conditions, specifying the occurred condition or conditions.

This guarantee will remain in force up to and including 60 days after the period of tender validity as specified in DNIT and any demand in respect thereof should reach the Bank not later than the above date.

We (Name of Bank) hereby also undertake to have the signature of Branch Manager issuing Bank Guarantee verified from Local Branch of the Bank in Bhubaneswar, (address of Local Branch Bhubaneswar, Odisha) for due authentication.

Our..... branch at Bhubaneswar (Name & Address of the
 branch) is liable to pay the guaranteed amount depending on the filing of claim and any part thereof under this Bank Guarantee only and only if it is served upon us by the employer at our Bhubaneswar Branch, a written claim or demand and received by us at our Bhubaneswar branch on or before Dt. otherwise bank shall be discharged of all liabilities under this guarantee thereafter.

.....
 (Signature of the authorized officer of the Bank)

.....
 Name and designation of the officer

.....

ANNEXURE G**FORMAT FOR DETERMINATION OF VALUE OF B**
(TO BE SUBMITTED IN SHAPE OF AFFIDAVIT ON STAMP PAPER)

SI No	Name of Work	Name of Employer	Agreement No	Date of Commencement	Stipulated Date of Completion	Expected date of completion	Agreement Value/Revised Agreement value (Rs. in lakhs)	Executed Value (Rs. in lakhs)	Balance Value of Work (Rs. in lakhs)
1	2	3	4	5	6	7	8	9	10 (8-9)

(1) I/We do hereby certify that, the above facts and figures are true to be best of my Knowledge and are as per the official records.

(2) If any of the data/figure is found to be false and fabricated during verification as per relevant clause of DTCN, action as deemed fit shall be initiated against me/us. Any action arising out of submission of false data/credentials shall be accepted by me/us.

(3) The total value of balance work as on _____ is Rs. _____ Lakhs.

(4) The Bid Capacity of my firm/our company is as follows;

$$A \times N \times 2 - B$$

$$= \text{Rs.} ______ \times ______ \times 2 - \text{Rs.} ______ = \text{Rs.} ______ \text{ Cr.}$$

Signature of the bidder
Address of the bidder:
OCCL enlistment No_

SECTION-III

SPECIAL CONDITION OF CONTRACT

Special Conditions of Contract

1. The contractor is to supply labour for giving section and profiles. All materials necessary for such work will be supplied by the Contractor at his own cost and responsibility and profiles are to be maintained till the work is completed.
2. The offer submitted by the Contractor will remain valid till finalization of the award of the work. He is not entitled to withdraw his offer during the period of consideration of his offer. Withdrawal of offer prior to finalization of the tender will entail forfeiture of security deposit.
3. The Contractor shall furnish the postal address of his site office as well as his permanent registered office along with Phone numbers (both Landline & Mobile) and valid e-mail id. Any notice shall be deemed to have been served if it is delivered to his authorized agent/representative at site or sent by Registered Post or sent by e-mail to the said site office.
4. The Contractor shall arrange to obtain drawings and specification of the work from the Senior Manager's Office. He has to carry out the work at the agreement rates including any additions/alternations in drawings/specifications as may be instructed by the Engineer-in-Charge during course of execution of the work.
5. The Contractor will install display board at his cost mentioning information about the work at worksite after drawal of the agreement.
6. The work has to be executed strictly as per drawings and specifications. The Contractor has to engage technical persons to assist the corporation for taking initial levels, final levels, giving layout and to supervise day-to-day work.
7. The quantities mentioned against each item of work are subject to variations. Such variations shall not vitiate the contract. The rates quoted shall apply for increased or decreased quantities of different items.
8. **PERIOD OF COMPLETION:**

This work is to be completed in all respect within **24 (twenty four) Calendar months** from the date of issue of work order. The Contractor, whose tender is accepted must submit a programme of work within 7 (Seven) days after issue of work order for approval of the Engineer-in-Charge. The Contractor will execute the work strictly as per the programme

submitted by him, failing which action will be taken by Senior Manager as per clauses indicated in the general terms and conditions of OCCL

9. OCCL shall provide temporary Bench Mark (T.B.M.) at convenient location. The Contractor has to establish at his cost sufficient Nos. of temporary B.Ms. for smooth execution and measurement of work.
10. Due to non-issue of design and drawings by the client in time and any hindrances caused due to non-settlement of rehabilitation and resettlement problems by the client which may likely to affect the progress of work or stoppage of work, the Contractor shall have no right to claim any compensation in whatsoever manner from OCCL. The Senior Manager (Civil) in-charge of the work may direct the Contractor to suspend the work or any part of the work temporarily for any period as may be necessary. This temporary suspension shall not vitiate the contract and the Contractor shall not be entitled to any claim on account of such temporary closure.
11. All materials required for the work shall be approved by the Engineer-in-Charge before use in the work. He will extend necessary co-operation for sampling and testing of materials by OCCL/client. However, testing charges shall be borne by the Contractor.
12. The Contractor has to obey all rules and regulations for movement of transport vehicles in main roads, village roads, in factory and colony areas. He has to obtain necessary permission from the concerned authorities at his cost and risk. Necessary permission/license for borrowing earth from borrow areas whether Government or private will bear his risk and cost. The rate quoted is inclusive of such expenditure.
13. The cost of cement provided in the estimate is as per prevailing Analysis of rates, Govt. of Odisha/ Govt of India. If consumption of cement during execution of the work is found to be less as per design mix, then the cost of excess cement shall be recovered from the R/A bills of the agency as per the estimated rate. Further, cost of empty cement bags as per prevailing schedule of rates of Govt. of Odisha shall be deducted from the bills of job worker.
14. The Contractor shall allow the quality control organization to take as many samples as may be required by them during course of execution of different items of works. He shall also extend necessary co-operation to carry out any number of field tests as may be necessary. Any portion of work or material rejected by quality control organization/ Department shall be treated to have been finally rejected by the Engineer-in-Charge.

15. Maintenance of the work during construction and during the **Defect Liability Period of 2 (two) years after completion of the work** is the responsibility of the Contractor.
16. The Contractor shall display notice both in English and Oriya indicating wages of different categories of labour in a conspicuous place. He shall also maintain wage book of each worker and shall issue wage cards in the prescribed forms to different workers.
17. Payment for the work done by the Contractor shall be based on actual field measurement. The Contractor or his authorized representative shall be present at the time of recording the measurement at each stage and sign the field level book and measurement book as token of acceptance.

The payment for the quantity of different items executed by the Contractor shall in no case exceed the quantity admitted by the Department for the respective items and certified / paid to OCCL.

18. Statutory deductions, such as security deposit, income tax including surcharge, hire charges of machineries, cost of materials, EPF contribution, labour clearance etc. shall be deducted from the R/A bills. If the Contractor fails to submit the receipt in support of payments towards royalty, cess, tolls and other taxes, the same shall also be deducted from the R/A bills.
19. **SAFETY PROVISIONS:**

The Contractor shall at his own expenses arrange for the safety during construction as required including the provisions in the safety manual published by the Central Water and Power Commission, New Delhi (January'1962) edition). In case the Contractor fails to make such arrangement, the corporation shall be entitled to cause them to be provided and to recover the cost thereof from the Contractor. For failure to comply with the provision of the safety manual, the Contractor shall without prejudice to any other liability pay to the Corporation a sum not exceeding **rupees five hundred per day** for each day of default.

20. **ACCIDENTS :**

It shall be the Contractor responsibility to protect against accidents on the works. He shall indemnify the corporation against any claims for damage or for injury to person/ machineries/ transport/ vehicle property resulting from any in the course of work and also under the provision of the workmen's compensation Act.

On the occurrences of an accident arising out of the works which results in death or which is so serious as to be likely to result in death, the Contractor shall within twenty four hours of such accident report in writing to the Senior Manager (Civil) in charge of the work the fact stating clearly and in sufficient details the circumstances of such accidents and the subsequent action. All other accidents on the works involving injuries to persons or damage to property other than that of the Contractor shall be promptly reported to the Senior Manager stating clearly and in sufficient details the facts and circumstances against all loss or damage resulting directly or indirectly from the Contractor failure to conform to the provisions of the said act in regard to such accidents. In the event of an accident in respect of which compensation may become payable under the workmen's compensation Act including all modifications thereof. The Senior Manager (Civil) in charge of the work may retain. Out of any money due and payable to the Contractor such sum or sums of money as may be in opinion of the Senior Manager be sufficient to meet such liability. On receipt of award from the Labour Commissioner in regard to quantum of compensation, the difference in amount will be reimbursed or recovered from the Contractor.

21. WAGES :

Wages shall have the same meaning as defined in the payment of wages Act and include time and piece rate wages, if any.

(i) Display of notices regarding wages etc.

The Contractor shall :

- (a) Before he commences his work, continue to display and correctly maintain in a clean and legible condition in conspicuous places on the work, notices in English and in the local India language spoken by the majority of the workers, giving the rates of wages prescribed by the State Public Department/Electricity Department for the district which the work is done.
- (b) Send a copy of such notice to be Engineer-in-Charge of the work.
- (ii) Payment of wages :
 - (a) Wages due to every workers shall be paid to him direct.
 - (b) All wages shall have to be paid in current coin or currency or in both.
- (iii) Fixing of wages period :
 - (a) The Contractor shall fix the wage period in respect of which the wages to payable.

- (b) No wage period shall exceed one month.
 - (c) Wages 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 payments of wages shall be made on a working day.
 - (iv) Wage book and wage cards etc. :
 - (a) The Contractor shall maintain a wage book of each worker in such as may be convenient, but the same shall include the following particulars.
 - (b) Rate of daily/monthly wages.
 - (c) Nature of work on which employed.
 - (d) Total No. of days working during each wage period.
 - (e) Total amount payable for the work during each wage period.
 - (f) All deductions made from the wages with an indication in each case of ground for which the deduction is made.
 - (g) Wage actually paid for each period.
22. During excavation of cut-off-trench, shoring, shuttering including cost, carriage of materials including all taxes is to be borne by the contractor. Only the designed sectional quantity will be paid. Dewatering from the foundation trenches including and running charges of pump and coffer dam if required will be borne by the contractor.
 23. It must be definitely understood that the Corporation / Government do not accept any responsibility for the correctness and completeness of the trial borings shown in the cross sections.
 24. Excavated materials and debris unused in the area are to be removed from the site by the contractor at his own cost and responsibility as per the direction of Engineer-in-charge.
 25. All measurement for earthwork excavation will be taken by section measurement. The bidder is to sign the longitudinal section and cross section of existing ground level before starting execution of the work. Final levels will be taken after completion of the work in all respects.
 26. The work will be executed as per approved drawing, design and B.I.S. specification and as per the instruction of Engineer-in-charge.
 27. No claim whatsoever on account of interest will be entertained under any circumstances.

28. The Contractor will remain responsible to arrange all mechanical means whenever required to complete the work in time at his own cost.
29. Unutilized Moorum, Metal, Chips, Sand and stones outside the specific alignment will not be taken into consideration for measurement.
30. Any damage caused to the work due to any cause except major natural calamity whatsoever during the execution will be made good by the contractor until it is handed over to the Department in complete shape.
31. The quantities provided in the tender schedule are tentative which is likely to vary during execution as directed by the Engineer-in-charge. Before starting the work, the initial levels will be taken for his acceptance. The final bill be paid on level sections.
32. Borrowing earth for the Embankment is the responsibility of the Contractor. The type of soil to be used in the embankment is to be got approved by the Engineer-in-Charge before use.
33. If use of explosives is necessary for the purpose of blasting of rock required at any stage of the execution, the contractor is to obtain necessary area license from the appropriate authorities and procure the explosives and store them at his own responsibility and arrange in the work sites. The procurement and storage of the explosives is the sole responsibility of the contractor & he shall abide by all the laws of explosive act.
34. No extra cost is to be paid to the contractor towards construction of coffer dam, approach road & haul road required for execution of work. The approach road to work site will be maintained by the contractor.
35. The detail specification enclosed with the tender papers for different item of work should be strictly adhered to during course of execution of work.
36. If departmental land is available the contractor will be allowed to use the same for accommodation of his labourers, stores and machineries free of rent. If department land is not available the contractor will make his own arrangement to land at his own cost.
37. The bidder should obtain equipment for the work. However, some equipment if available in the department will be given on hire and condition to be fixed by the Engineer-in-charge. Time for charging of cost of hire will be reckoned from the date on which equipment will be handed over to the contractor to the date of its return to the department after the work is completed or the contract is rescinded, or when the contractor is not required the same finally. The daily hire charges of the machineries will be realized from the contractor's bill on the basis of each day the machines will be under his custody. The contractor will return the equipment in perfect running condition as it was at the time of issue. While the departmental machineries given on hire are with the contractor, compensation towards any loss or damage of the same shall be paid by the contractor to make good the loss or damage. The amount of compensation will be decided by the Engineer-in-charge. The contractor shall not remove the equipment from the site while the same is in his custody. If any equipment or any part thereof is required to be sent out from the site for repair or otherwise, written permission from the Engineer-in-charge shall be taken. The contractor should maintain repair, overhaul and the equipment with due diligence and care. Proper grades of fuel, oil and lubricants should be used. Only good and genuine parts should be used. The equipment shall be made available for inspection by the Engineer-in-charge or other competent authority. If the equipments are not maintained, repaired or used properly, the contractor is liable to pay compensation to

the department towards the damage caused to the equipment for improper use. The amount of compensation shall be assessed by the Engineer-in-charge which will be final. The equipment shall be handed over initially as they are. It will be the responsibility of the contractor to get the machine actually commissioned and used in the work.

38. The quantity mentioned can be increased or reduced to the extent of 10% for individual items subject to a maximum of 5% over the estimated cost. If it exceeds the limit stated above, prior approval of competent authority is mandatory before making any payment.
39. The period of completion is fixed as 18 calendar months and cannot be altered except in case of exceptional circumstances with due approval of next higher authority.
40. Royalty for stone products, sand and Borrow earth are to be recovered from the contractor's bill as per prevailing Govt. Notification.

40. Testing of reinforcement bar and concrete works.

- (i) If, in the opinion of the Engineer-in-Charge of the work, the reinforcement bars to be used in the work requires testing in order to confirm its technical specification, the same shall be tested either in the Department laboratory or in any other authorized laboratory as referred by the Engineer-in-Charge at the cost of the contractor. The contractor shall bear all the cost towards supply of required samples, transportation and testing charges. The decision of the Engineer-in-Charge on this aspect is final and binding on the contractor.
- (ii) All the testing of concrete works shall be carried out as per the direction of the engineer-in-charge or his authorized field functionaries and in case of any dispute arises on this aspect, the decision of the **Engineer-in-Charge** is final and binding on the contractor. Testing of all the concrete works of all grade required for structures, Cement Concrete lining and in any other construction activities of the work shall be tested in the Department Laboratory at the cost of the contractor. The contractor shall supply all the required samples at his own cost including transportation and bear all the testing charges of the concrete. The cost for the testing as charged by the CRO, concerned Quality Control Division shall be final and binding on the contractor. If, in the opinion of the engineer-in-charge a Field Laboratory for acceleration of testing of concrete is required, the contractor shall install it at the work site at his own cost with all the required machineries and equipments as per the direction of the engineer-in-charge and cement testing work shall be carried out in the Field Laboratory under the direct supervision of the Field functionaries of the Quality Control Division, Water Resources, Odisha.

SECTION-IV

GENERAL CONDITIONS OF CONTRACT

GENERAL CONDITIONS OF CONTRACT

A. GENERAL

1.0 Interpretation

- 1.1 In interpreting these Conditions of Contract, singular also means plural, male also means female, and vice-versa. Headings have no significance. Works have their normal meaning under the language of the contract unless specifically defined. The Engineer-in-Charge will provide instructions clarifying queries about the conditions of Contract.
- 1.2 The documents forming the Contract shall be interpreted in the following order of priority:
 - a) Articles of Contract
 - b) Letter of Acceptance, notice to proceed with the works
 - c) Agency's Bid (Technical bid)
 - d) Conditions of contract
 - e) Specifications
 - f) Drawings
 - g) Any other document listed as forming part of the Contract.

2.0 Engineer-in-Charge's Decisions

- 2.1 Except where otherwise specifically stated, the Engineer-in-Charge will decide the contractual matters between the OCCL and the Agency in the role representing the OCCL.

3.0 Delegation

- 3.1 The Engineer-in-Charge may delegate any of his duties and responsibilities to other officers and may cancel any delegation by an official order issued.

4.0 Communications

- 4.1 Communications between parties, which are referred to in the conditions, are effective only when in writing. A notice shall be effective only when it is delivered (in terms of Indian Contract Act).
- 4.2 The agency at time of signing of Agreement shall furnish the permanent and temporary address of the firm for correspondence. He shall also designate his authorized representative for liasoning with the OCCL. In case of change of authorized representative, the new representative shall be promptly designated. The e-mail address, telephone number and Fax number of the firm & the representative shall also be furnished.

5.0 Sub-contracting

- 5.1 No part of the contract shall be Sublette nor shall transfer be made by power of attorney, authorizing others to receive payment on the agency's behalf.

6.0 Other Agencies

- 6.1 The Agency shall cooperate and share the site with other agencies, Public authorities, utilities, and the OCCL/ Department. The Agency shall also provide facilities and services for them as directed by the Engineer-in-charge.

7.0 Personnel:

- 7.1 The Agency shall employ the required Key Personnel named in the Schedule of Key Personnel to carry out the functions stated in the Schedule or other personnel approved by the Engineer-in-charge. The Engineer-in-Charge will approve any proposed replacement of Key Personnel only if their qualifications, abilities, and relevant experience are substantially equal to or better than those of the personnel listed in the Schedule.
- 7.2 Failure to employ the required technical personnel including quality management staff by the agency, the employer would engage any quality assurance staff for implementing quality management Plan. The amounts spent on such deployment will be recovered from the agency over and above the provision made in part two of schedule-A from the agency's bills. However, this will not absolve the agency from the responsibility of quality management on contract works.
- 7.3 The technical personnel including quality assurance personnel should be on full time and available at site whenever required by Engineer in Charge to take instructions.
- 7.4 The names of the technical personnel including quality assurance personnel to be employed by the agency should be furnished in the statement enclosed separately.
- 7.5 In case the agency is already having more than one work on hand and has undertaken more than one work at the same time, he should employ separate technical and quality assurance personnel on each work.
- 7.6 If the agency fails to employ technical and quality assurance personnel the work will be suspended, OCCL/ department will engage technical and quality assurance personnel and recover the cost thereof from the agency. This will not absolve the agency from the responsibility of maintaining quality of work and implementing quality management plan.
- 7.7 If the Engineer-in-Charge asks the Agency to remove a person who is a member of Agency's staff or his work force stating the reasons, the Agency shall ensure that the person leaves the site forthwith and has no further connection with the work in the contract.
- 7.8 All Agency's personnel employed at the plant/work site at any time during the period covered by the present Contract will be provided by him. The Employer is not liable for personnel in any way and cannot be held responsible in the event of litigation of any sort between the Agency and members of plant personnel or their representatives

8.0 Agency's Risks:

- 8.1 All risks of loss or damage to physical property and of personnel injury and death, which arise during and in consequence of the performance of the Agency, are the responsibility of the Agency.

9.0 Insurance:

9.1 The Agency shall provide, in the joint names of the OCCL and the agency, insurance cover from the start date to the end of the Defects Liability Period i.e. for 24 months for the following events.

- i. Loss of or damage of property in connection with the Contract; and
- ii. Personal injury or death of persons employed for construction
- iii. Loss of or damage to the Works, Plant and Materials :
- iv. Loss or damage to the Equipment.

9.2 Policies and certificates of insurance for events i. & ii. above shall be delivered by the Agency to the Engineer-in-Charge at the time of concluding Contract. The policies and certificates of insurance for the events (iii) & (iv) of above clause shall be delivered by the agency to Engineer-in-Charge on commencement of work & after finalization of planning & design. All such insurance shall provide for compensation to be payable to rectify the loss or damage incurred.

- i. The agency shall furnish insurance policy in force in accordance with proposal furnished in the Bid and approved by the OCCL for concluding the contract.
- ii. The agency shall also pay regularly the subsequent insurance premium and produce necessary receipt to the Engineer-in-Charge, well in advance.
- iii. In case of failure to act in the above said manner the OCCL will pay the premium and the same will be recovered from the Agency's payments.

9.3 Alterations to the terms of insurance shall not be made without the approval of the Engineer-in-Charge.

Any amounts not insured or not recovered from the insurers shall be borne by the Agency in accordance with their responsibilities under relevant Clause.

The Agency shall, except if and so far as the Contract provides otherwise, indemnify the Employer against all losses and claims in respect of:

- a. Death of or injury to any person, or,
- b. Loss of or damage to any property (other than the Works),

Which may arise out of in consequent of the Operation and Maintenance of the Facility and the remedying of any defects therein, and against all claims proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

The insurance policy shall include a cross liability clause such that the insurance shall apply to the Agency and to the Employer as separate insurers.

The Employer shall not be liable for or in respect of any damages or compensation payable to any workman or other person in the employment of the Agency or any Sub-agency, The Agency shall indemnify and keep indemnified the employer against all such damages and compensation, other than those for which the Employer is liable as aforesaid, and against all claims, proceedings, damages, costs, charges, and expenses whatsoever in respect thereof or in relation thereto.

The Agency shall insure against such liability and shall continue such insurance during the whole of the time that any persons are employed by him on the Facility. Provided that, in respect of any persons employed by any Sub-agency, the Agency's obligations to insure as aforesaid under this Sub-Clause shall be satisfied if the Sub-agency shall have insured against the liability in respect of such persons in such manner that the Employer is indemnified under the policy, but the Agency shall require such Sub-agency to produce to the Employer, when required, such policy of insurance and receipt for the payment of the current premium.

In the event that the Agency or the Employer fails to comply with conditions imposed by the insurance policies affected pursuant to the Contract, each will indemnify the other against all losses and claims arising from such failure according to the Contract Conditions.

10.0 Site Inspections:

- 10.1 The agency should inspect the site and also proposed quarries of choice for materials source of water and quote his bid price including quarrying, conveyance and all other charges etc.
- 10.2 The responsibility for arranging the land for borrow area rests with the Agency and no separate payment will be made for procurement or otherwise. The agency's quoted bid price will be inclusive of land cost.

11.0 Agency to Execute the Works:

- 11.1 The Agency shall conduct Surveying, Planning, construction of all component, & Commissioning the Work in accordance with the approved specifications and Drawings and work programme.

12.0 Diversion of streams / Nallas / Drains:

- 12.1 The agency shall at all time carry out construction of cross drainage works in a manner creating least interference to the natural flow of water while consistent with the satisfactory execution of work. A temporary diversion shall be formed by the agency at his cost where necessary. No extra payment shall be made for this work.
- 12.2 No separate payment for bailing out sub-soils, water drainage or locked up rain water for diversion, shoring, foundations, bailing of pumping water either from excavation of soils from foundations or such other incidental will be paid. The bid price to be quoted by the agency is for the finished item of work in situ and including all the incidental charges. The borrow pits are also to be de-watered by the agency himself at his expense, if that should be found necessary.
- 12.3 The work of diversion arrangements should be carefully planned and prepared by the agency and forwarded to the Engineer-in-Charge technically substantiating the proposals and approval of the Engineer-in-Charge obtained for execution.
- 12.4 The agency has to arrange for bailing out water, protection to the work in progress and the portion of works already completed and safety measures for men and materials and all necessary arrangements to complete the work.
- 12.5 All the arrangements so required should be carried out and maintained at the cost of the agency and no separate or additional payment is admissible.

- 12.6 Necessary coffer dams and ring bunds have to be constructed at the cost of agency and some are to be removed after the completion of the work. The agency has to quote his bid price keeping the above in view.

13.0 Temporary Diversions (Works on Highways):

- 13.1 DELETED

14.0 Ramps:

- 14.1 Ramps required during execution may be formed wherever necessary and some are to be removed after completion of the work. No separate payment will be made for this purpose.

15.0 Monsoon Damages:

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

16.0 The works to be completed by the Intended Completion Date:

The Agency may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the programme submitted by the Agency at the time of agreement, with the approval of the Engineer-in-Charge, and complete the work by the Intended Completion Date.

17.0 Safety:

The Agency shall be responsible for the safety of all activities at Site.

18.0 Discoveries:

Anything of historical or other interest or of significant value unexpectedly discovered on the Site is the property of the Government. The Agency is to notify the Engineer-in-Charge of such discoveries and carry out the Engineer-in-Charges instructions for dealing with them.

19.0 Possession of the Site.

The OCCL/Department shall give possession of the site to the Agency. If possession of a part site is given, the OCCL/Department will ensure that the part site so handed over is amenable to carry out the work at site by the Agency.

20.0 Access to the Site:

The Agency shall provide the Engineer-in-Charge any person authorized by the Engineer-in-Charge, access to the site and to any place where work in connection with the Contract is being carried out or is intended to be carried out.

21.0 Instructions:

The Agency shall carry out all instructions of the Engineer-in-Charge comply with all the applicable local laws where the Site is located.

22.0 Settlement of disputes:

- 22.1 If any dispute of difference of any kind whatsoever arises between the OCCL and the Agency in connection with, or arising out of the Contract, whether during the progress of the works or after their completion and whether before or after the termination, abandonment or breach of the Contract, it shall in the first place, be referred to for settlement by the Engineer-in-Charge who shall, within a period of thirty days of receipt of request of the Agency to do so, give written notice of his decision to the Agency. Upon receipt of the written notice of the decision of the Engineer-in-Charge the Agency shall promptly proceed without delay to comply with such notice of decision.
- 22.2 If the Engineer-in-Charge fails to give notice of his decision in writing within a period of thirty days after being requested or if the Agency is dissatisfied with the notice of the decision of the Engineer-in-Charge, the Agency may within thirty days of receipt of the notice of decision appeal to the General Manager who will give notice of his decision within thirty days of receipt of the appeal. In case of failure of General Manager to give the decision within stipulated period or if the agency is dissatisfied with the decision, he may within thirty days of receipt of such notice, appeal to the Managing Director, OCCL who shall offer an opportunity to the agency to be heard and to offer evidence in support of his appeal. Managing Director, OCCL shall give notice of his decision within a period of thirty days after the Agency has given the said evidence in support of his appeal. Such decision of the Managing Director, OCCL, in respect of every matter so referred shall be final and binding upon the Agency and shall forthwith be given effect to by the Agency, who shall proceed with the execution of the works with all due diligence.

23.0 Arbitration:

In case the Agency is dissatisfied with any such decision of the Managing Director, OCCL, then the agency within thirty days may refer the matter or matters of dispute for arbitration. The arbitration shall be conducted in accordance with the provisions of Indian Arbitration and Conciliation Act 1996 or any statutory modification thereof.

24.0 TIME PERIOD FOR COMPLETION

- 24.1 Time is the essence of the contract. The total period of completion is **24 (twenty four) Calendar months** from the date of signing of Agreement which shall be the date of commencement of work. The period is inclusive of rainy seasons. After signing the contract, the Engineer-in-Charge shall forthwith notify the agency to go ahead with the work & the agency shall forthwith begin the work. The agency shall furnish a work programme containing CPM/PERT network within fifteen days of signing of contract so as to achieve the mile stones specified in the bid.
- 24.2 This being a percentage rate contract, conducting of actual survey at site prior to work, planning with reference to approved drawing are within the scope of the contract and

the agency shall meticulously plan so as to obtain the required site for carrying out the work

- 24.3 The agency shall bear all costs and charges for special or temporary way leases required by him in connection with access to the site. The agency shall also provide at his own cost any additional accommodation outside the site required by him for the purposes of the work.

B. Construction Programme & Progress

25.0 Construction Programme:

- 25.1 The Agency shall furnish within seven days of signing of the contract a work programme, containing CPM/PERT showing the sequence in which he proposes to carry out the work, monthly progress expected to be achieved, indicating date of procurement of materials plant and machinery. The schedule should be such that it is practicable to achieve completion of the whole work within the time limit fixed and in keeping with the Mile Stone programme specified and shall obtain the approval of the Engineer-in-charge. Further, rate of the progress as in the program shall be kept up to date. In case it is subsequently found necessary to alter this program, the agency shall submit sufficiently in advance the revised programme incorporating necessary modifications and get the same approved by the Engineer-in-Charge. The Engineer-in-Charge will get the program approval by the Managing Director, OCCL before communicating to the agency.

The Engineer-in-Charge shall have all times the right, without any way violating this contract, or forming grounds for any claim, to alter the order of progress of the works or any part thereof and the agency shall after receiving such directions proceed as per the order directed.

26.0 Speed of work:

- 26.1 The Agency shall at all times maintain the progress of work to conform to the latest operative progress schedule approved by the Managing Director, OCCL, Bhubaneswar. The agency should furnish progress report indicating the programme and progress once in a month. The Engineer-in-Charge may at any time in writing direct the agency to slow down any part or whole of the work for any reason (which shall not be questioned) whatsoever, and the agency shall comply with such orders of the Engineer-in-Charge. The compliance of such orders shall not entitle the agency to any claim of compensation. Such orders of the Engineer-in-Charge for slowing down the work will however be duly taken into account while granting extension of time if asked by the agency for which no extra payment will be entertained.

26.2 Delays in Commencement or progress or neglect of work :

If, at any time, the Engineer-in-Charge shall be of the opinion that the Agency is delaying Commencement of the work or violating any of the provisions of the Contract or is neglecting or delaying the progress of the work, he shall so advise the Agency in writing and at the same time demand compliance in accordance with instructions to Bidder and conditions of Contract. If the Agency neglects to comply with such demand within seven days after receipt of such notice, it shall then or at any time thereafter, be lawful for the Engineer-in-Charge to take suitable action in accordance with relevant Clauses of contract.

27.0 Suspension of works by the Agency:

- 27.1 If the Agency suspends the works, or sublet the work without sanction of the Engineer-in-Charge, or in the opinion of the Engineer-in-Charge shall neglect or fail to proceed with due diligence in the performance of his part of the Contract as laid down in the Schedule rate of progress, or if he shall continue to default or repeat such default, the Engineer-in-Charge shall take action in accordance with Clauses of termination of contract.

28.0 Extension of completion date:

- 28.1 No claim for compensation on account of delays or hindrances to the work from any cause whatever shall be accepted. Reasonable extension of time will be allowed by the Engineer-in-Charge or by the officer competent to sanction the extension, for unavoidable delays, such as may result from cause(s), which in the opinion of the Engineer-in-Charge are undoubtedly beyond the control of the agency. The Engineer-in-Charge shall assess the period of delay or hindrance caused by any written instructions issued by him.
- 28.2 The Agency shall give written notice to the Engineer-in-Charge whenever planning or progress of the works is likely to be delayed or disrupted unless any further drawings or order including a direction, instruction or approval is issued by the Engineer-in-Charge within a reasonable time. The notice shall include details of the drawing or order required and of why and by when it is required and of any delay or disruption likely to be suffered if it is late. If by reason of any failure or inability of the Engineer-in-Charge to issue within a reasonable time in all the circumstances, any drawing or order requested by the agency the Agency suffers delay, then the Engineer-in-Charge shall take such delay into account in determining any extension of time for which no compensation shall be claimed by the agency.
- 28.3 In the event of the Engineer-in-Charge failing to issue necessary instructions and thereby causing delay and hindrance to the agency, the latter shall have the right to appeal to the Managing Director, OCCL whose decision will be final and binding. The agency shall lodge in writing to the Engineer-in-Charge a statement for time extension for any delay or hindrance referred to above, within fourteen days from its occurrence, otherwise no extension of time will be allowed.
- 28.4 Whenever authorized alterations or additions made during the progress of the work are of such a nature in the opinion of the Engineer-in-Charge as to justify an extension of time in consequence thereof, such extension will be granted in writing by the Engineer-in-Charge or other competent authority when ordering such alterations or additions.
- 28.5 Application for extension of time for the completion of a work on the grounds of unavoidable hindrance or any other grounds shall be submitted by the agency within 30 days of such hindrance & the Engineer-in-Charge shall authorize or recommend such extension of time as deemed necessary or proper within fifteen days of the receipt of the such an application. In cases where the sanction of the higher authorities to the grant of extension of time is necessary, the Engineer-in-Charge should send his recommendation as expeditiously as possible. The higher authority should communicate his decision within 60 days from the date of receipt on recommendation in his office. If the orders of the competent authority are not received in time, the Engineer-in-

Charge may grant extension of time under intimation to the concerned authorities so that the contract might remain in force, but while communicating this extension of time, he must inform the agency that the extension is granted without prejudice to OCCL/ Government's right to levy compensation under relevant clause of contract.

28.6 The power to grant extension of time vests with the authority who accepted the tender but the period of extension that can be granted by such an authority is limited to the period equivalent to the time originally stipulated in the Agreement for completion of the work beyond this, approval of next higher authority should be obtained before extension of time is granted.

28.7 The application for extension of time and sanction thereto should be made in the prescribed form.

29.0 Delay Ordered by the Engineer-in-Charge.

The Engineer-in-Charge may instruct the Agency to delay the start or progress of any activity within the Work.

30.0 Early Warning:

30.1 The agency is to bring to the notice of the Engineer-in-Charge at the earliest opportunity of specific likely future events or circumstances that may adversely affect the Execution of Works.

30.2 The Agency shall cooperate with the Engineer-in-Charge in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Engineer-in-Charge.

31.0 Management Meetings:

The Engineer-in-Charge may require the Agency to attend management meetings. The business of a management meeting shall be to review the programme for remaining work and to deal with matters raised in accordance with the early warning procedure. The minutes of the meeting shall be given in writing for follow up by the parties.

C. QUALITY CONTROL

32.0 Identifying Defects:

32.1 The Engineer-in-Charge shall check the Agency's work and notify the Agency of any Defects that are found. Such checking shall not affect the Agency's responsibilities. The Engineer-in-

Charge may instruct the Agency to verify the Defect and to uncover and test any work that the Engineer considers may be a Defect.

33.0 Tests:

33.1 If the Engineer-in-Charge instructs the Agency to carry out a test not specified in the Specification to check whether any work has a Defect, the Agency shall promptly comply and pay for the test and any sampling.

34.0 Action in case of improper materials and workmanship:

34.1 If in the opinion of the Engineer-in-Charge any work or part thereof is executed with improper materials or defective workmanship the agency(s) shall when required by the Engineer-in-Charge, forthwith re-execute the same and substitute proper materials and workmanship and in case of default by the agency(s) in so doing within a week from the date of the requisition, the Engineer-in-Charge shall have full power to employ other

person to re-execute the work and the cost thereof shall be borne by the agency(s). Every time notice of a Defect is given, the Agency shall correct the notified defect within the length of time specified by the Engineer-in-Charge's notice

35.0 Action and compensation payable in case of bad work:

- 35.1 If at any time before security deposit is refunded to the agency 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 inferior quality or that any materials or article provided by him for the execution of the work are unsound or of a quality inferior to that contracted for or are otherwise not in accordance with contract, it shall be lawful for Engineer-in-Charge to intimate this fact in writing to the agency and then notwithstanding the fact that the work, materials or article complained of may have been inadvertently passed, certified and paid for, the agency shall be bound forthwith to rectify or remove and reconstruct the work so specified in whole or in part as the case may require or if so required shall remove the materials or articles so specified and provide other proper and suitable materials or articles at his own 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 the written intimation aforesaid, the agency 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 during which the failure so continues and in the event of any such failure as aforesaid, the Engineer-in-Charge may rectify or remove and re-execute the work or remove and replace the materials or articles complained, at the cost of the agency. If the Engineer-in-Charge considers that such inferior work or materials as described above may be accepted or made use of it shall be within his discretion to accept the same at such reduced rates as he may fix therefore.

- 35.2 The Engineer-in-Charge may also introduce check lists which shall be kept in Bound registers by the construction supervision staff. The agency may be required to fill up these lists in the
First instance & shall be subsequently checked by the Construction/Quality Control Engineers.

36.0 Quality Control :

Quality control monitoring reports, test results, reports of corrective action etc, shall be furnished to the employer at regular intervals.

Quality Audit shall get conducted by the Engineer-in-Charge, OCCL or by other organization and the agency shall extend the testing facilities to them also.

The agency shall produce the Quality records maintained by him to the OCCL/ department or his authorizing agent for the quality audit.

37.0 Taxes included in the bid:

The Bid price quoted by the agency shall be deemed to be inclusive of all Tax and other taxes on all materials that the agency will have to purchase for performance of this contract.

38.0 Liquidated Damages for delay:

- 38.1 If for any reason, which does not entitle the agency to an extension of time, the rate of progress of works, or any section of works is at any time, in the opinion of the Engineer-in-Charge too slow to ensure completion by the prescribed time or extended time for completion, Engineer-in-Charge shall so notify the agency in writing and the agency shall there upon take such steps as are necessary to expedite progress so as to complete the works or such section by the prescribed time or extended time. The agency shall not be entitled to any additional payment for taking such steps. If as a result of any notice given by the Engineer-in-Charge under this clause the agency shall seek the Engineer-in-Charge's permission to do any work at night or on Sundays, if locally recognized as days of rest, or their locally recognized equivalent, such permission shall not be unreasonably refused.
- 38.2 If the Agency fails to complete the work substantially under contract by the stipulated date, he shall pay liquidated damages at the rate of 0.05 percentage of the contract value per day from the date of delaying the said work up to the date of completion and handing over to the Government.
- 39.3 However also if the agency fails to complete any part of the work as designated in the mile stone, by the time indicated against such part, he shall pay Liquidated damages at rate of 0.05 percentage of value of that part per day from the date of delaying the said part of the work up to the date of completion of the said designated part.
- 39.4 The aggregate maximum of liquidated damages payable under this clause shall not exceed 0.05 percentage of contract value per day and shall be subject to the maximum amount of 10% (ten percent) of the contract amount.
- 39.5 Delays requiring payment of liquidated damages amounting to 10% of the contract amount shall be sufficient cause for termination of contract and for forfeiture of security deposit.
- 39.6 If abnormal delay arises and not attributable to the agency, extra time will be allowed to complete the work and LD for delay for the stated reasons will not be levied without any additional financial benefit to the agency.

39.0 Rescission of Contract

Delays requiring payment of 10% of contract amount as liquidated damages shall be one of the cause for rescission of contract. To rescind the contract (of which the recession notice in writing to the agency under the hand of the Engineer-in-Charge shall be conclusive evidence) 20% of the value of left over work will be realized from the agency as penalty. In the Event of any of the above courses being adopted by the Engineer-in-Charge, the agency 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 agency 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 Engineer-in-Charge 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. (Works Dept No.10639 dated 27.05.2005).

40.0 DELETED

41.0 Securities Deposit:

41.1 Performance Security Deposit: OCCL shall retain from each payment due to the contractor, **5% of gross** bill amount until completion of the whole of the Works.

42.0 Cost of Repairs:

Loss or damage to the Works or materials to the Works between the Start Date and the end of the Defects Correction Periods shall be remedied by the Agency at the Agency's cost if the loss or damage arises from the Agency's acts or omissions.

E. FINISHING THE CONTRACT

43.0 Completion:

- 44.1 On completion of the work, the agency (s) shall be furnished with a certificate by the Engineer-in-Charge of such completion. But no such certificate shall be given nor shall the work be considered to be complete until the agency(s) have rectified the defects, removed from the premises, on which the work shall have been executed, all scaffoldings, surplus materials and rubbish and shall have cleaned of dirt from all wood work, doors, windows wall floors or other parts of any structures in or upon which the work has been executed or of which he / they may have had possession for the purpose of executing work, nor until the work shall have been measured by the Engineer-in-Charge or where the measurements have been taken by his subordinate until they receive the approval of the Engineer-in-Charge, the measurements being binding and conclusive against the agency(s). If the agency(s) shall fail to comply with the requirements of this clause as to the 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 expense of the agency (s) 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 agency(s) shall forthwith bear all the expenses to be incurred, but 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.
- 44.2 The completion certificate of the Engineer-in-Charge showing the final balance due or payable to the agency(s) shall be conclusive evidence of the work having been duly completed and that the agency(s) shall be entitled to receive payment of the final balance in accordance with such certificate, but without prejudice to the liability of the agency(s) under the provisions of the clause.

45.0 Taking Over:

The Department/OCCL shall take over the site and the Works within fifteen days of the Engineer-in-Charge issuing a certificate of successful completion of Operation & maintenance work.

46.0 Final Account:

The Agency shall supply to the Engineer-in-Charge a detailed account of the total amount that the Agency considers payable under the Contract before the end of the Defects Liability Period. The Engineer-in-Charge shall issue a Defects Liability Certificate and certify any final payment that is due to the Agency within 90 days of receiving the Agency's account if it is correct and complete. If it is not, the Engineer-in-Charge shall

issue within 90 days a schedule that states the scope of the corrections or additions that are necessary. If the final Account is still unsatisfactory after it has been resubmitted, the Engineer-in-Charge shall decide on the amount payable to the Agency and issue a payment certificate within 90 days of receiving the Agency's revised account.

47.0 Termination:

The OCCL may terminate the Contract if the agency causes a fundamental breach of the Contract.

47.1 Fundamental breaches of Contract include, but shall not be limited to the following.

- a) The Agency stops work for 28 days when no stoppage of work is shown on the current program and the stoppage has not been authorized by the Engineer-in-Charge.
- b) The agency is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation.
- c) The Engineer-in-Charge gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Agency fails to correct it within a reasonable period of time determined by the Engineer-in-Charge; and
- d) The Agency does not maintain a security which is required and
- e) The Agency has delayed the completion of works by the number of days for which the maximum amount of liquidated damages is to be paid as defined.
- f) If the agency, in the judgment of the OCCL has engaged in corrupt or fraudulent practices in competing for or in the executing the contract.

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

47.2 Notwithstanding the above the OCCL or Engineer-in-Charge or Employer may terminate the contract for convenience.

47.3 If the Contract is terminated, the Agency shall stop work immediately, make the site safe & secured and leave the site as soon as reasonably possible.

48.0 Payment upon Termination:

If the Contract is terminated because of a fundamental breach of Contract by the Agency, the Engineer-in-Charge shall issue a certificate for the value of the work done less advance payments received upon the date of the issue of the certificate, less other recoveries due in terms of the Contract, less taxes due to be deducted at source as per applicable laws and less **20 percent** of the value of work not completed. Additional Liquidated Damages shall not apply. If the total amount due to the OCCL exceeds any payment due to the Agency the difference shall be a debt payable to the OCCL. In case of default for payment within 28 days from the date of issue of notice to the above

effect, the agency shall be liable to pay interest at 12% per annum for the period of delay.

49.0 Property:

All materials on the site, plant, equipment, Temporary works and works are deemed to be the property of the OCCL/Department if the Contract is terminated because of Agency's default.

50.0 Releases from Performance:

If the Agency is frustrated by the outbreak of war or by any other event entirely outside the control of either the OCCL or the Agency the Engineer-in-Charge shall certify that the contract has been frustrated. The Agency shall make the site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all works carried out before receiving it and for any work carried out afterwards to which commitment was made.

F. OTHER GENERAL CONDITIONS

51.0 Water Supply

The Agency has to make his own arrangements for water required for the work and to the colonies and work sites, which are to be established by the Agency.

52.0 Electrical Power

The Agency will have to make their own arrangements for drawing electric power from the nearest power line after obtaining permission from the Electricity Authority at his own cost. In case of failure of electricity, the Agency has to make alternative arrangements for supply of electricity by Diesel Generator sets of suitable capacity at place of work. The agency shall satisfy all the conditions and rules required as per Indian Electricity Act 1910 and under rule-45(1) of the Indian Electricity Rules, 1956 as amended from time to time and other pertinent rules.

The power shall be used for bona-fide OCCL works only.

52.1 Electric Power for Domestic Supply:

- a) The agency has to make his own arrangements for the supply of electric power for domestic purposes and the charges for this purpose have to be paid by him at the rates as fixed by the Electricity Authority from time to time.
- a) The agency will have to make his own arrangements to lay and maintain the necessary distribution lines and wiring for the camp at his own cost. The layout and the methods of laying the lines and wiring shall have the prior approval of the Engineer-in-Charge. All camp area shall be properly electrified. All lines, streets, approaches for the camp etc., shall be sufficiently lighted for the safety of staff and labour of the agency, at the cost of the Agency and it will be subject to the approval of the Engineer-in-Charge.

53.0 Land:

53.1 Land for Agency's use:

The agency will be permitted to use Government land for his site office and colony. The agency shall have to make his own arrangements for acquiring and clearing the site, leveling, providing drainage and other facilities for labour staff colonies, At/PO- work-

shop or stores and for related activities. The Agency shall apply to the Department within reasonable time after the award of the contract and at least 30 days in advance of its use, the details of land required by him for the work at site and the land required for his camp. Should any private land, which has not been acquired, be required by the agency for his use, the same may be acquired by the agency at his own cost by private negotiations and any claim shall not be admissible to him on this account.

The Engineer-in-Charge reserves the right to refuse permission for use of any government land for which no claim or compensation shall be admissible to the agency. The agency shall, however, not be required to pay cost or any rent for the Government land given to him.

53.2. Surrender of Occupied Land:

- a) The Government land as here in before mentioned shall be surrendered to the Engineer-in-Charge within seven days, after issue of completion certificate. Also no land shall be held by the agency longer than the Engineer-in-Charge shall deem necessary and the agency shall on the receipt of due notice from the Engineer-in-Charge, vacate and surrender the land which the Engineer-in-Charge may certify as no longer required by the Agency for the purpose of the work.
- b) The agency shall make good to the satisfaction of the Engineer-in-Charge any damage to areas, which he has to return or to other property or land handed over to him for purpose of this work Temporary structures may be erected by the agency for storage sheds, offices, residences etc., for non-commercial use, with the permission of the Engineer-in-Charge on the land handed over to him at his own cost. At the completion of the work these structures shall be dismantled site cleared and handed over to the Engineer-in-Charge. The land required for providing amenities will be given free of cost from Government lands if available otherwise the agency shall have to make his own arrangements.

54.0 APPROACH ROADS AND ROADS IN WORK AREA:

In addition to existing public roads and roads Constructed by Government, if any, in work area all additional approach roads inside work area and camp required by the Agency shall be constructed and maintained by him at his own cost. The layout design, construction and maintenance etc. of the roads shall be subject to the approval of the Engineer-in-Charge. The agency shall permit the use of these roads by the Government free of charge.

It is possible that work at, or in the vicinity of the work site will be performed by the Government or by other agency engaged in work for the Government during the contract period. The agency shall without charge permit the government and such other agency and other workmen to use the access facilities including roads and other facilities, constructed and acquired by the agency for use in the performance of the works.

The agency's heavy construction traffic or tracked equipment shall not traverse any public roads or bridges unless the agency has made arrangement with the authority concerned. In case agency's heavy construction traffic or tracked equipment is not allowed to traverse

any public roads or bridges and the agency is required to make some alternative arrangements, no claim on this account shall be entertained.

The agency is cautioned to take necessary precautions in transportation of construction materials to avoid accidents.

55.0 Payment for Camp Construction:

No payment will be made to the agency for construction, operation and maintenance of camp and other camp facilities.

56.0 Explosive Magazines & Fuel Storage Tanks:

No explosive shall be stored within 1/2 (half) KM of the limit of the camp sites. The storage of gasoline and other fuel oils or of Butane, Propane and other liquefied petroleum gases, shall conform to the regulations of Odisha State Government and Government of India. The tanks, above ground and having capacity in excess of 2000 litres, shall not be located within the camp area, nor within 200m of any building.

57.0 Labour:

The agency shall, make his own arrangements for the engagement of all staff and labour, local or other, and for their payment, housing, feeding and transport.

Labour importation and amenities to labour and agency's staff shall be to the agency's account. His bid cost shall include the expenditure towards importation of labour amenities to labour and staff.

57.1 Transportation of Labour:

The agency shall make his own arrangement for the daily transportation of the labour and staff from labour camps colonies to the work site at his own cost. No extra payment will be made to the agency for the above transportation of the labour.

The agency will at all times duly observe the provisions of the Employment of Children Act- XXVI of 1938 and any enactment or modification of the same and will not employ or permit any person to do any work for the purpose under the provisions of this contract in contravention of said Act. The agency here by agrees to indemnify the OCCL from and against all claims, penalties which may be suffered by the OCCL or any person employed by the OCCL by any default on the part of the agency in the observance and performance of the provisions of the Employment of Children Act- XXVI of 1938 or any enactment or modification of the same.

The agency shall obtain the insurance at his own cost to cover the risk on the works to labour engaged by him during period of execution against fire and other usual risks and produce the same to the Engineer-in-Charge concerned before commencement of work.

58.0 Safety Measures:

The agency shall take necessary precautions for safety of the workers and preserving their health while working in such jobs, which require special protection and precautions. The following are some of the measures listed but they are not exhaustive and agency shall add to and augment these precautions on his own initiative where necessary and shall comply with directions issued by the Engineer-in-Charge or on his behalf from time to time and at all times.

1. Providing protective foot wear to workers situations like mixing and placing of mortar or concrete sand in quarries and places where the work is done under much wet conditions.
2. Providing protective head wear to workers at places like underground excavations to protect them against rock falls.
3. Providing masks to workers at granulates or at other locations where too much fine dust is floating about and sprinkling water at frequent intervals by water hoses on all stone crushing area and storage bins abate to dust.
4. Getting the workers in such jobs periodically examined for chest trouble due to too much breathing in to fine dust.
5. Taking such normal precautions like fencing and lightening in excavation of trenches, not allowing rolls and metal parts of useless timber spread around, making danger areas for blasting providing whistles etc.
6. Supply work men with proper belts, ropes etc., when working in precarious slopes etc.
7. Avoiding named electrical wire etc. as they would electrocute the works.
8. Taking necessary steps towards training the workers concerned on the machinery before they are allowed to handle- them independently and taking all necessary precautions in around the areas where machines hoists and similar units are working.

59.0 Fair Wage Clause:

The agency shall not employ for the purpose of this contract any person who is below the age of fourteen (14) years and shall pay to each labourer for work done by such labourers fair wages. (PWD No.-22059 Dtd-16.08.77)

Explanation – “Fair Wage” means wages, whether for time or piece work prescribed by the state Public Works Department provided that where higher rates have been prescribed under the Minimum Wages Act’1948 wages at such higher rates should constitute fair wages.

The Engineer-in-Charge shall have the right to enquire into and decide ant complaints alleging that wages paid by the agency to pay labourer for work done by such labourer is less than the wages as per the sub-paragraph (1) above.

- (b) The agency shall notwithstanding the provisions of any contract to contrary, cause to be paid a fair wages to labourers indirectly engaged on the work including any labour engaged by his sub agency in connection with the said work, as if the labourers had been immediately employed by him.
- (c) In respect of all labour directly or indirectly employed in the works for the performance of the agency’s part of this agreement, the agency shall comply with or cause to be complied with all regulations made by Government in regard to payment of wages period deductions from wages, recovery of wages not paid and deductions unauthorisedly made, maintenance of wage register, wage cards, publications of scale of wages and other terms of employment, inspection and submission of periodical return and all other matters of a like nature.

- (d) The Engineer-in-Charge or Sub-divisional Officer concerned shall have the right to deduct, from the money due to the agency, any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason of non-fulfilment of conditions of the contract for the benefit of the 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 agency 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-agency.
- (f) The regulations aforesaid shall be deemed to be a part of this contract and any breach thereof shall be breach of this contract.
- (g) Under the provisions of the Minimum Wages Act' 1948 and the Minimum Wages (Central Rules 1950) the agency is bound to allow or cause to be allowed to the labourers directly
or indirectly employed in the work one day rest for six days continuous work and pay wages at the same rate as for duty. In the event of default the Engineer-in-Charge or Sub-divisional Officer concerned shall have the right to deduct the sum not paid on account of wages for weekly holiday to any labourers and pay the same to the person entitled there to from any money due to the agency.
- (h) The agency 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 agency has
undertaken to execute under this contract) to the satisfaction of the Engineer-in-Charged on his failure to do so, OCCL/Government shall be entitled to provide the same and recover the cost from the agency.
- (i) The agency shall submit by the 4th & 10th every month to the Engineer-in-Charge true statement showing in respect of the second half of the preceeding month and the first half of 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 injury caused by them and (5) the number of female workers who have been allowed maternity benefit according to clause K and the amount paid to them failing which the agency shall be liable to pay to OCCL/ Government as admissible for each default to materially incorrect statement. The decision of the Engineer-in-Charge shall be final in deducting from any bill due to agency amount levied as fine.
- (j) In respect of all labour directly or indirectly employed in the work for the performance of the agency's part of this agreement, the agency shall comply with or cause to be complied with all the rule, framed by Government employed by the Odisha Public Works Department and its agencies. This will apply to work places having 50 or more workers.

59.1 Odisha P.W.D Agency's Labour Regulation.

Short Title – These regulations may be called “The Odisha Public Works Department/Electricity Department Agency’s Regulations.”

1. Definitions – In these Regulations, unless otherwise expressed or indicated the following words and expressions shall have the meaning hereby assigned to them respectively that is to say –

(i) **“Labour”** means works employed by a agency of the Odisha Public Works Department/Electricity Department directly or indirectly through a sub-agency or other person, by an agent on his behalf.

(ii) **“Fair wages”** means wages whether for the time of piece work described y the State Public Works Department/Electricity Department for the area in which the work is done.

(iii) **“Agency”** shall include every person whether a sub-agency or headman or agent employing labour on the work taken on contract.

(iv) **“Wages”** shall have the same meaning as defined in the payment of Wages Act. and include time and piece rate wages, if any –

2. Display of notices regarding wages, etc.

The agency shall –

(a) Before he commences his work on contract display and correctly maintain and continue to display, in a clean and legible condition, in conspicuous places on the work, notices in English and in the local Indian language spoken by the majority of the workers, giving the rate of wage prescribed by the State Public Works Department for the district where the work is done.

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

3. Payment of Wages

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

(ii) All wages shall be paid in current coin or currency or in both.

4. Fixation of wage period

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

(ii) No wage period shall exceed one month.

(iii) Wages of every workman employed on the contract shall be paid before expiry of 3 days, after the last day of the wage period in respect of which the wages are payable.

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

(iv) All payment of wages shall be made on a working day.

5. Wages book and wage cards, etc.

(i) The agency shall maintain a wage book of each worker in such form 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 of work during each wage period.
- (d) Total amount payable for the work during each wage period.
- (e) All deductions made from the wages with an indication in each case of the ground for which the deduction is made.
- (f) Wage actually paid for each wage period.
- (ii) The agency shall also maintain a wage card for each worker employed on the work.
- (iii) The Engineer-in-Charge may grant an exemption from the maintenance of wage bond, wage cards to a agency who, in his opinion may not directly or indirectly employ more than 10 persons on the work.

6. Fines deduction which may be from wages

(i) The wages of a worker shall be paid to him without any deduction of any kind except the following.

(a) Fines

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

(c) Deductions for damages for damage to or loss of good expressly entrusted to the employed person for custody or for loss of money for which he is required to account where such damage or loss is directly attributable to his neglect or default.

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

(i) 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 or showing cause against such fines or deductions.

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

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

7. Register of Fines, etc.

(i) The agency shall maintain a register of fines and of all deductions for damage or loss. Such Register shall mention the reason for which fine was imposed or deduction for damage or loss was made.

(ii) The agency shall maintain a list in English and in the local Indian language, clearly defining acts and omissions for which penalty or fine can be imposed. It shall display such list and maintain it in a clean and legible condition in conspicuous places in the work.

8. 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.

9. Power of Labour Welfare Officer to make investigation or enquiry –

The Labour Welfare Officer 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 if these of these regulations. He shall investigate into any complaint regarding default made by the agency, sub-agency in regard to such provisions.

10. Report of Labour Welfare Officers-

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

11. Appeal against the decision of Labour Welfare Officers-

Any persons aggrieved by the decision and recommendation of the Labor Welfare Officer or other person so authorised may appeal against such decision to the Labour Commissioner within 30 days from the date of decision forwarding simultaneously a copy of his appeal to the Engineer-in-Charge concerned but subject to such appeal, the decision of the officer shall be final and binding upon the agency.

12. Inspection of registers –

The agency shall allow inspection of the wage book and wage cards to any of his workers or to his agent at a convenient time and place after due notice is received, or to the Labour Commissioner or any other person authorised by the OCCL/ Government of Odisha on his behalf.

13. Submission of return –

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

14. Amendments –

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

67.2 Maternity benefit rules for female workers employed by Agency.

Leave and pay during leave shall be regularized as follows.

1. Leave : i) In case of delivery : Maternity leave not exceeding 8 weeks up to and including the day of delivery or 4th weeks following that day.
- ii) In case Miscarriage: Up to 3 weeks from the date of miscarriage.

2. Pay: i) In case of delivery: Leave pay during maternity leave will be at the rate of the woman's average daily earning calculated on the total wages earned on the days when full time work was done during a period of three months immediately preceding the date of which she gives notice that she expects to be confirmed or at the rate of daily wage whichever is greater.
- ii) In case of Miscarriage : Leave pay at the rate of daily earnings calculated on the total wages earned on the date when full time work was done during a period of 3 months immediately preceding the date of such miscarriage.

Condition of the grant of Maternity Leave: No maternity leave benefit shall be admissible to a woman unless she has been employed for a total period not less than 8 months immediately preceding the date on which she proceeds on leave.

MODEL RULES FOR HEALTH AND SANITARY ARRANGEMENTS FOR WORKERS EMPLOYED BY ODISHA P.W.D ON ITS AGENCY.

1. Application: These rules shall apply to 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 averages 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 is employed in connection with construction work.
3. First Aid: (a) At every work place there shall be maintained in readily accessible place First-Aid appliances including an adequate supply of sterilizer dressings and sterilized cotton wool. The appliances shall be kept in good order and in large work place they shall be readily available during working hours.

(b) At large works places, where hospital facilities are not available within easy distance of the works, First-Aid posts shall be established and run by a trained compounder.

(c) Where large work places are remote from regular hospital 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 surplus and no beds are considered necessary owing to the proximity of city town hospital and 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 ready to take injured person or persons suddenly taken seriously ill, to the nearest hospitals.
4. Drinking Water: (a) In every work place, there shall be provided and maintained at suitable place easily accessible to labour, a sufficient supply of water fit 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 60 feet from any latrine, drain or other sources of pollution. Where water has to be drawn from an existing well which is within such proximity of latrine drain or any other source of pollution, the well shall be properly chlorinated before water is drawn from it for drinking. All such wells be entirely closed in and be provided with a trap door which shall be dust and water proof.

(d) A reliable pump shall be fitted to each covered well, the trap door shall be kept locked

open only for cleaning or inspection which shall be done at least once 2 months.

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

5. Washing and Bathing Place:

(i) Adequate washing and bathing place shall be provided separately for man 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 places 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 per 100.

(c) For every additional 100, 3 sets

(In particular cases the Engineer-in-Charge shall have the power to vary the scale where necessary). Latrines and Urinal for women: If women are employed, separate latrines and urinal for women. If women are employed, separate latrines 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.

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

8. Constructions 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.

9. Disposal of Excreta : Unless otherwise arrange for by the local sanitary authorities, arrangement for a proper disposal of excreta by incineration at the work place shall be made by means of a suitable incinerator approved by Asst. director of Public Health or Municipal Medical Officer of Health as the case may be, in whose jurisdiction the work place is situated. After natively excreta may be disposed of putting of a layer of.

10. Night soil at the bottom of pucca tank prepared for the purpose and covering it with a layer of waste or refuse and then covering it up with a layer of 6" of waste or

refuse and then covering it up with a layer of each 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 and for meals and the other for rest the use of labourers. The height of the shelter shall not be less than 11 feet, from the floor level to the lowest of the roof.
12. Creche: (a) At every work place at which more than 50 women workers are employed, there shall be provided only one creche for the use of children under the age of 6 years, belonging to such women and shall be used for infant's games and play and their bed room. The huts shall not be constructed on a lower standard than the following:
 - h) Thatched roofs
 - ii) Mud floors and walls
 - iii) Planks spread 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 dais in attendance, sanitary, utensils shall be provided to the satisfaction of the Health Officer of the area concerned. The use of the hut shall be restricted to children, their attendants and mothers of the children.

- (b) Where the number of women workers is more than 50, the Agency shall provide one hut and a Dai to look after the children of women workers.
- (c) The size of creche shall vary according to the number of women workers.
- (d) The creche shall be properly maintained and necessary equipment like toys etc. shall be provided.
13. Canteen: A cooked food Canteen on moderate scale shall be provided for the benefits of workers whenever it is considered expedient.

60 Indemnity Bond:

The agency has to furnish the bond at the time of signing of the Agreement.

Name of work **"Construction of Spillway of Upper Lanth Irrigation Project, Belpada"**

I _____ agency S/o _____ aged _____ Resident of _____ do hereby bind myself to pay all the claims may come (a) under Workmen's Compensation Act' 1933 with any statutory modification thereof and rules there under or otherwise for or in respect of any damage or compensation payable in connection with any accident or injury sustained (b) under Minimum wages Act'1948 (c) under payment of wages Act'1936 (d) under the Agency labour (Regulation and Abolition) Act' 1970 by workmen engaged for the performance of the business

relating to the above contract i.e., failing such payment of claims of workmen engaged in the above work, I abide in accepting for the recovery of such claims, effected from any of my assets with the OCCL/departments.

61.0 Compliance with Labour Regulations:

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

The employees of the Agency and the Sub-agency in no case shall be treated as the Department of the OCCL/Department at any point of time.

62.0 Salient features of some major labour laws applicable to establishment engaged in buildings and other construction work:

- a) Workmen compensation Act' 1923: The Act provides for compensation in case if injury by accident arising out of and during the course of employment.
- b) Payment of Gratuity Act' 1972: Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if any employee has completed 5 years service or more, or on death, the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments, employing 10 or more employees.
- c) Employees P.F. and Miscellaneous provision Act' 1952: The Act provides for monthly contributions by the OCCL/Department plus workers @ 10% or 8.33%. The benefits payable under the Act are:
 - i) Pension or family pension on retirement or death, as the case may be.
 - ii) Deposit linked insurance on the death in harness of the worker.
 - iii) Payment of P.F. accumulation on retirement/death etc.,
- d) Maternity Benefit Act' 1951: The Act provides for leave and some other benefits to women employees in case of confinements or miscarriage etc.

- e) Contract Labour (Regulation & Abolition) Act' 1970: The Act provides for certain welfare measures to be provided by the agency to contract labour and in case the Agency fails to provide, the same are required to be provided by the Principal Department by Law.
- The Principal Department is required to take certificate of Registration and the agency is required to take license from the designated Officer. The Act is applicable to the establishments or Agency of Principal Department if they employ 20 or more contract labour.
- f) Minimum wages Act' 1948: The Department is supposed to pay not less than the Minimum wages fixed by appropriate Government as per provisions of the Act if the employment is a
- g) scheduled employment construction of Buildings, Roads, Runways are scheduled employments.
- h) Payment of wages Act' 1936: It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.
- i) Equal Remuneration Act' 1979: The Act provides for payment of equal wages for work of equal nature to Male or Female workers and for not making discrimination against Female employee in the matters of transfers, training and promotions etc.
- j) Payment of Bonus Act'1965: The Act is applicable to all establishments employing 20 or more employees. The Act provides for payment of annual bonus subject to a minimum of 8.33% of wages and maximum of 20% of wages to employees drawing ` 3500/- per month or less. The bonus to be paid to employees getting ` 2500/- per months or above and up to ` 3500/- per month shall be worked out by taking wages as ` 2500/- per monthly only. The Act does not apply to certain establishments. The newly set-up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of this Act.
- k) Trade Unions Act' 1926: The Act lays down the procedure for registration of trade unions of workmen and Departments. The Trade Unions registered under the act have been given certain immunities from civil and criminal liabilities.
- l) Child Labour (Prohibition & Regulation) Act' 1986: The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes, Employment Child Labour is prohibited in Building and Construction Industry.
- m) Inter-State Migrant workmen's (Regulation of Employment & Conditions of service) Act' 1979: The Act applicable to an establishment, which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another State). The inter State migrant workmen, in an establishment to which this Act becomes applicable, are

required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.

- n) The Building and Other Construction workers (regulation of Employment and conditions of service) Act' 1996 and the Cess Act of 1996: All the establishments who carry on any building or other construction work and employs 10 or more workers are covered under this Act. All such establishments are required to pay cess at the rate not exceeding 2% of the cost of construction as may be modified by the Government. The Department of the establishment is required to provide safety measures at the Building or construction work and other welfare measures, such as Canteens, First-Aid facilities, Ambulance, Housing accommodations for workers near the work place etc. The Department to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

63.0 Liabilities of the Agency:

63.1 Accident Relief and workmen compensation:

The agency should make all necessary arrangements for the safety of workmen on the occurrence of the accident, which results in the injury or death of any of the workmen employed by the agency, the agency shall within 24 hours of the happenings of the accident and such accidents should intimate in writing to the concerned Asst. Engineer / Asst. Engineer-in-Charge of the Department the act of such accident. The agency shall indemnify Government against all loss or damage sustained by the Government resulting directly or indirectly from his failure to give a intimation in the manner aforesaid including the penalties or fines, if any, payable by Govt. as a consequence of Govt. failure to give notice under Workmen's Compensation Act or otherwise conforming to the provisions of the said Act in regard to such accident.

- 63.2 In the event of an accident in respect of which compensation may become payable under the Workmen's Compensation Act VIII 23 whether by the agency, by the Government it shall be lawful for the Engineer-in-Charge to retain such sum of money which may in the opinion of the Engineer-in-Charge be sufficient to meet such liability. The opinion of the Engineer-in-Charge shall be final in regard to all matters arising under this clause.

- 63.3 The agency shall at all times indemnify the Govt. of Odisha. Against all claims which may be made under the workmen's compensation act or any statutory modification thereafter or rules there under or otherwise consequent of any damage or compensation payable in consequent of any accident or injuries sustained or death of any workmen engaged in the performance of the business relating to the agency.

64.0 Agency's Staff, Representatives and Labour:

(a)The agency shall, at all times, maintain on the works, staff of qualified Engineers, and Supervisors of sufficient experience of similar other jobs to assure that the quality of work turned out shall be as intended in the specifications. The agency shall also maintain at the works, a Work Manager or sufficient status, experience and office and duly authorize him to deal with all aspects of the day-to-day work. All communications to any commitments by the Work Manager shall be considered as binding on the Agency.

(b) The Agency shall at all times submit details of skilled and unskilled labour and equipment employed to the Engineer-in-Charge in prescribed proforma as he may require to assess and ensure the proper progress of work.

(c) If the agency does not employ the technical person agreed to on the work a fine of Rs.25,000/- will be imposed. If he does not employ for 30 days, thereafter it becomes a fundamental breach of contract.

(d) The Agency shall at all times, maintain on the work a staff of qualified Engineers and Supervisors of sufficient experience of similar other jobs to ensure that the quality of work turned out shall be as intended in these-specifications and they shall be present at the work spot during working hours and at the time of inspection by the OCCL/Department Officers. All orders and direction given to such supervisory or other staff of the agency to be present on any specified inspection and the agency shall comply with such requisitions.

(e) The agency shall supply to the Engineer-in-Charge details of name, qualifications and experience in regard to all supervisory staff employed by the agency and notify the changes when made and satisfy the Engineer-in-Charge regarding the quality and adequacy of staff thus employed.

(f) The Engineer-in-Charge will have the unquestionable right to ask for change in the agency's supervisory staff and to other removal from the work and connection herewith of any of such staff. The agency shall comply with such order and effect replacement to the satisfaction of the Engineer-in-Charge.

(g) The Agency shall not without written authorization permit entry on site of work of any person authorized agents, engaged in connection with work.

(h) All vehicles used by the agency shall be clearly marked with agency's name.

65.0 Accommodation and food:

The agency should arrange accommodation he needs, at his own cost. The agency shall make his own arrangements for supply of food grains, fuel and other provision to his staff and labourers including controlled commodities.

66.0 Relationship:

Agency shall have to furnish information along with Bid, about the relationship he is having with any officer of the Department Government of Odisha of the rank Assistant Engineer and above engaged in the work and any officer of the rank of Assistant Secretary and above of the Department of Government of Odisha.

67.0 Protection of adjoining premises:

The agency shall protect adjoining sites against structural, decorative and other damages that could be caused by the execution of these works and make good at his cost any such damages.

68.0 Work during night or on Sundays and holidays:

The works can be allowed to be carried out during night, Sundays or authorised holidays in order to enable him to meet the schedule targets and the work shall require almost round the clock working keeping in view:

- i) The provisions of relevant labour laws being adhered to:
- ii) Adequate lighting, supervision and safety measures are established to the satisfaction of the Engineer-in-Charge and
- iii) The construction programme given by the Agency and agreed upon by the Engineer-in-Charge envisages such night working or working during Sundays or authorised holidays.

69.0 Layout of materials stacks:

The agency shall deposit materials for the purpose of the work on such parts only of the ground as may be approved by the Engineer-in-Charge before starting work. A detailed survey, clearly indicating position and areas where materials shall be stacked and sheds built is to be conducted by the agency at his own cost and only after obtaining necessary approval of the plan for use of sites by the Engineer-in-Charge, the Agency can use the sites accordingly.

70.0 Use of blasting materials:

Procurement of blasting materials and its storage is the responsibility of the agency. The agency shall engage licensed blaster for blasting operation. The agency is to act in accordance with Indian Explosive Act and other rules prevailing, during the execution of work. It is the responsibility of the agency to see, that works by other agencies in the vicinity are not hampered, in such cases if any claim is made by other agencies that should be borne by the agency. Carriage of blasting materials, from the magazine to the work site, is the responsibility of the agency.

71.0 Plant and Equipment:

- 71.1. The agency shall have sufficient plant, equipment and labour and shall work such hours and shifts as may be necessary to maintain the progress on the work as per the approval progress schedule. The working and shifts hours shall comply with the Govt. Regulations in force.
- 71.2 It is to expressly and clearly understand that agency shall make his own arrangements to equip himself with all machinery and special tools and plant for the speedy and proper execution of the work and the OCCL does not undertake responsibility towards their supply.
- 71.3 The OCCL shall supply such of the machinery that may be available on hire basis but their supply cannot be demanded as matter of right and no delay in progress can be attributed to such non-supply of the plant by the OCCL and the OCCL cannot be made liable for any damage to the agency. The Agency shall be responsible for safe custody of the OCCL machinery supplied to him (which will be delivered to agency at the machinery yard at site of work) and he has to make good all damages and losses if any other than fire, wear and tear to bring it to the conditions that existed at the time of issue to the

agency before handing over the same to the OCCL. The hire charges for the machinery handed over to the agency will be recovered at the rate prevalent at the time of supply. The agency will have to execute supplemental contract with Engineer-in-Charge at the time of supply of the machinery.

71.4 The acceptance of OCCL machinery on hire is optional to the agency.

72.0 Steel forms:

Steel forms should be used for all items involving use of centering and shuttering. They shall be such that the concrete surface obtained after removal of centering and shuttering shall be single plane without any dents and undulations.

73.0 Inconvenience to the public:

The agency shall not deposit materials at any site, which will cause inconvenience to public. The Engineer-in-Charge may direct the agency to remove such materials or may undertake the job at the cost of the agency.

74.0 Contract documents and materials to be treated as confidential:

All documents, correspondences, decisions and orders, concerning the contract shall be considered as confidential and/or restricted in nature by the agency and he shall not divulge or allow access to them by any unauthorised person.

75.0 General obligations of Agency:

- 75.1 The agency shall, subject to the provision of the contract and with due care and diligence, execute and maintain the works in accordance with specifications and drawings.
- 75.2 The agency shall promptly inform the OCCL and the Engineer-in-Charge of any error, omission and fault and to rectify the defect in the design or specifications for the works which are discovered when reviewing the contract documents or in the process of execution of the works.

76.0 Security measures

- a) Security requirements for the work shall be in accordance with the Governments general requirements including provisions of this clause and the Agency shall conform to such requirements and shall be held responsible for the actions of all his staff, employees and the staff and employees of his sub-agencies.
- b) All agencies' employees, representatives and sub-agency's employees shall wear identifications badges provided by the agency. Badges shall identify the agency, showing and employee's number and shall be worn at all times while at the site. Individual labour will not be required to wear identification badges.
- c) All vehicles used by the agency shall be clearly marked with agency's name.
- d) The agency shall be responsible for the security of the works for the duration of the contract and shall provide and maintain continuously adequate security personnel to fulfill these obligations. The requirements of security measures shall

include, but not limited to maintenance of order on the site, provision of all lighting, fencing, guard flagmen and all other measures necessary for the protection of the works within the colonies, camps and elsewhere on the site, all materials delivered to the site, all persons employed in connection with the works continuously throughout working and non working period including nights, Sundays and holidays for duration of the contract.

- e) Other agencies working on the site concurrently with the agency will provide security for their own plant and materials. However, their security revisions shall in no way relieve the agency of his responsibilities in this respect.
- f) Separate payment will not be made for provision of security services and the cost of this work shall be deemed to have been included in the bid.

77.0 Fire fighting measures:

- a) The agency shall provide and maintain adequate firefighting equipment and take adequate fire precaution measures for the safety of all personnel and temporary and permanent works and shall take action to prevent damage to destruction by fire of trees shrubs and grasses at his own cost.

78.0 Sanitation:

The agency shall implement the sanitary and watch and ward rules and regulations for all employees employed under this contract and if the Agency fails to enforce these rules, the Engineer-in-Charge may enforce them at the expenses of the Agency.

79.0 Training of personnel:

The agency, shall, if and as directed by the Engineer-in-Charge provide free of any charge adequate facilities, for vocational training of Government Officers, students, Engineers, supervisors, foremen, skilled workmen etc. not exceeding six in number at any one time on the agency's work. Their salaries, allowances etc. will be borne by the Government and the training schemes will be drawn up by the Engineer-in-Charge in consultation with the agency.

80.0 Ecological balance:

- a) The agency shall maintain ecological balance by preventing de-forestation, water pollution and defacing of natural landscape. The agency shall so conduct his construction operation as to prevent any unnecessary destruction, scarring, or defacing of the natural surroundings in the vicinity of the work. In respect of the ecological balance, agency shall observe the following instructions.
 - i) Where unnecessary destruction, scarring, damage or defacing may occur, as result of the operation, the same shall be repaired replanted or otherwise corrected at the agency's expense. The agency shall adopt precautions when using explosives, which will prevent scattering of rocks or other debris outside the work area. All work are including borrow areas shall be smoothened and graded in a manner to conform to the natural appearance of the landscape as directed by the Engineer-in-charge.
 - ii) All trees and shrubbery which are not specifically required to be cleared or removed for construction purposes shall be preserved and shall be protected from any damage that may be caused by the Agency's construction operation and equipment. The removal of trees and shrubs will be permitted only after prior approval by the

Engineer-in-Charge. Special care shall be exercised where trees or shrubs are exposed to injuries by construction equipment, blasting, excavating, dumping, chemical damage or other operation and the agency shall adequately protect such trees by use of protective barriers or other methods approved by the Engineer-in-Charge. Trees shall not be used for anchorages. The agency shall be responsible for injuries to trees and shrubs caused by his operations. The term "injury" shall include, without limitation bruising, scarring, tearing and breaking of roots, trunks or branches. All injured trees and shrubs be restored as nearly as practicable without delay to their original condition at the agency's expense.

- iii) The agency's construction activities shall be performed by methods that will prevent entrance or accidental spillage of solid matter contaminants, debris and other objectionable pollutants and wastage into river. Such pollutant and waste include earth and earth products, garbage, cement concrete, sewage effluent, industrial wastes, radio-active substances, mercury, oil and other petroleum products, aggregate residuals, mineral salts and thermal pollutants. Pollutants and wastes shall be disposed off in a manner and at sites approved by the Engineer-in-Charge.
- iv) In conduct of construction activities and operation of equipments the agency shall utilize such practicable methods and devices as are reasonably available to control, prevent and otherwise minimize the air pollution. The excessive omission of dust in to the atmosphere will not be permitted during the manufacture, handling and storage of concrete aggregates and the agency shall use such methods and equipment as a necessary for collection and disposal or prevention of dust during these operations. The agency's methods of storing and handling cement shall also include means of eliminating atmospheric discharges of dust, equipment and vehicles that give objectionable omission of exhaust gases shall not be operated. Burning of materials a resulting from clearing of trees, bushes, combustible construction materials and rubbish may be permitted only when atmospheric conditions for burning are considered favorable.
- b) Separate payment will not be made for complying with the provisions of this clause and all cost shall be deemed to have been included in the unit rates and prices included in the contract if any provision is not complied with within a reasonable time even after issue of a notice in this respect, the necessary operations would be carried out by the Engineer-in-Charge at the cost of the Agency, Orders of the Engineer-in-Charge in this respect would be final and binding on the agency.

81.0 Preservation of existing vegetation:

- a) The agency will preserve and protect all existing vegetation such as trees, on or adjacent to the site which do not unreasonably interfere with the construction as may be determined by the Engineer-in-Charge. The agency will be held responsible for all unauthorized cutting or damage of trees, including damage due to careless operation of equipment, stockpiling of materials or trekking of grass areas by equipment Care shall be taken by the Agency in felling trees authorized for removal to avoid any unnecessary damages to vegetation and trees that are to remain in place and to structures under construction or in existence and to workmen.
- b) All the produce from such cutting of trees by the agency shall remain the property of Government and shall be properly stacked at site, approved by the Engineer-in-Charge.

No payment whatsoever shall be made for such cutting and its stacking by the Agency. If any produce from such cutting is not handed over to the Government by the agency, he shall be charged for the same at the rates to be decided by the Engineer-in-Charge. The recovery of this amount shall be made in full from the intermediate bill that follows.

- c) The agency shall also make arrangements of fuel deposits for supply of required fuel for the labourers to be employed for cooking purpose at his own cost in order to prevent destruction of vegetation growth in the surrounding area of the work site.

82.0 Possession Prior to completion:

The Engineer-in-Charge shall have the right to take possession of or use any completed part of work or works or any part thereof under construction either temporarily or permanently. Such possession or use shall not be deemed as an acceptance of any work either completed or not completed in accordance with the contract specification except where expressly otherwise specified by the Engineer-in-charge.

83.0 Access to the Agency's books:

Whenever it is considered necessary by the Engineer-in-Charge to ascertain the actual cost of execution of any particular extra item of work or supply of the plant or material on which advance is to be made or of extra items or claims, he shall direct the agency to produce the relevant documents such as payrolls, records of personnel, invoices of materials and any or all data relevant to the item or necessary to determine its cost etc. and the agency shall when so required furnish all information pertaining to the aforesaid items in the mode and manner that may be specified by the Engineer-in-Charge.

84.0 Drawing to be kept at site:

The agency is to supply seven sets of corrected drawings for approval of the Project authority. The approving authority will forward four sets of approved drawing to the Engineer-in-Charge and two sets to the agency for his/their own use. The agency shall keep one complete set of drawings and specifications in the site in charge of the agency's agent to whom the instructions can be given by the Engineer-in-Charge.

85.0 B.I.S Books and Standard Specification / OPWD code to be kept site:

A complete set of Indian Standard specification referred to in "Technical Specifications" and OPWD Code shall be kept at site for reference.

86.0 Site Order Book:

An order book shall be kept at the site of the work. As far as possible, all orders regarding the work are to be entered in this book. All entries shall be signed and dated by the OCCL Officers in direct charge of the work and by the agency or by his representative. In important cases, the Engineer-in-Charge or MD, OCCL will countersign the entries, which have been made. The order book shall not be removed from the worksite, except with the written permission of the Engineer-in-Charge. The Site Order Book shall be issued by the Engineer-in-Charge for use at site.

87.0 Variations by way of modification, omissions or additions:

The agency(s) shall not vary or deviate from the drawings or specifications except upon the express authority of the Engineer-in-Charge which shall be obtained by an order in

writing of the Engineer-in-Charge or by plan or drawing expressly given or signed by him or by any subsequent written approval signed by him. For example the foundation shall be carried to the depths in suitable strata, shown in the drawing. But if the Engineer is of opinion that they should be shallower or deeper and so directs the agency in writing the instruction of the Engineer-in-Charge shall be binding on the agency.

87.1 The Power to make additions and alteration in drawing or specification etc.:

The Project authority shall have power to make any alternations in or additions to the original specification, drawing, designs and instructions that may appear to him to be necessary or advisable during the progress of the work and the agency(s) shall be bound to carry out the work in accordance with the instructions which may be given to him/them in writing signed by the Engineer-in-Charge and such alterations shall not invalidate the contract, and any additional work beyond the scope of the work which the agency may be directed to do in the manner above specified as part of the work or any curtailment of the work from the scope of the work as designed, which may be found necessary during the period of construction shall be carried out or omitted by the agency(s) on the same conditions in all respects on which he/they agreed to do the main work. If the additional or altered work for which no rates can be arrived from the main work then the agency shall within seven days of the date of the receipt by him/them of the order to carry out the work, inform the Engineer-in-Charge of the rate which he/they propose to charge for such class of work. 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 a class of work and arrange to carry it out in such manner as he may consider it advisable. In the event of dispute the decision of the MD, OCCL shall be final. The time limit for the completion of the work shall be extended or curtailed in the proportion to the increase or decrease in its costs. As alteration or curtailment bears to the cost of the original contract work, the certificate of the Engineer-in-Charge as to such proportion shall be conclusive.

88.0 Care and diversion of river / stream. :

The agency shall submit details regarding the diversion and care of river or stream during construction of the work along with a separate print-out of the time table showing earliest and

latest start and finish dates of various activities. He should submit a detailed labour plan with drawings for the diversion and care of river during construction of work. The above arrangements shall be at agency's cost.

89.0 INCOME TAX:

- a) During the currency of the contract, deduction of income tax as per Income tax Rule shall be made from the gross value of each bill of the contract.
- b) The agency's staff, personnel and labour will be liable to pay personnel income taxes in respect of their salaries and wages as are chargeable under the laws and regulations for the time being in force; and the agency shall perform such duties in regard to such deductions thereof as may be imposed on him by such laws and regulations.

90.0 ROYALTY CHARGES:

The agency shall pay the royalty to the competent authority / local body as per rules.

The agency shall furnish quarterly statement showing quantity of quarried materials from

whom purchased (with full address of the seller) & copies of bills for purchase to the District Officer of the Revenue Department authority competent to levy royalty in the area of work. Agency shall also furnish such additional information as regards royalty payment to the royalty collecting Authority as may be called for. The royalty charges paid shall be borne by the agency & shall not be reimbursed by the Engineer-in-Charge.

91.0 GST:

- 91.1 GST as applicable shall be deducted at source during the currency of the contract while making payments to the agency.
- 91.2 The agency should produce a valid GST Certificate before the payment of the final bill; otherwise payment to the agency will be withheld.
- 91.3 The tax structure is liable for revision as per the orders of the Government issued from time to time and in such case; the same tax will be deducted at source at the revised rates only while making payment to the agency.
- 91.4 Excess recovery due to downward revision in sales tax rates as per orders of Government from time to time will be reimbursed.

92.0 Labour Welfare Cess.

Labour welfare cess @ 1% of basic bill amount is to be deducted during currency of contract subject to the amendments made by Govt. from time to time.

93.0 SUPPLY OF CONSTRUCTION MATERIALS:

The agency(s) is/are to provide every article or thing which may be necessary and requisite for the due and proper execution of all the works to satisfactory completion of the contract in all respect.

94.0 SETTING OUT:

The agency shall be responsible for the true and proper setting out of the works and the correctness of positions, levels, dimensions and alignments of all parts of the work and for the provisions of all necessary instruments, appliances and labour in connection therewith, If, at any time, during the progress of the work, any errors, appear or arise in the positions, levels, dimensions or alignments of any part of the work, the agency, on being required to rectify such errors by the Engineer-in-Charge shall at his own expense do so to the satisfaction of the Engineer-in-charge. The checking of and setting out of any line or level by the Engineer-in-Charge or his representative shall not in any way, relieve the agency of his responsibilities for their correctness and other things used in setting out of the work. The agency shall carefully protect and observe all bench-marks, site-nails, pegs and other things used in setting out of the work.

95.0 Sufficiency of the contract price:

The Agency shall be deemed to have satisfied himself as to the correctness and sufficiency of the Contract Price. Unless otherwise stated in the Contract, the Contract price covers all the Agency's obligations under the Contract (including those under provisional sums, if any) and all things necessary for the proper planning & design,

execution and completion of the Works and the remedying of any defects during construction and maintenance period.

96.0 Unforeseeable Difficulties:

Except as otherwise stated in the Contract:

- a. the Agency shall be deemed to have obtained all necessary information as to risks, contingencies and other circumstances which may influence or affect the Works:
- b. by signing the Contract, the Agency accepts total responsibility for having foreseen all difficulties and costs of successfully completing.
- c. the Works; and the Contract Price shall not be adjusted to take account of any unforeseen difficulties or costs.

97.0 Rights of Way and Facilities:

The Agency shall bear all costs and charges, other than the statutory charges, for special and/or temporary rights-of-way, which he may require, including those for access to the Site. Department shall bear the statutory charges for R. O. R. The Agency shall also obtain, at his risk and cost, any additional facilities outside the site, which he may require for the purposes of the Works.

98.0 Avoidance of Interference:

The Agency shall not interfere unnecessarily or improperly with:

- a) The convenience of the public, or
- b) The access to and use and occupation of all roads and footpaths, irrespective of whether they are public or in the possession of the Employer or of others. –

The Agency shall indemnify and hold the Employer harmless against and from all - damages, losses and expenses (including legal fees and expenses) resulting from any such unnecessary or improper interference.

99.0 Access Route:

The Agency shall be deemed to have been satisfied as to the suitability and availability of access routes to the Site. The Agency shall use reasonable efforts to prevent any road or bridge from being damaged by the Agency's traffic or by the Agency's Personnel. These efforts shall include the proper use of appropriate vehicles and routes.

Except as otherwise stated in these Conditions:

the Agency shall (as between the Parties) be responsible for any maintenance which may be required for his use of access routes; the Agency shall provide all necessary signs or directions along access routes, and shall obtain any permission which may be required from the relevant authorities for his use of routes, signs and directions; the Employer shall not be responsible for any claims which may arise from the use or otherwise of any access route, the Employer does not guarantee the suitability or availability of particular access routes, and Costs due to non-suitability or non-availability, for the use required by the Agency, of access routes shall be borne by the Agency.

100.0 Transport of Goods:

- a) The Agency shall give the Employer, not less than 21 days' notice, of the date on which any Plant or a major item of other Goods will be delivered to the Site;

- b) The Agency shall be responsible for packing, loading, transporting, receiving. Unloading, storing and protection all Goods and other things required for the Works; and
- c) The Agency shall indemnify and hold the Employer harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from the transport of Goods, and shall negotiate and pay all claims arising from their transport.

101.0 Agency's Equipment:

The Agency shall be responsible for all his/their equipment. When brought on to the Site, Agency's Equipment shall be deemed to be exclusively intended for the execution of the Works.

- 1) All Constructional Plant, Temporary Works and materials provided by the Agency shall, when brought on to the site, be deemed to be exclusively intended for the execution of the Works and the Agency shall not remove the same or any part thereof, except for the purpose of moving it from one part of the site to another, without the consent, in writing, of the Engineer, which shall not be unreasonably withheld.
- 2) Upon completion of the works the Agency shall remove from the site all the said Constructional Plant and Temporary Works remaining thereon and any unused materials provided by the Agency.
- 3) The Employer shall not at any time be liable for the loss of or damage to any of the said Constructional Plant, Temporary Works or materials.

102.0 Progress Reports:

Monthly progress reports shall be prepared by the Agency and submitted to the Employer in six copies. The first report shall cover the period up to the end of the first calendar month following the Commencement Date. Reports shall be submitted monthly thereafter, each within 5 days after the last day of the period to which it relates.

Reporting shall continue until the Agency has completed all work. The work which is known to be outstanding at the completion date is to be completed stated in the Taking-Over Certificate for the Works.

Each report shall include:

- (a) Charts and detailed descriptions of progress, including each stage of design, Agency's Documents, procurement, manufacture, delivery to Site, construction, commissioning and trial operation;
- (b) Digital photographs showing the status of progress on the Site;
- (c) For the manufacture of each main item of Plant and Materials, the name of the manufacturer, manufacture location, percentage progress, and the actual or expected dates of:
 - (i) Commencement of manufacture,
 - (ii) Agency's inspections,

- (iii) Tests, and
 - (iv) Shipment and arrival at the Site;
- (d) The details of Agency's Personnel and Equipments.
- (e) Copies of quality assurance documents, test results and certificates of Material;
- (f) List of Variations, notices given
- (g) Safety statistics, including details of any hazardous incidents and Activities relating to environmental aspects and public relations; and
- (h) Comparisons of actual and planned progress, with details of any events or circumstances which may jeopardize the completion in accordance with the Contract, and the measures being (or to be) adopted to overcome delays.

103.0 Design:

103.1 General Design Obligations:

The Agency shall be deemed to have scrutinized, prior to the Base Date, the Employer's Requirements. The Agency shall be responsible for the planning of the Works and for the accuracy of such Employer's Requirements except as stated below.

The Employer shall not be responsible for any error, inaccuracy or omission of any kind in the Employer's Requirements as originally included in the Contract and shall not be deemed to have given any representation of accuracy or completeness of any data or information. Any data or information received by the Agency, from the Employer or otherwise shall not relieve the Agency from his responsibility for the Planning, and execution of the Works.

103.2 Agency's Documents:

The Agency's Documents shall comprise the technical documents specified in the Employer's Requirements, documents required to satisfy all regulatory approvals, and the documents.

The Agency shall prepare all his Documents, and shall also prepare any other documents necessary to instruct his Personnel.

If the Employer's Requirements describe the Agency's Documents which are to be submitted to the Employer for review, they shall be submitted accordingly, together with a notice as described below. In the following provisions of this Sub-Clause, (i) "review period" means the period required by the Employer for review, and (ii) "Agency's Documents" exclude any documents which are not specified as being required to be submitted for review.

The Employers may give notice to the Agency that his Document fails (to the extent stated) to comply with the Contract. If his Document so fails to comply, it shall be rectified, resubmitted and reviewed in accordance with this Sub-Clause, at his cost.

For each part of the Works, and except to the extent that the Parties otherwise agree:

- (a) Execution of such part of the Works shall not commence prior to the expiry of the review periods for all the Agency's Documents which are relevant to its execution.
- (b) execution of such part of the Works shall be in accordance with these Agency's Documents, as submitted for review; and if the Agency; wishes to modify any document which has previously been submitted for review, the Agency shall immediately give notice to the Employer. Thereafter, the Agency shall submit revised documents to the Employer in accordance with the above procedure.
- (c) If the Employer's Representative instructs that further Construction Documents are necessary for carrying the works, the Agency shall upon receiving the Employer's Representative Instructions, prepare such construction documents and shall not be considered as variation. Any such contract (under the preceding paragraph) or any review (under this Sub-Clause - or otherwise) shall not relieve the Agency from any obligation or responsibility.

103.3 As-Built Documents:

The Agency shall prepare, and keep up-to-date, a complete set of 'as-built' records of the execution of the Works, showing the exact as-built locations, sizes and details of the work as executed. These records shall be kept on the Site and shall be used exclusively for the purposes of this Sub-Clause. Two copies shall be supplied to the Employer prior to the commencement of the quantity checks / Verification Tests on Completion.

In addition, the Agency shall supply to the Employer as-built drawings of the Works, showing all Works as executed, and submit them to the Employer for review under Sub-Clause [Agency's Documents]. The Agency shall obtain the consent of the Employer as to their size, the referencing system, and other relevant details.

Prior to the issue of any Taking-Over Certificate, the Agency shall supply to the Employer the specified numbers and types of copies of the relevant as-built drawings, in accordance with the Employer's Requirements. The Work shall not be considered to be completed for the purposes of taking-over [Taking Over of the Works and Sections] until the Employer has received these documents.

103.4 Design Error:

If errors, omissions, ambiguities, inconsistencies, inadequacies or other defects are found and the Works shall be corrected, notwithstanding any consent or approval under this Clause.

104.0 Programme:

- 104.1 The Agency shall submit a work programme to the employer within 15 (fifteen) days after the conclusion of contract / commencement date whichever is earlier and the programme shall be based on the basic time period for completion and milestone as indicated in the Contract Document. His programme shall be considered effective upon acceptance by the Engineer-in-Charge.

The Agency shall also submit a revised work programme whenever the previous programme is inconsistent with actual progress or with the Agency's obligations. Unless otherwise stated in the contract each work programme shall include:

- (a) The order in which the Agency intends to carry -out the Works, including the anticipated timing of each major stage of the Works.
- (b) The periods for reviews under Clause [Agency's Documents],
- (c) The sequence and timing of inspections and tests specified in the Contract, and
- (d) A supporting report which includes:

- (i) A general description of the methods which the Agency intends to adopt for the execution of each major stage of the Works, and
- (ii) The approximate number of each class of Agency's Personnel and of each type of Agency's Equipment for each major stage.

104.2 Rate of Progress:

If, at any time:

- (a) actual progress is too slow to complete within the Time for Completion, and/or
- (b) progress has fallen (or will fall) behind the current programme under Sub-Clause [Programme], then the Employer may instruct the Agency to submit, under Sub Clause, a revised programme and supporting report describing the revised methods which the Agency proposes to adopt in order to expedite progress and complete within the Time for Completion of the mile stone and the work. Unless the Employer notifies otherwise, the Agency shall adopt these revised methods, which may require increases in the working hours and/or in the numbers of Agency's Personnel and/or Goods, at the risk and cost of the Agency.

105.0 Charge of site

From the commencement of the works to the completion of the same, they are to be under the agency (s) charge. The Agency(s) is / are to be held responsible for and to make good all injuries, damages and repair occasioned or rendered necessary to the same by fire or other causes and they are to hold the employer harmless from any claims for injuries to persons or for structural employer harmless from any claims for injuries to persons or for structural damage to property happening from any neglect, default, want of proper care or misconduct on the part of the agency's(s) or of any one in his/their employees during the execution of the works.

106.0 Changes in drawing

If at any time before or after the commencement of the work the employer shall for any reason whatsoever.

- a) Cause alterations, omissions or variation in the drawings and specification involving any curtailment of the works as originally contemplated or
- b) Not required the whole of work as specified in the Bid to be carried out, the agency(s) shall have no claim to any payment or compensation whatsoever on account of any profit or advantage which he/they might have derived from the execution of the work in full as specified in the Bid but which he/they did not derive in consequence of the curtailment of the works by reason of alterations, omissions or variations or in consequence of the full amount of the work not having been carried out.

SECTION V

TECHNICAL SPECIFICATIONS

SECTION – 1**GENERAL INFORMATION****1.0 General Information & Scope of Work****1.1 Description of work to be executed:**

“Construction of Spillway of Upper Lanth Irrigation Project, Belpada”

1.2 Location of work site:

The Spillway is to be constructed across river Lanth near village Chikili in Ghagurli G.P of Belpada Block of Patnagarh Sub-Division in the Balangir district. The work site is situated approximately at a distance of 15 Kms from Belpada, 30-35 Kms from Patnagarh and Kantabanji, of Balangir district

1.3 Transport communication facilities.

The contractor has to make arrangement at his own cost to transport all his construction equipments, construction materials and labour to work site, as stated via above root.

1.4 Climate :

The project area has moderate climate with mean temperature from 18⁰C to 45⁰C during summer month. The rainy season is generally confined to four months from 16th June to 15th October during which about 70% of the total annual precipitation is received.

1.5 Availability of Labour:

Both Semi-Skilled & unskilled labour required for the work are available in project area and it is preferable to engage local labourer, However the Contractor must make his own arrangements for labour / machineries / equipments.

1.6 Nearest Town:

The nearest town to the work site is Patnagarh & Kantabanji of Balangir district.

1.7. Availability of Petrol, Diesel and other lubricants:

Nearest petrol pump is at Belpada in the district of Balangir.

1.8 Electric Supply:

Electricity supply is available at work site. The Contractor shall make his own arrangement for extension of electric connection at his own cost if so required by him.

1.9 Observation of Rules:

The Contractor shall take precaution to ensure safety to the workers. The department will not take any responsibility for accident if any that may occur during the period of execution. The Contactor shall take immediate action to rectify the defects, immediately if any during the period of execution pointed out by the Department. Labour license must be produced before the starting of work.

1.10 Housing Facilities:

Private house may or may not available in the vicinity of the work site. The Contractor shall make his own arrangement for housing of the labours, workers and staff at the work site.

1.11 Medical Aid:

The nearest Health Centre available at Belpada, Dist- Balangir. However, the Contractor shall make first aid arrangement at his own cost in accordance with rule and regulations of prevailing Labour Act.

1.12 Post, Telegraph & Telephones:

Post, Telephones, & Fax are available at Belpada.

1.13 Local Roads:

The existing available approach road to the work site can be used by the contractor. The contractor shall however construct and maintain the connecting roads in the working areas including drainage, sanitary etc. at his own cost. The contractor shall construct haul road and other approach road as maybe necessary for proper execution of the work at his own cost.

1.14 General Information:

1.14.1 The information and the data related to work site conditions described above represents the site condition in general and for information of the bidders/contractors. The department does not guarantee the reliabilities or accuracy of any other data. The Contractor shall undertake at his expense such studies as are necessary to assess the reliabilities and accuracy of information presented.

1.14.2 It shall be presumed that the bidder / contractor visits sites of proposed works at his expense and satisfy himself as to the nature and location of work and local condition in general and particularly about the availability of construction materials electricity supply, water supply, storage and handling of materials, disposal of soil, road communication, availability of labour and other related matters, planning for execution etc. before quoting his rates for different items of work. The department therefore will not bear any responsibility for any interpretation or conclusion made by the contractor in respect of site condition and consequence thereof.

1.15 Sources of Fund :

Department of Water Resources, Odisha.

SECTION-2**CLEARING OF SITE****2.1 *Cleaning and Grubbing.***

The portion of the right of way, where required for constructing the work under these specifications including borrow area, submergence area, shall be cleared of all plants, bushes, rubbish and other objectionable matters. The timber and other useful materials should be stacked as directed by the Engineer-in-charge and handed over to the Department. Trees designated by the Employer shall not be cut and shall be protected from injury. After handing over useful material to department the waste material shall be disposed off and removed from the site of work before the date of completion of the contract as approved by the Employer. The clearing operation shall be in accordance with clause 3.1, 3.1.1, 3.2 and 3.3 of IS 4701-1982 Indian code of practice for earthwork. Surface boulders either loose or partly embedded in the ground will have to be removed and stacked as directed.

2.2 *Site Drainage and diversion and care of the river flows.*

The Contractor shall handle all flows from natural drainage channels intercepted by the work. He shall perform any additional excavation and grading for drainage as directed and provide and maintain any temporary construction required to by pass or otherwise cause the flows to be harmless to the work and property. The contractor should design and construct the required coffer dams to divert the flows during execution. He should submit the design of the cofferdams and the diversion plans of the river flows and work progress schedule. They shall be submitted to the Engineer-in-charge for approval. When the temporary construction is no longer needed and prior to acceptance of the work the contractor shall remove the temporary construction and restore the site to its original condition as approved by the Engineer. The cost of all works and materials required for the above work shall be included by the bidder in the unit prices quoted in bill of quantities and no separate payment will be made for the same.

SECTION-3**EXCAVATION FOR SPILLWAY****3.1 General.**

- a) The work to be done under these specifications shall consist of furnishing all tools, constructional plant, labour, materials and other things required for excavation in all strata, conveyance and disposal of the excavated materials, leads and lifts, temporary work for performance of all the operations connected with the work embraced under the contract as will secure a satisfactory quantity of work.
- b) Construction and maintenance of diversions in case diversion of streams where they were disturbed due to excavation of dam / barrage and appurtenant works and for construction of structures.

The list of I.S codes and other publications applicable to this section is given below.

The abbreviations, OSS, IS, IRC, B.S, ASTM shall be considered to have the following meanings.

OSS - Odisha Standard Specification

I.S - Indian Standard of the Bureau of Indian Standards

IRC - Indian Roads Congress

B.S - British Standards

ASTM - American Standard of the American Society of Testing Materials.

Earthwork:

Sl. No.	I.S. Number	Short Title
01.	IS:4701-1982	Code of practice of earth work on canal.
02.	IS:3764-4966	Safety code for excavation work
03.	IS:1200(Part-I)-1974	Measurement of building and Civil Engineering works.
04.	IS:2720(Part-2)-1973	Method of test for soils part-2. Determination of water content.
05.	IS:3701-1968	Safety code for excavation works.
06.	IS:3698(Part-I)-1966	Safety code for scaffolding
07.	IS:3696(Part-B)-1966	Safety code for ladders
08.	IS:4082-1077	Recommendation of stacking and storage of

		construction materials at site.
--	--	---------------------------------

In addition to the above IS codes, the specifications of OSS and manual for Quality control and inspection shall also be complied with

3.2 Planning

- a) Priority to the commencement of work, all relevant data shall be collected by the Contractor and drawings prepared by him showing the location of the excavation, spoil deposition and filling.
- b) The contractor shall present his planning of the work along with required details to the Engineer atleast 15 days before starting the work.

3.3 Setting out works

- a) The contractor shall be responsible for the correct setting out of all works and its execution at his cost. The contractor shall execute the work true to alignment, grade and levels as shown in the drawings and as directed by the Engineer and shall check these at frequent intervals. The contractor shall provide all facilities like labour and instruments and shall cooperate with the Engineer to check all alignments, grade, levels and dimensions. Such checking shall not absolve the contractor of his own responsibility of maintaining the accuracy of the works.
- b) The contractor shall establish sufficient number of reference bench marks facilitating setting out of works and taking levels for purpose of measurements.
- c) Prior to commencement of work, the Contractor shall erect additional permanent bench marks, reference lines, reference points and check profiles at convenient locations approved by the Engineer. The bench mark stones shall be of 900mmx225mmx150mm size with 450mm embedded under firm ground in concrete and 150mm projecting above ground. The Word 'BM' showing value of RL shall be conspicuously carved and painted.
- d) The contractor shall take all precautions to see that the lines, points and bench marks are not disturbed by his work and shall make good of any such damage.

3.4 Clearing the site

The provisions of Section 3 on Clearing of Site shall apply

3.5 Recording of working levels for soils & rocks.

- a) The area required for dams/barrage and appurtenant works shall be cleared in accordance with the provisions of section 3. Measurements for soils and rocks will be based on levels. Initially on handing over site, net levels shall be taken at 2.5m or less interval as directed by the Engineer. The levels will be entered in field books and plotted in cross section sheets by the contractor in the presence of Engineer-in-charge or his representative. The contractor

shall write a certificate “accepted the pre levels recorded on pages from ____ to ____” and sign at the end of levels in the level field book in token of acceptance

- b) After stripping and prior to commencement of excavation cross sectional levels of the stripped surface shall be taken at the same locations and intervals and certificates as mentioned in (a) above shall be recorded.

At the earliest, cross sectional profiles taken after stripping shall be prepared duly plotting the pre levels and the contractor’s signature shall be obtained on these cross section sheets. These cross sections called initial cross sections duly signed by the contractor and Engineer shall be preserved. Measurement of quantity will be based on these levels only. All linear dimensions shall be measured in metres to the nearest 0.01m; areas shall be computed in square meters nearest to 0.01 square metre. However, in case of rock excavation occurring in bed or sides, the actual quantity of rock shall be arrived at by taking block levels at 2.5m intervals all along the entire area of bed and sides.

- c) No separate payment will be made to the contractor for the materials and labour provided for taking the cross sectional levels.

3.6 Earthwork Excavation for Spillway foundation.

Classification of excavated materials:

All materials involved in excavation shall be classified and got approved by the Engineer into the following groups.

- a) All Kinds of soils

This shall comprise ordinary soils such as vegetable or organic soil turf, sand, silt, clay, mud, peat, black cotton soil, soft shale or loose moorum and hard soils such as stiff black cotton soil, stiff clay, compressed hard gravel, stoney earth, stone matrix, soft disintegrated rock removable by pick axes and crow bars, boulders not exceeding 300mm in any direction and mixture of these and similar material.

- b) Hard Disintegrated Rock not requiring blasting.

Hard disintegrated rock not requiring blasting, hard disintegrated rock or soft rock or conglomerate rock and hard lime kankar removable by pick axes and crow bars.

- c) Rock Requiring Blasting.

- i) Fissured and fractured rock and boulders of size more than 0.30 cum upto 3 cum in size requiring ordinary blasting
- ii) Fissured and fractured rock and boulders of size more than 0.03 cum upto 3 cum in size requiring restricted blasting using Jack Hammer with controlled charge.
- iii) Hard rock, sheet rock and boulders more than 3 cum size requiring blasting with ordinary blasting.
- iv) Hard rock , sheet rock and boulders more than 3 cum size requiring restricted blasting using Jack hammer with controlled charge.

3.6.1 Excavation of Foundation

Before any of the work for the excavation of foundation is taken up, all loose rock, semi-detached rock in or close to the area to be excavated that is liable to fall or otherwise injure the workmen or the works shall be stripped. The method used shall be such as not to shatter or render unsuitable or unsafe any rock that was originally sound and safe. Any material not requiring removal as contemplated therein, but which may later become loosened or unsuitable shall be promptly and satisfactorily removed.

a) Excavation in all soils.

Overburden excavation shall include removal of all material other than rock excavation. The overburden excavation shall include earth, gravel, hard and compact material such as cemented gravel and soft disintegrated rock and also all boulders and detached pieces of rock measuring 0.03 cum or less in volume.

b) Rock excavation.

Rock excavation shall include rock in place which cannot be excavated until loosened by blasting, barring or wedging and also all boulders or detached pieces of solid rock more than one cubic meter in volume.

The excavation shall be made to sufficient depth to secure foundation on sound rock, free from weathered material, open seams or other objectionable defects. All necessary precautions shall be taken to preserve the rock below and beyond the lines of excavation in the soundest possible condition. The rock excavation shall be done by controlled blasting using Jack hammer holes of 32mm dia or less with little charge such that the blasting done will neither open up seams nor crack the rocks beyond prescribed limit.

The firing of system of blasts shall be controlled by the use of delay detonators. As excavation approaches its final lines, the depth of holes for blasting and amount of explosives used for hole shall be progressively reduced and excavation shall be done by controlled blasting. Whenever further blasting is liable to injure the concrete it is to be discontinued and the excavation for final 0.5m completed by wedging, barring, chiseling, line drilling and broaching or other suitable methods.

No blasting shall be done within 15 meters of any permanent structure. Where blasting would create a hazard to existing structures for installation, rock excavation shall be performed by methods other than blasting. The general excavation will be to levels and shapes shown in the relevant approved drawings. The foundation levels are based on indication of preliminary borings and are subject to changes as per actual site conditions warrant. Before starting concrete or masonry work, as large an area as possible should be exposed for inspection and test, so that a nearby section excavated later should not disclose that the former section should have been taken to lower depth.

After excavation of hard rocks , 70% recovery shall be taken into account in case of blasting and 50% in case of excavation by rock breakers. Recovered excavated hard rocks shall be issued to the contractor at the current Schedule of Rates.

c) Line drilling for rock excavation.

Where vertical or square faces of rock are required in portions of the work. Such faces of excavation shall be formed by line drilling and broaching. The diameter and spacing of the holes for line drilling shall be subject to approval. The spacing of the drill holes shall be sufficiently close to ensure that rock will break along the designed lines. No blasting will be permitted in the holes along the sides of the excavation but light blasting will be permitted in areas adjacent to the holes provided that where further blasting might injure the rock upon or adjacent to which concrete is to be placed, the use of explosives shall be discontinued and excavation completed by wedging, barring or other suitable methods. Wagon drills shall not be used as it may disturb the rock structure.

d) Preparation of foundation - initial

After completion of rough excavation of foundation, scaling and trimming operations for the final removal of all shabby weathered and dummy rock and loosened mass shall be done by chiseling, picking, wedging and barring. The final foundation surface shall present a rough outline to provide added resistance to sliding and all smooth surfaces shall be roughened. The final surface shall be free from steep angles and sharp projections. Neither along the dam/barrage nor across, shall the foundation have a slope exceeding the angle of friction of concrete on rock. Where slopes are steep the rock shall be benched to give a downward slope towards upstream of about 1:10.

The foundation surface after cleaning out should be sounded by striking with hammer and portions which do not return a solid ringing sound shall be chiseled out. Sprinkling the area with water will indicate the joints in rock from the water lines which cling to the cleavages after the area has partially dried up. Such portions shall be tested for soundness and rectified where necessary.

3.6.2 Tolerance in excavation.

Measurements for soils and rocks will be based on levels. Initially on handing over the site, net levels shall be taken at 2.50 m or less interval as desired by the Engineer. The levels will be plotted in a cross section sheet and average level arrived at for purpose of determining the quantity of excavation. The contractor should sign the cross section sheets in token of his acceptance.

- i. For excavation in rock a tolerance of 15cm beyond the profile will however be permitted. No extra payment will be made for the excavation beyond the designed profile. The over breakages within the tolerance limit of 15 cm shall be refilled with C.C M20 grade specified for foundations. No extra payment for filling such over breakage shall be allowed.

3.6.3 SPOILS

The excavated spoil in soils and hard rock is to be deposited outside the working area at suitable location in consultation with the Engineer.

- 3.6.4 Hard rock boulders of size greater than 0.03 cum. shall be stacked. The stack shall be closely packed with minimum voids and 40% will be deducted from the stack measurements to obtain solid measurements (this is subject to increase in the case of loose packing).
- 3.6.5 The excavated material shall be stacked within the area approved by the Engineer - in - charge. If the excavated material is deposited in unauthorized land, such work will not be measured for payment unless suitable action as may be directed by the Engineer - in - charge is taken by the contractor. In addition to non - payment of such work suitable amounts as directed by the Engineer - in - charge will be recovered from the Contractor as directed towards any extra cost which may have to bear on account of the Contractor's un-authorized action.

3.6.6 USE OF EXCAVATED MATERIALS

All the materials available from excavation will be the property of Govt. and shall be disposed as directed by the Engineer - in - charge. The Material of approved quality may be used by the Contractor in the item of work included in Schedule of requirement of the tender or on ancillary for preparatory work free of charge. Prior approval of the Engineer - in - charge for such free use shall however be taken.

- 3.6.7 No re-handling of excavated material due to injudicious selection of the place for dumping will be paid for.
- 3.6.8 Blasting executed by Contractor in connection with the works shall be carried out in the manner described under "Blasting operations – Instructions to contractors" Controlled blasting shall be carried out where desired in the manner as directed.

- 3.6.9 In conducting blasting operations, proper precautions shall be taken for protection of persons, the work and property. All Government laws and regulations relating to the design and location of powder magazines, transportation and handling of explosives and other measures enacted for the prevention of accidents at powder magazines shall be followed.

3.7 MEASUREMENT

- 3.7.1 All linear measurement shall be in meters correct to 0.02 of a meter and volumes worked out in cubic meters correct to 0.01 of a cubic metre.
- 3.7.2 The measurements for the foundation excavation shall be made according to the sections shown on the drawings or to such other sections including stepping and slopping back as authorized by the Engineer.
- 3.7.3 In case of excavation in rock, when measurement is not directly possible from section it may be arrived at by measuring volume from stacks of the excavated rock. All original works shall be measured by levels.
- 3.7.4 The Level books, the section sheets (in which the levels are plotted) and the calculation sheets shall be treated as adjuncts to the measurement books.

SECTION - 4

DRILLING & PRESSURE GROUTING IN DAM / SPILLWAY FOUNDATION

4.1 Treatment of foundation – concrete /masonry

4.1.1 General

Low pressure blanket of grouting and high pressure curtain grouting together with drainage holes drilling subsequent to high pressure grouting shall constitute the foundation treatment for the masonry spillway/dam/barrage. Blanket grouting, required to seal and consolidate the foundation near the surface, shall be performed generally in the upstream third of the foundation area and in other areas if considered necessary. These holes are designated in drawings as 'B' holes. Curtain grouting aims at effecting a deeper seal in the foundation along the upstream edge of the structure to reduce uplift pressures and seepage. The curtain holes are designated in the drawings as 'A' holes.

The list of IS codes applicable:

- i) IS 6066-1984 Recommendations of pressure grouting of rock foundation in river valley project.
- ii) IS 54410-1986 Code of practice for portable pneumatic drilling machine.
- iii) IS 2529-1973 Code of practice for in-situ permeability test.

The work of drilling and grouting shall include, but may not be limited to the following:

- 4.1.1.1 Surface treatment like cleaning etc.
- 4.1.1.2 Exploratory work consisting of test drilling and grouting to determine the size, depth and spacing of holes and then grout intake etc., for deciding on the detailed grouting programme.
- 4.1.1.3 Causing of drill holes as required, drilling washing and testing as required by the conditions encountered at the site and grouting the rock (both low and high pressure) in the area.
- 4.1.1.4 Installation and maintenance of special recording instruments required for the work covered by this section.
- 4.1.1.5 Clean up the grouting area:

A curtain grout and drainage holes will be drilled with standard rotary drilling equipment. Plug or non-coring bits may also be used. Where blanket grouting is to be done from the foundation surface, or from levelling course concrete through embedded pipes in rock which does not produce mud slurries percussion drilling in lieu of rotary drilling may be used for holes upto 10m depth. Exploratory and grout holes shall not deviate from the required direction by more than one percent of the length of the hole, as measured at the point of maximum penetration.

During drilling, testing and grouting operations the rock surface in the grout area and the surrounding 10m strip shall be kept clean and free of oil, grease, drill cuttings, much, grout, cement, pozzolana, excess water or any kind of waste.

Appearance of grout from any of the cracks, openings, cavities or drilled holes of any type in the grouting area shall be watched for. All open drill holes, cleaned out faults, cavities and larger cracks in the bed rock or concrete surface shall be protected at all times during the progress of the work from becoming plugged or filled with oil, grease, drill cutting, much, grout, cement or any kind of waste.

4.1.2 Definitions.

For the purpose of work to be performed under this section the following definitions shall apply.

A 'Zone' means a series of adjacent rock strata having similar characteristics.

A 'Section' means a partial or complete depth of hole for drilling or grouting purposes within any given zone.

An 'Exploratory hole' means any hole drilled in any material for the purpose of investigation and which subsequently may be used for grouting the bedrock. Exploratory holes may include holes drilled for testing of any kind.

A "Grout hole" means hole drilled in rock and used for injection of grout mixture under pressure for the sealing of permeable zones in the bed rock.

"Rotary Drilling" means the operation of drilling a hole in rock by continuously rotating a drill bit under pressure against the rock surface.

"Core drilling" means the operation of rotary drilling a hole in rock using a hollow cylindrical bit during which rock core is sought to be recovered continuously from the hole.

"Percussion drilling" means the operation of drilling a hole in rock using bits which are hammered against the rock surface with rotating movement.

4.1.3 General Programme

The general extent and typical details of the drilling and grouting works are shown on the specification drawings. The upper portion of the surface bed rock will require to be blanket grouted through holes which are not less than 35mm in diameter arranged on a 3m by 6m grid and to a depth generally ranging between 9m and 12m.

The actual number and spacing of the holes and the pressure to be used for grouting injections will depend upon the nature of the rock as disclosed by the foundation excavation, the results of water pressure, grouting acceptance and other tests, and the results of the progressive grouting operation itself. The procedure for grouting will be subject to modifications determined as above. "Stage drilling and grouting" is defined as any complete cycle of drilling, cleaning and pressure grouting regardless of the depth of hole drilling or grouted during any such complete operation. The number and depth of stages of drilling and grouting required to complete any hole will vary with the foundation conditions encountered.

The pattern of drilling and grouting shall be as per the recommendations of the geologist of Geological Survey of India.

The "stage" grouting method specified above involves the placement of grout by drilling and grouting in successive operations in accordance with the following general procedure.

- 4.1.3.1 Certain holes for foundation grouting shall be drilled to comparatively shallow depths which will be governed by the foundation conditions.
- 4.1.3.2 The holes thus drilled shall be washed and pressure tested and then grouted, except that when pressure testing indicates a relatively tight hole, the grouting of the hole may be omitted for that stage and the hole may be left open for drilling and grouting in the next stage.
- 4.1.3.3 The excess grout shall be removed from the holes by washing or by other methods before it has set sufficiently.
- 4.1.3.4 After an interval of 48 hours the holes not already drilled to their limiting depth shall be deepened.
- 4.1.3.5 The holes thus deepened shall again be washed and pressure tested, if required, and then be grouted.
- 4.1.3.6 Again the excess grout shall be removed from the holes as described above.

4.1.3.7 The process of successively drilling to additional depths and grouting in stages dictated by the field condition shall be repeated until all the set of holes shall be completely drilled and grouted over such sections of the foundation areas as may be found to be necessary. As the construction work progresses, the development of leakage or the conditions of the surrounding foundations may indicate that parts of the foundations already grouted may require additional grouting. In such cases even additional holes for grouting shall be drilled and grouted.

4.1.3.8 The process of successively drilling to additional depths and grouting at higher pressures in stages for the first set of holes and then for succeeding intermediate sets of holes shall be repeated for the second and subsequent zones of that section. Other sections shall be grouted in a like manner until grouting of the foundation is completed to satisfaction.

The drilling and grouting of the high pressure curtain holes shall be done in the rock through the M.S Pipes embedded in concrete, from the foundation gallery. Requirement as to depth and spacing of holes as shown on the drawings are approximate and subject to revision during the work of drilling, testing and grouting. It is, however, anticipated that the holes will be drilled at approximately 3m. spacing and to an average depth as shown in drawing or as directed by Engineer. The diameter of any grout hole shall not be less than 45mm and the hole shall be drilled to varying depths and at inclinations as shown in the drawings.

It is essentially that a exploratory drilling and pressure testing programme be performed early in the work , which, together with the first blanket grouting results and the detailed geology of the area, may indicate that an increase or decrease in the hole spacing and/or drilling of holes inclined to the vertical may be required through out or in localized areas of the foundation. In such a case, adjustment of hole spacing will be necessary. It is anticipated that the bulk of the drilling of the grout holes will be done to full depth in one operation normally. However, if during drilling of any grout hole, the drill water is lost during the drilling operation, the drilling shall be stopped and the hole grouted before drilling is resumed. Upon completion of drilling a hole it shall be temporarily capped or otherwise protected from entry of foreign matter until grouting operations require it to be opened. These will be removed and the holes refilled as soon as they are no longer required.

4.1.4 Washing of Holes.

4.1.4.1 General

On completion of drilling of a hole and before water testing or grouting of any stage of a hole is begun the hole shall be washed under pressure with water until the return water becomes clear and no drill cuttings, rock fragment or any other solid materials are found in the water. If it is found that the hole cannot be cleaned with water only under pressure even after a reasonable length of time, it shall be washed with alternating jets of air and water under pressure, injected through a hose or a pipe lowered to the bottom of the hole. Washing of holes shall be a routine part of all drilling in rock.

4.1.4.1.1 Special washing

The result of routine washing may, in many cases, indicate that special washing procedures are required in order to remove more extensive deposits of “loose materials from tissues, fractures or other zones of loose or clayey material intercepted by the grout holes. When such a special washing programme is required, at least the nearest two holes in advance of each such hole shall be completely drilled for the same stage and the adjacent holes washed to facilitate flushing out of any intervening clay or silt seams or fractures. All intercepted rock seams and crevices containing washable material shall be washed with alternating water and air under pressure to remove as much of these materials as possible. If practicable, such material shall be ejected from one or more holes by introducing water under pressure through an adjacent hole. In no case shall such pressure exceed the maximum allowed.

4.1.5 Pressure Testing of Holes

During the drilling of holes, or after drilling is completed, or during or after grouting, holes as required shall be water pressure tested. In all grout holes when abnormal gain or loss of drill water is observed or caving of the hole or binding of the bit occurs during drilling or the drill rods fall suddenly as through an open crack or cavity, it may be required that drilling be discontinued and the hole pressure tested.

The procedure for water pressure testing shall be as specified herein. If a hole is drilled to full depth, the section of the hole to be tested shall be isolated by sealing it with double packers attached to a perforated steel pipe and lowered into the hole. If stage drilling method is used, a single packer shall be used to isolate the section to be tested. Water shall then be pumped into the test section under pressure and for periods, specified herein.

The time, pressures and quantities of water used for testing a section of a hole shall be recorded. The length of test section shall be measured parallel to the direction of hole. Holes shall be tested in 5 to 15 feet long sections. The pressure testing apparatus shall be subject to periodic tests for accuracy and satisfactory operation.

The pressure test shall be performed in one continuous operation using the following steps of pressure and times.

Step No.	Pressure (P) psi	Elapsed Time, Minutes
1	1/3 P	5
2	2/3 P	5
3	P	10
4	2/3 P	5
5	1/3 P	5

The pressure P shall be determined, depending on geological conditions and on the depth of the upper packer. However, this pressure need not exceed a maximum of 150 psi at the gauge. After steps no.4 and 5 the valve shall be closed and the pressure drop observed and recorded for a minimum period of 3 minutes in each instance.

A desirable degree of impermeability is considered to exist when the leakage obtained by applying a water test to a section of a hole drilled is less than two Lugeons (L) i.e 2 liter/meter/min of hole tested when a pressure of 10 Kg/cm² at the gauge point is applied for a period of 10 minutes.

4.1.6 Pipe for foundation grouting

- 4.1.6.1 Low Pressure Grout Holes: As soon as the drilling of a pattern is completed and all holes blown clear of muck, standard 65mm, 450mm diameter black iron pipe, long or more, as the rock conditions may require, shall be anchored in the drill hole with grout, mortar or lead wool, or other suitable material for making connection for grouting. The upper ends of all pipes shall be threaded and a coupling installed for convenience in making grout connections and each coupling shall be fitted with a standard cast-iron plug which will be screwed in loosely to prevent the entrance of debris or concrete.

Where permitted by the conditions of rock, grout-hole connections may also be made directly to the hole by means of a mechanical or a pneumatic expander without the use of embedded pipe.

In case blanket grouting is done after the base concrete, the MS Pipe will be embedded in the concrete while laying as per grouting pattern specified. Then the drilling shall be done through these pipes and grouted.

- 4.1.6.2 High pressure Grout Holes: Standard 75 mm, Black steel pipe shall be used wherever embedded pipe is specified for grout holes and also in foundation work over springs, crevices, seams and other spots disclosing foundation defects and elsewhere if required. Pipes and fittings that are embedded in concrete shall be thoroughly cleaned and held firmly in position and protected from damage while concrete is being built around them. The pipes for the high pressure grout holes shall be over 1m. high from the foundation gallery level and preferably upto the foundation rock so that where drilling is done later on, difficulties in keeping to the specified inclination may be avoided.

4.1.7 Grout materials and procedures.

4.1.7.1 Materials

- 4.1.7.1.1 **General:** Grout shall be composed of Portland cement and water or Portland cement, pozzolana, and water. It is possible that in special cases, the addition of sand may also be required.

- 4.1.7.1.2 **Cement:** Cement shall, unless otherwise specified, conform to the Indian standard specifications, IS:263-1958 for ordinary Portland cement. The cement shall be free from lumps. Any cement which is found to contain lumps for foreign matter of nature and in amounts detrimental to the results of the work shall be rejected.

- 4.1.7.1.3 **Water:** Water shall be clean and free from injurious amounts of deleterious substances such as but not limited to sewage, soil, acid, alkali, salts and organic matter.

- 4.1.7.1.4 **Pozzolana:** Pozzolana shall satisfy all the requirements of IS:1727-1960.

- 4.1.7.1.5 **Sand:** Sand, which is used as a filter, shall consist of hard dense durable uncoated rock fragments and shall conform to the relevant specification under I.S 383-1963 shall apply. The methods of testing for sand as specified in IS 2386-1963 shall apply. The sand shall remain in free draining storage for at least 72 hours prior to use.

4.1.7.2 Grouting procedure:

The water cement ratio of the grout will be varied to meet the characteristics of each hole as revealed by the grouting operation and will range between 10:1 and 2:1 by volume. In general, if the pressure tests indicate a tight hole, grouting shall be started with a thin mix. If an open hole condition exists as determined by loss of drill water or inability to build up pressure during washing operations, then grouting shall be started with a thick mix and with the grout pump operating as nearly as practicable at constant speed, the ratio will be decreased or sand added, if necessary, until the required pressure has been reached. When the pressure tends to rise too high, the water cement ratio shall be increased. If necessary, to relieve permeable stoppage, periodic applications of water under pressure shall be made. Under no conditions shall pressure or rate of pumping be increased suddenly as either may promote stoppage. As injection shall be continued (unless prevented by leakage) in any hole until, at the limiting grout pressure there is a negligible grout consumption.

A useful rule is to stop pumping when the grout consumption is less than 1.5 lugeon at pressure upto 3.5 Kg/cm^2 and 2 Lugeon at pressure between 3.5 Kg/cm^2 and 10.5 Kg/cm^2 . For pressure above 14 Kg/cm^2 the grouting pressure shall be maintained for such reasonable time as to ensure that the foundation has been satisfactorily grouted. Should grout leaks develop, such leaks shall be caulked promptly. If, due to size and continuity of fractures, it is found impossible to reach the required pressure after pumping reasonable volume of grout at the minimum workable water cement ratio, the speed of pumping shall be reduced. Following such reduction in pumping speed, if the desired result is not obtained, grouting the hole will be discontinued. In such event, the hole shall be cleaned, the grout allowed to set, and additional drilling and grouting shall then be done in this hole or in the adjacent area as determined in the field until the desired resistance is built up.

All pressure grouting operations shall be performed in the presence of a responsible Engineer in charge of grouting. After the grouting of any stage of a hole is finished the pressure shall be maintained by means of stop cock or other suitable devices, until the grout has set to the extent that it will be retained in the hole. The arrangement of the grouting equipment shall be such as to provide a continuous circulation of grout throughout the system and permit accurate pressure control at the hole by operation of valve on the grout return line, regardless of how small the grout intake may be. The fouling of equipment and lines shall be prevented, by constant circulation of grout, and periodic flushing out of the system with water. Flushing will be done with the grout intake valve closed, the water supply valve open and the pump running at full speed.

4.1.7.3 Grout pressure and methods of applying grout:

The pressure should be as high as practicable but controlled to avoid disturbance to rock structure. It is expected that in general grout pressure may go up to 7.0 Kg/cm^2 for consideration grouting and high pressure grouting. Grouting pressure must be properly and carefully varied to suit the depth of the holes, distance from exposed rock surface, and character of rock with reference to open joints, seams etc. The highest possible pressure consistent with safety, speedy work and the largest possible coverage, as determined by pressure testing and check leveling during grouting should be used. Where deemed necessary, the upper seams shall be grouted in advance of the regular programme in order to permit the use of increased pressure on the lower seams.

In general, where stage grouting is to be adopted, it may be necessary or desirable, depending on site conditions to use different grouting pressure for grouting different sections of the grout hole, especially those of the high pressure grout holes. The grouting shall then be performed by attaching a packer to the end of the grout supply pipe, lowering the grout supply pipe into the hole to the top of the bottom section, grouting at the required pressure and allowing the packer to remain in place until there is no back pressure, withdrawing the grout supply pipe to the top of the next higher sections at the specified pressure until the entire hole is performed without the use of a packer. The packers shall be designed so that they can be expanded to seal the drill holes at the specified elevations, and when expanded, shall be capable of withstanding without leakage, for a period of 5 minutes, water pressure equal to the maximum grout pressures to be used.

High pressure grouting will not be started until all concrete required within a radius of 60m. has been placed to a height of not less than 25m. A primary series of holes above 6m to 10m apart (according to site conditions) shall first be treated to a depth of at least two stages over a reasonable length of curtain which should not be less than 20m. A secondary series of holes spaced midway between the primary series shall then be treated to the same depth. Water tests shall be made on a third series of holes midway between the primary and secondary series and

compared with those made on the treated holes prior to injection to determine the efficiency of previous injections, the holes are then used for injection if they fail to pass the permeability requirements, when tertiary holes to be grouted through isolated holes may require grouting. But if the majority of the tertiary holes are required to be grouted, a fourth series of holes shall be drilled, tested and grouted if necessary.

In order to detect any movement or upheaval of the foundation rock due to excessive grout pressure upheaval or deformation, gauges shall be installed, prior to grouting operations, if so directed, at frequent intervals over areas where shallow grouting is required, and at 60m intervals for curtain grouting throughout the length of drainage gallery in the base of the dam/barrage. For this purpose, one inch diameter pipe shall be anchored by grouting to the bottom of the holes, drilled ten feet deeper than the proposed grout holes. Above the anchorage, the pipe shall be encased in a 5 cm asphalt dipped fibre conduit and the holes filled up with lean mortar. An iron yoke of bridge shall be anchored to the surrounding rock or concrete. Measuring tips shall be set at the top of the pipe and on the underside of the yoke. The gaps between the tips shall be frequently measured with a thickness gauge during grouting operations. For any progressive upheaval greater than 0.025 cm the pressure shall be reduced and grouting operations continued thereafter. If necessary, the pressure shall be relieved by allowing the grout to flow out of the holes until the gauge shows the settlement has ceased before continuing the operations.

4.1.7.4. Records of Grouting

Drilling, pressure washing, pressure testing and grouting records shall be kept neatly and systematically as the work proceeds. The exact location of all holes with reference to the axis and chainages along the dam shall be recorded and an accurate log of all operations kept. Record maps and sections shall be completed showing all subsurface conditions as found and corrected by grouting operations. Representative cores shall be suitably boxed and referenced. All information regarding the grouting, amount of grout taken effects observed in the surrounding holes of rock etc. may be kept under the following heads.

- a. Hole number
- b. Type of hole and method of drilling
- c. Position, chain age with distance upstream or downstream of the axis line.
- d. Top level and depth
- e. Date and time of commencement of grouting
- f. Date of completion
- g. Quantity of cement consumed
- h. Observations during grouting, concerning behaviour of holes under air and water pressure, appearance of wash water, quantity and proportion of grout used, time and pressure of grouting, application and retention of grout pressure, connection to and effect on adjacent holes, method of application of grout stage grouting and etc. and other conditions noted while drilling and grouting, to enable compilation of complete geophysical record of the foundation.

4.1.8 Drainage

- 4.1.8.1 General: Foundation drainage for the concrete dam will be provided by a line of holes drilled from the foundation gallery into the foundation rock at approximately 3m center to center and about 25m deep or as directed by the Engineer through 100 mm dia. pipes embedded in the concrete portion. Drainage holes shall not be drilled until all adjacent grout holes within a minimum distance of 45m. have been drilled and grouted. The bottom of each drainage hole

shall have a nominal diameter of 7.5cm if after a given area is grouted and drilled for drainage, it is found necessary to drill and grout additional grout holes, previously drilled holes may be required to be opened by re-drilling to secure satisfactory drainage.

4.1.9 Internal Drainage by formed Drains:

The internal drainage of spillway dam and non-overflow dam blocks shall be provided by means of 200 mm. diameter precast vertical drains discharging into the foundation gallery. The location of these precast drains will be as shown in the drawings. In the event that any drain hole becomes clogged or obstructed during the progress of the work, it shall be completely opened up. The top of each vertical drain hole shall be sealed with concrete capping and the bottom of each vertical drain hole shall be connected to the foundation gallery by standard black pipe and elbows as per approved drawing.

4.1.10 Measurement and payment.

No separate payment will be made for this item.

SECTION - 5**DRILLING & BLASTING****5.1 GENERAL**

Blasting where required will be permitted only when proper precautions have been taken for the protection of persons and property in accordance with IS 4081-1967 (Indian standard specification for safety code for blasting and related drilling operations). While carrying out excavation, adequate precautions in accordance with IS 3764-1966 (Indian standard specifications for safety code for excavation work) shall be taken.

Explosives such as gelatin, detonators and fuse coils etc. required for the rock blasting are to be procured by the contractor at his own cost. The contractor has to purchase the blasting materials mentioning the name of work and name of the contractor. The materials without mentioning the above two names on the bill will not be accepted. It shall be the responsibility of the contractor to store the explosives purchased by him in accordance with the rules of the Explosives act and other rules framed by Government of India. He should possess/acquire proper license for transport of explosives, possession and use of explosives and short fires as per Revised act, 1963.

He shall also furnish the following details.

Capacity	License No. and date	Validity period.
----------	----------------------	------------------

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

The provisions detailed in the specifications supplementary to the above laws, rules and regulations, are also applicable. Further, the engineer may issue modifications, alterations and new instructions from time to time. The contractor shall comply with the same without these being made a cause for any claims.

A list of I.S. Codes applicable is furnished below.

IS 4081-1986 – Safety code of blasting and related drilling operations.

IS 3764-1966: Safety code for excavation work.

In addition to the above I.S codes, and manual for quality control and inspection shall also be complied with.

5.2 MATERIALS:

All the material such as explosives, detonators, fuse coils, tamping materials etc. that are proposed to be used in the blasting operations shall have the prior approval of the Employer. Only explosives of required make and strength are to be used.

Black powder and safe explosive shall be used wherever possible. Explosives with nitroglycerine shall be used where the above explosives are not effective.

The use of fuse with only one protection coat is prohibited. The fuse shall be sufficiently water resistant as to be unaffected when immersed in water for thirty minutes. Rate of burning of the fuse shall be uniform and not less than 4(four) seconds per 26 millimeters of length with 10% (ten percent) tolerance on either side. The fuse known as instantaneous fuse shall not be used.

The fuse shall be inspected before use and the moist, damaged or broken ones discarded. The rate of burning of all new types of fuses shall be examined. When they have been in stock for a long time they shall be treated before use. The detonators used shall be capable of producing effective blasting of the explosives.

5.3 PERSONNEL:

Excavation by blasting will 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 make-up, handling, storage and blasting work shall be adequately insured by the contractor.

The person in-charge of the explosive magazine shall be very reliable and his deployment shall be approved by the Employer.

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 the explosives. It shall be assured that the supervisor in-charge is thoroughly acquainted with all the details of handling and blasting operations.

5.4 STORAGE OF EXPLOSIVES.

The contractor shall build a magazine or make suitable permanent arrangements at his cost for safe storage of explosives. Contractor shall provide portable magazine for carrying the explosives to work-spot from the magazine at his cost. The site of the magazine, its capacity and design shall be subject to approval by the Inspector of Explosives before construction is taken up. As a rule, explosives should be stored in a clean, dry, well ventilated, bullet proof and fire proof building in an isolated site.

The contractor shall provide armed guard security of required numbers for explosive magazines or while transporting to work site as per rules in force at his cost.

The explosives detonators and fuse coils shall each be separately stored.

A careful and day to day account of explosives shall be kept by the contractor in a register in a manner prescribed by the employer. The employer may also pay surprise visits to the storage magazine. In case of any unaccounted storage of the explosives or if the account is not found to have been maintained in a manner prescribed by the engineer, 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 clause shall be in addition to that which might be taken by the competent civil authorities in the court of law.

The magazine shall at all times be kept scrupulously clean.

No unauthorized person should at any time be admitted inside the magazine. A notice shall be hung near the storage prohibiting entrance of unauthorized persons.

The magazine on no account be opened during or on the approach of a thunder storm and no person shall remain in the vicinity of the magazine during such period.

Magazine shoes without nails shall at all times be kept in the magazine and a wooden tub or cement trough about 300 millimeters high and 450 millimeters in diameter filled with water shall be fixed near the door of the magazine.

Persons 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 feet on the clear floor unless they have the magazine shoes on;
- ii) not to allow the magazine shoes to touch ground outside the clean floor
- iii) not to allow any dirt or grit to fall on the clean floor.

Persons with bare foot shall, before entering the magazine, dip their feet in water and then step directly from tub over the barrier (if there be one) on the clean floor.

A brush or broom shall be kept in the lobby of the magazine, for cleaning the magazine on each occasion when it is opened for the receipt, delivery or inspection of explosives. No matches or inflammatory materials shall be allowed in the magazine. Light shall be obtained from the electric storage battery lantern.

No person having articles of steel or iron on him shall be allowed to enter the magazine.

Only cotton, rags, waste and articles 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 of the prohibited articles on them.

No tools or implements other than those made 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 explosives shall not be thrown down or damaged along the floor and shall be stacked on wooden trestles.

Where there are white ants, the legs of trestles should 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 boxes or loose packing materials shall not be kept inside the magazine. Magazines shall be inspected at least twice a year by an officer representing the Engineer.

He shall see that all the rules are strictly complied with. The magazine shall have a lightning conductor which should be got tested at least once a year. The contractor shall comply with all the recommendations made by the officer testing the lightning conductor and also rectify the defects notified to him within 15 days failing which the engineer shall be entitled to comply with the same at the contractor's expense which shall not be open to question. The engineer may take any action that he may consider fit at the cost of the contractor.

The following shall be hung in the lobby of the magazine.

- a. A copy of rules both in English and in the languages which the workers concerned are familiar with.
- b. A statement showing the stock in the magazine on that day.
- c. A certificate showing the last date of testing of the lightning conductor.
- d. A notice stating "smoking is strictly prohibited".

5.5 USE OF EXPLOSIVES.

For the transport of the explosives and detonators between the store and the 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 container shall be used.

The boxes and containers used, shall be kept closed. Explosive shall be stored and used chronologically earlier received shall be used first. A make up house shall be provided at each working place in which cartridges will be made up by competent and licensed men as required for the work. The make-up house shall be separated from other buildings. Only electric storage battery lamps shall be used in this house.

No smoking shall be allowed in the make-up house or generally while dealing with explosives.

5.6 DISPOSAL OF DETERIORATED EXPLOSIVES.

All deteriorated explosives shall be disposed off in an approved manner; the quantity of the deteriorated explosives to be disposed off shall be intimated to the engineer prior to its disposal.

5.7 PREPARATION OF PRIMERS.

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

5.8 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 shall satisfy himself to that effect by actual inspection. While charging, open lamps shall be kept away. For charging with powered explosives, a naked flame shall not be allowed. Only wooden tamping rods, without any kind of metal on the rod shall be allowed to be used. The tamping rods shall have cylindrical ends. Bore hole must be of such size that the cartridge can easily pass down them. They shall not however be too big.

Only one cartridge shall be inserted at a time and gently pressed into the hole with the tamping rods. The sand, clay or other tamping materials used for filling the holes completely shall not be tamped too hard.

5.9 BLASTING.

Blasting shall be carried during the fixed hours of the day which shall have the approval of the engineer. The hours once fixed shall not be altered without prior written approval of the engineer.

The site of blasting operation shall be prominently demarcated by red danger flags. The order to fire shall be given only by the contractor's supervisor in-charge of the work and this order shall be given only after giving the warning signal three times, so as to enable all the labour watchmen etc. to reach safe shelters.

Whistle/ bugle with distinctive note shall be used to give the warning signals. The bugle shall not be used for any other purpose. All the labour shall be made acquainted with the sound of the bugle and shall be strictly warned to leave their work immediately at the first warning signal; and to move for safe shelters. They are not to leave the shelters until all clear signal has been given.

All the roads and footpaths leading to the blasting area shall be watched.

In special cases, suitable extra precautions shall be taken. The Engineer may however permit blasting for under ground excavation, without restriction of fixed time, provided that he is satisfied that proper precautions are taken to give sufficient warning to all concerned and that the work of other agencies on the site is not hampered. For lighting the ruse, a lamp with a strong flame such as carbide lamp shall be used.

The contractor's supervisor shall watch the required time for firing of the fuses and shall see that all the workmen are under safe shelters in good time.

5.10 ELECTRICAL FIRING.

Only the contractor's supervisor in-charge shall possess key of the exploder and short firing accessories and he shall keep it always with himself. Special apparatus shall be used as a source of current for the blasting operations; power lines shall not be tapped for the purpose.

The detonators shall be checked before use. For blast in series, only detonators of the same manufacturer and of the same group of electrical resistance shall be used. Such of the 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 contact with water, metallic parts or rock.

The firing cables shall be connected to source of current only when nobody is in the area of blasting. Before firing, the circuit shall be checked by a suitable apparatus. After firing with or without an actual blast, the contact between the firing cable and the source of current shall be cut off before any one is allowed to leave the shelters. During storm/rain, the blasting operations shall be suspended.

5.11 PRECAUTIONS AFTER BLASTING.

After the blast, the contractor's supervisor must carefully inspect the work and satisfy himself that all the charges have exploded. After the blast has taken place in the 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 is suspected that part of the blast has failed to fire or is 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 near this hole until one of the two following operations has been carried out by supervisor.

Either: i) Supervisor should very carefully (when the tamping is of damp clay) extract the tamping with a wooden scraper or jet of water or compressed air (using pipe or soft material) and withdraw the fuse with the primer and detonator attached after which a fresh primer and detonator with fuse should be placed in this hole and fired out

Or (ii) the hole may be cleared of 300mm, of capping and the direction then be ascertained by placing a stick in the hole. Another hole may be drilled at least 226mm away, and parallel to it. Then balance of the cartridge and detonators shall be removed.

Before leaving his work, the contractor's supervisor should inform the supervisor 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 locations and how they are dealt with shall be maintained by the contractor.

The contractor's supervisor should also at once 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 names of the day and night shift supervisors of the contractor must be noted daily in the contractor's office. If misfire has been found to be due to a 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.

Drilling holes not completely exploded by blasting shall not be permitted.

The contractor should produce his firer's license and furnish the particulars in the following format.

Sl. No.	Name	Firer's license No.& date.	Validity period.
---------	------	-------------------------------	------------------

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

SECTION - 6**STEEL REINFORCEMENT****6.1 GENERAL**

- a. The section covers specifications for providing steel reinforcement to Dams/barrages and ancillary works and the contractor has to make his own arrangements for the procurement of tested mild steel and H.Y.S.D. Bars required for the work only from the reputed manufacturers. Necessary I.S.I. test certificates are to be produced to Engineer before use in work. Steel bars shall be stored in such a way as to avoid distortion and to prevent deterioration by corrosion. The Contractor shall make his own arrangements for transportation and storage.
- b. High yield strength deformed bars shall conform to I.S:1786-1985,

The diameter and weight of plain and HYSD steel bars shall be as follows.

Sl. No	Diameter of rod	Sectional weight in Kilogram per running meter both for plain and HYSD steel.
1	6 Millimeters	0.22
2.	8 Millimeters	0.39
3.	10 Millimeters	0.62
4.	12 Millimeters	0.89
5.	14 Millimeters	1.21
6.	16 Millimeters	1.58
7.	18 Millimeters	2.00
8.	20 Millimeters	2.47
9.	22 Millimeters	2.98
10.	25 Millimeters	3.85
11.	28 Millimeters	4.83
12.	32 Millimeters	6.31
13.	36 Millimeters	7.99
14.	40 Millimeters	9.86
15.	42 Millimeters	10.88

NOTE : If any rods other than those specified above are used, the weights shall be as per standard steel tables.

- c. The work shall consist of shaping and placing reinforcement in conformity to the shape and dimensions shown on the drawings and as specified in the specifications, including cutting, bending, clearing, wedging, placing, binding and fixing in position. A list of IS codes applicable is furnished below:

List of IS Codes:

IS:456-1978/2000	Code of practice for plain and reinforced concrete
IS:1786-1985	Specification for High strength deformed steel bars and wires for concrete reinforcement.
IS:432-1982 (Part-I)	Specifications for mild steel and medium tensile steel bars for concrete reinforcement and hard drawn steel wire.
IS-280-1978	Mild steel wire for general engineering purposes.
IS-2502-1963	Code of practice for bending and fixing of bars for concrete reinforcement.
IS:9417-1989	Recommendations for welding cold worked bars for reinforced concrete construction
IS:2751-1979	Welding of mild steel plain and deformed bars for reinforced construction
IS:814-1991	Covered electrodes for manual metal arc welding of carbon and carbon manganese steel.
IS:1278-1972	Filer rods and wires and gas welding.
IS: IS:7861- 1975	Code of practice for extreme weather concreting
IS: 14591- 1999	Temperature Control of Mass Concrete of Dams- Guidelines

In addition to the above Indian Standard codes, the specifications of OSS and manual for quality control and inspection shall also be complied with.

6.2 Material

i. a. Steel shall be clean and free from loose rust or loose mill scale and other objectionable foreign substances at the time of fixing in position and subsequent concreting.. The fact that early stage rust has no detrimental effect on bond shall not be used as excuse of careless handling and storage of steel.

b. The contractor shall procure high yield strength deformed bars, conforming to IS:1786-1985.

c. The reinforcement bars used by the contractor shall be in accordance with the Section 5.1.

ii. Cutting, Bending and binding of reinforcement.

a. Reinforcement steel shall conform accurately to the dimensions given in the bar bending schedules shown on relevant drawings.

b. Bars shall be bent cold to the specified shape and dimensions by a bar bender by hand or power to attain proper radius of bends as shown in drawings or as directed by the Engineer. Heating of reinforcement bars to facilitate bending will not normally be permitted. When, however, such heating is permitted in the case of large diameter bars, the temperature of the steel shall not exceed the temperature corresponding to a cherry red colour.

c. Bars shall not be bent or straightened in a manner that will injure the material

d. Bars bent during the transport or handling shall be straightened before being used on work, they shall not be heated to facilitate bending.

6.3 Placing of reinforcement.

- a. Before the reinforcement is placed, the surface of the bars and the surfaces of any metal bar supports shall be cleaned of the rust, loose mill scale, dirt, grease and other objectionable foreign substances.
- b. All reinforcing bars shall be accurately placed in exact position shown on the drawing, and shall be securely held in position during placing of concrete by annealed binding wire, and by using stays, blocks or metal chairs, spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals so that they will not sag between supports, nor be displaced during concreting or by any operation of the work.
- c. Wire for binding reinforcement shall be soft and annealed mild steel of 16 SWG and shall conform to IS:280-1978.
- d. The contractor shall also ensure that there is no disturbance caused to the reinforcing bars already placed in concrete.
- e. All devices used for positioning shall be of non-corrodible material. Metal supports shall not extend to the surface of the concrete, except where shown on the drawings. Pieces of broken stone or brick and wooden blocks shall not be used. Where portions of such supports will be exposed on concrete surfaces designated to receive F2 or F3 finish, the exposed portion of support shall be galvanized or coated with other corrosion resistant material without which the concreting will not be permitted. Such supports shall not be exposed on surfaces designated to receive F4 finish unless otherwise shown on the drawings.
- f. Placing of reinforcement bars on layers of freshly laid concrete, as work progresses, for adjusting bar spacing shall not be allowed.
- g. Layers of bars shall be separated by spacer bars, pre-cast blocks or other approved devices.
- h. Reinforcement after being placed in position shall be maintained in a clean condition until completely embedded in concrete. Special care shall be taken to prevent any displacement of reinforcement in concrete already placed.
- i. To protect reinforcement from corrosion, concrete cover shall be provided as indicated on the drawings. All bars protruding from concrete and to which other bars are to be spliced and which are likely to be exposed for an indefinite period shall be protected by a thick coat of neat cement grout.
- j. Bars crossing each other, where required, shall be secured by binding wire (annealed) or size not less than 1mm dia and conforming to IS:280-1978 in such a manner that they do not slip over each other at the time of fixing and concreting.
- k. As far as possible, bars of full length shall be used. In case this is not possible, overlapping of bars shall be done as directed by Engineer-in-Charge. When practicable, overlapping bars shall not touch each other, but be kept apart by 25 mm or $1\frac{1}{4}$ times the maximum size of the coarse aggregate which is greater, by concrete between them. Where not feasible, overlapping bars shall be bound with annealed steel wire, not less than 1mm thickness twisted tight. The overlaps shall be staggered for different bars and located at points, along the span where neither shear nor bending moment is maximum.
- l. The minimum allowable clearance between parallel round bars shall not be less than $1\frac{1}{2}$ times the diameter of the large bars and for square bars shall not be less than twice the side dimensions of the larger bars or $1\frac{1}{2}$ times the maximum size of aggregate, whichever is greater.

- m. Dissimilar diameter rods should not be joined together.

6.4 Splicing

- a. Where it is necessary to splice reinforcement ,the splices shall be made by lapping or by welding or by mechanical means.

When permitted or specified on the drawings, joints of reinforcement bars shall be butt welded so as to transmit their full strength. Welding of bars shall be done as directed by the Employer and conforming with requirements of clause 11.4 of IS:456-1978.

If it is proposed to use welded splices in reinforcing bars, the equipment, the material and all welding and testing procedures shall be subject to the approval of the Employer. The contractor shall also carryout test welds as required by the Employer. No extra rate will be paid for welding reinforcement and test-welds, as bid price is inclusive of this item.

For welded splices for reinforcing bars conforming to IS:1786-1985 welding shall be done in accordance with IS:9417-1979. For reinforcing bars conforming to IS:432(PartI)-1982 welding shall be done in accordance with IS:2751-1979. Electrodes for manual metal arc welding shall conform to IS:814(Part-I)-1974 and IS:814(Part-II)-1974. Mild steel filler rods for Oxy-acetylene welding shall conform to IS:1278-1972, provided they are capable of giving a minimum butt weld tensile strength of 41 Kg/mm².

Only electric arc welding using a process which excludes air from the molten metal and conforms to any or all other special provisions for the work shall be accepted. Suitable means shall be provided for holding the bars securely in position during welding. It must be ensured that no voids are left in welding and when welding is done in two or three steps, previous surfaces shall be cleaned well. Ends of bars shall be cleaned of all iron scale, rust, grease, paint and other foreign matter before welding.

- b. Reinforcing bars of 28 mm in diameter and larger may be connected by butt welding provided that lapped splices will be permitted if found to be more practical than butt welding and if lapping does not encroach on cover limitation or hinder concrete or reinforcement placing.
- c. Reinforcing bars 25mm in diameter and less may be either lapped or butt welded, whichever is the most practicable.

Butt welding of reinforcing bars shall be performed either by the gas pressure or flash pressure welding process or by the electric arc methods under cover from weather.

Welded pieces of reinforcement shall be tested at the rate of 0.5% of total number of joints welded. Specimen shall be taken from the actual site of work. Strength of the weld provided shall be at least 25% higher than the strength of bars.

- d. Welded joints or splices shall preferably be located at points where steel will not be subject to more than 75% of the maximum permissible stresses and welds so staggered that at any section not more than 20% of rods are welded. Approval of such additional splices will generally be restricted to splices not closer than 8 metres in horizontal bars or 4 meters in vertical bars measured between mid point of laps.

6.5 Coupling of bars.

Wherever indicated on the drawings or desired by the Engineer-in-Charge to use mechanical couplings for reinforcing bars, bars shall be joined by couplings which shall have a cross sections sufficient to transmit the full strength of bars. The ends of bars that are joined by couplings shall be upset for sufficient length, so that the effective cross section at the base of threads is not less than the normal cross section of the bars. The threads shall be standard with worm threads. Steel for couplings shall conform to IS:226. The contractor shall submit samples of the proposed coupling to the Engineer for approval not less than 60 days prior to their proposed use.

6.6 Care of placed reinforcement and concrete

Where reinforcement bars at construction joints and afterwards are bent back into their original position, care shall be taken to ensure that at no time the radius of the bend is less than 6 x diameter for deformed bars and 4 x diameter for plain mild steel bars. Care shall also be taken, when bending such bars, to ensure that the concrete around the bars is not damaged.

As specified in clause 11.3 of IS:456-1978 unless otherwise specified by the Engineer-in-Charge, reinforcement shall be placed within the following tolerances.

- i. For effective depth 200 mm or less = $\pm 10\text{mm}$
- ii. For effective depth more than 200mm = $\pm 15\text{mm}$

The cover shall in no case be reduced by more than one third of specified cover or 5mm which ever is less.

- a. The dowels shall be of the same HYSD bars of grade F2 415 conforming to IS-1786-1985 as used for reinforcement
- b. Details for dowels shall be as shown on the drawings or as directed by the Engineer.
- c. 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 quantity after they have been placed but before being covered by concrete.
- d. Before the dowels are embedded in concrete, the surfaces of dowels shall be cleaned of all dirt, grease or other foreign substances which in the opinion of the Engineer are objectionable.
- e. The dowels shall be accurately placed and secured in position so that they will not be displaced during the placing of the concrete.

6.7 INSPECTION BEFORE CONCRETING :

No concreting shall be started unless the reinforcement as laid is finally checked and certified by the Engineer-in-charge or his authorized representative, Before starting the concreting the contractor shall make certain that the measurements of the reinforcement placed in have been recorded and that the Engineer-in-charge certifies corrections of reinforcement used. Failure to do so may mean no payment or payment at the discretion of the Engineer-in-charge for the reinforcement concrete.

SECTION – 7**CONCRETE****(Excluding Framework, Reinforcement and Joints)****7.1 SCOPE OF WORK**

- (1) The work under this section includes all concrete works in barrage, bridge, road works, afflux bund etc covering the ingredient materials, testing and services related to the concrete work to be carried out by the contractor under this contract.
- (2) The concrete work shall be performed to the dimensions as shown on the construction drawings or as otherwise directed by the Engineer-in-charge. Lift drawings for each pour showing all embedment, lines and levels shall be prepared by the contractor.
- (3) The contractor shall cooperate with all other contractors and organizations related to the construction of permanent works where the materials or equipment is to be fixed to or embedded in the concrete structures.
- (4) Form work, reinforcement and concrete are covered separately in other sections of this specification.
- (5) The approval given by the Engineer-in-charge to the contractor's plants and equipment or their operation or of any construction methods shall not relieve the contractor of his full responsibility for the proper and safe execution of concrete work or any obligations under this contract.

7.2 STANDARDS

- 1) Unless otherwise specified, the standard and recommendations of Indian Standards Code of Practices shall be followed in respect of all materials, equipment and performances.
 - 2) The following Indian standards are specifically mentioned.
- | | | | |
|----|-----|----------|---|
| 1. | IS: | 269-1976 | Ordinary and low heat Portland cement (third revision) (with amendment No. 1 to 5) |
| 2. | IS: | 383-1970 | Coarse and fine aggregates from natural sources concrete (second revision) (Reaffirmed 1980) |
| 3. | IS: | 456-1978 | Code of practice for plain and reinforced concrete (third revision) Amendment No.1 |
| 4. | IS: | 455-1976 | Portland slag cement (third revision) (with amendment No. 1 to 5) |
| 5. | IS: | 457-1957 | Code of practice for general construction of plain and reinforced concrete for dams and other massive structures. |
| 6. | IS: | 460-1985 | Test Sieves Part 1 to 3 |
| 7. | IS: | 516-1959 | Methods of test for strength of concrete (with amendment No.1) |

- | | | | |
|-----|-----|-----------|--|
| 8. | IS: | 650-1966 | Standard sand for resting of cement (first revision) (with amendments No. 1 & 2) (Reaffirmed 1980) |
| 9. | IS: | 883-1970 | Code of practice for design of concrete member in bulking (Third Revision) |
| 10. | IS: | 1999-1959 | Methods of sampling and analysis of concrete |
| 11. | IS: | 1489-1976 | Portland pozzolana cement (Second revision) (With amendments NO. 1 to 5) |
| 12. | IS: | 1791-1985 | General requirements for batch concrete mixers (Second revision) |
| 13. | IS: | 2506-1985 | General requirement for concrete vibrator screed board type (first revision) |
| 14. | IS: | 2722-1964 | Portable swing weigh batchers for concrete (Single and double bucket type. |
| 15. | IS: | 3085-1965 | Methods of test for permeability of cement mortar and concrete (Re-affirmed 1980) |
| 16. | IS: | 3558-1983 | Code of practice for use of immersion vibrators for consolidating concrete (first revision) |
| 17. | IS: | 3873-1978 | Code of practice of laying in-situ cement concrete lining on canals (First revision) |
| 18. | IS: | 4031-1968 | Methods of physical tests for hydraulic cement (Reaffirmed 1980) |
| 19. | IS: | 4032-1985 | Method of chemical analysis of hydraulic cement (first Revision) |
| 20. | IS: | 4656-1968 | Form vibrators for concrete |
| 21. | IS: | 4845-1968 | Definition and terminology relating to hydraulic cement (Reaffirmed 1980) |
| 22. | IS: | 4634-1968 | Method for testing performance of batch type concrete mixers |
| 23. | IS: | 4925-1968 | Concrete batching and mixing plant. |
| 24. | IS: | 4926-1976 | Ready-mixed concrete (first revision) |
| 25. | IS: | 5512-1983 | Flow table for use in tests of hydraulic cement and pozzolanic materials (first revision) |
| 26. | IS: | 5513-1976 | Vicat apparatus (first revision with amendment NO.1) |
| 27. | IS: | 5515-1983 | Compacting factor apparatus (first revision) |
| 28. | IS: | 5640-1970 | Method of test for determination of aggregate impact value of soft coarse aggregate |
| 29. | IS: | 5816-1970 | Splitting tensile strength of concrete – Method of Test |
| 30. | IS: | 5889-1970 | Vibratory plate compactor (with amendment No.1) |
| 31. | IS: | 5829-1970 | Concrete transit mixers and agitators. |
| 32. | IS: | 6461 | Glossary of terms relating to cement concrete |

Part I to XII

- | | | | |
|-----|-----|-----------|---|
| 33. | IS: | 6923-1973 | Method of test for performance of screed board concrete vibrator. |
|-----|-----|-----------|---|

- | | | | |
|-----|--------------|-----------------|---|
| 34. | IS: | 6925-1973 | Method of test for determination of water soluble chlorides in concrete admixtures. |
| 35. | IS: | 7245-1974 | Concrete pavers. |
| 36. | IS: | 7320-1974 | Rapid hardening Portland cement (first revision with amendment No.1 & 2) |
| 37. | IS: | 7861 Part 1 & 2 | Code of practice for extreme weather concreting |
| 38. | IS: | 8043-1978 | Hydrophobic Portland cement (first revision with Amendments No. 1 & 2) |
| 39. | IS: | 8112-1967 | High Strength Ordinary Portland Cement (with amendments No. 1 to 4) |
| 40. | IS: | 8142-1978 | Method of test of determining setting time of concrete by penetration resistance. |
| 41. | IS: | 8989-1978 | Safety code for erection of concrete framed structures. |
| 42. | IS: | 9017-1978 | Method of making curing and determination of compressive strength of concrete test specimens. |
| 43. | IS: | 9077-1979 | Code of practice for corrosion protection of steel reinforcement in RB & BCC Construction. |
| 44. | IS: | 9103-1979 | Ad mixtures of concrete |
| 45. | IS: | 9284-1979 | Method of test for abrasion resistance of concrete |
| 46. | SP: | 16 (S & T) | Design aids for reinforced concrete to IS: 456-2000 |
| 47. | IS: IS:7861- | 1975 Part-1 | Code of practice for extreme weather concreting |
| 48. | IS: IS:7861- | 1975 Part-2 | Code of practice for extreme weather concreting |
| 49. | IS: 14591- | 1999 | Temperature Control of Mass Concrete of Dams- Guidelines |

In addition to the above relevant Indian Standard following other publications shall also apply in case of wanting specification Indian Standard.

Other Publications :

- | | | |
|----|------|--|
| 1. | USBR | Concrete Manual (Eight edition revised print 1981) |
| 2. | ASTM | C-156-80 water retention test. |
| 3. | ASTM | C-30981 Type-2 Liquid membrane – Forming compound for curing concrete. |
| 4. | ASTM | C-491-90 Water reducing agents |
| 5. | ASTM | C-494 – Type D water reducing agent and set retarder. |
| 6. | ASTM | E-97 light reflectance test. |
| 7. | IRC | codes Standard specifications and code of practice for Road bridges (Section-I, II , III, VII etc) |
| 8. | | Govt. of Odisha quality control and field instruction manual (1989) I & P Dept. |

Other BSI codes relevant to the work, but not mentioned above, shall also be followed.

7.3 SUBMITTALS

7.3.1 Submittals Before Construction

- 1) Submittals listed herein are related to items, which require the consent of the Engineer-in-charge and are to be submitted by the Contractor before the appropriate work may proceed.
- 2) Within 28 days from the date of issue of Notification of Award, but before procuring or mobilizing to the site the equipment, the contractor shall submit to the Engineer-in-charge updated and detailed plans and descriptions, consistent with those submitted with his Tender and any subsequent amendments and additions agreed to by the Engineer-in-charge and the contractor, including but not limited to the following:
 - a) Aggregates Processing Plant:

Description, flow diagrams and drawings in sufficient details to indicate layout, type and capacity of crushing, screening, washing, conveying and other aggregate processing and handling equipment.
 - b) Batching Plant

Description, flow diagrams and drawings of the plants, and details of the equipment the contractor intends to use, to determine and control the quantity of each separate concrete ingredient and mixing thereof into uniform mixture.
 - c) Transport and Placing of Concrete.

Full details of the equipment and methods for transporting the concrete from the concrete plant to the final point of placing including numbers, type and capacity of transport vehicles, concrete pumps, vibrators, and details of standby plants to be installed.
 - b) Mode and methodology of concrete compaction and concrete curing.
 - c) Sampling and Testing of Materials: List and details of equipment of sampling and testing, detailed program for quality control of concrete work and qualification and experience of the proposed personnel.
 - d) Foundation and surface preparation equipment.
- 3) At least 56 days in advance of any concrete work being carried out at the site, the contractor shall submit to the Engineer-in-charge following notifications based on the results of the preliminary material testing:
 - a) Notification on the quantity of cement required, brand of cement to be used on approval of Engineer-in-Charge and the proposed schedule of shipment and storage.
 - b) Notification of the source, analysis, method of delivery and storage of water for concrete manufacture.
 - c) Notification of any admixtures which the contractor proposes to use, manufacturers thereof, and information about the chemical names of the principal ingredients and the effects of under or over dosage. Should the contractor intend to use an accelerator in any concrete work for his own convenience, he shall give full details of the type, dosage, influence on construction, and the cost savings involved.
 - d) Details of the materials for formwork and surface finishes, treatment of construction joints, and construction techniques which the contractor proposes to use in order to achieve the required concrete surfaces and allowable tolerances.

- e) Details of special additives like silica fume & steel fibres for production of high performance concrete.
- f) Details of curing methodology

7.3.2 Submittals During Construction

- a. Contractor shall provide the Engineer-in-charge with a weekly placing schedule giving the detailed location of the pours, the approximate extent of pours, and the date on which the concrete will be placed. This weekly programme of concrete placement shall be submitted to the Engineer-in-charge for his acceptance at least 2 days prior to the commencement of the week.
- b. Before commencement of the concrete placement the contractor shall prepare a checklist regarding all preparations for the specified work such as cleaning and treating rock surfaces and foundations, formwork, reinforcement, embedding, instrumentation and submit this list to the Engineer-in-charge, who after his satisfaction about the work preparations will permit the contractor in writing to commence concrete placement.
- c. The contractor shall keep and make available to the Engineer-in-charge records of the date ,quantity and storage location of each delivery and shall provide facilities for checking the stock of cement.
- d. During the performance of the concrete work, the contractor shall keep a diary where he shall record the construction procedures related to concreting. This diary shall be made available to the Engineer-in-charge upon request. The records shall contain at least the following.
 - g) Commencement and termination of concreting of various parts of the structures.
 - h) Quantities and quality of aggregates and cement provided and the storage from which they were drawn.
 - i) Temperature of air, water and concrete.
 - j) Meteorological conditions
 - k) Sampling and testing performed and summary of results.
 - l) Personnel employed during various stages of the concreting operation and name of the responsible inspector or foreman.
 - m) Equipment used.
 - n) Any special material or procedures employed.
- e. The Engineer-in-charge reserves the right to require any additional information deemed necessary to be included in the submitted documents.

7.4 CONSTITUENTS OF CONCRETE

7.4.1 Cement

- (1) Cement shall be ordinarily Portland cement conforming to IS:269 or low heat- low alkali Portland pozzolana cement (PPC) conforming to IS:1489 or Grade 43 conforming to IS:8112 or Grade 52 cement conforming to IS:12269 depending upon the use and type of structure. If required slag cement may also be used.
- (2) Cement, which does not comply with, relevant IS code or is damaged in consignment, handling or storage shall be promptly removed from the site.

- (3) All facilities for transport and storage of cement shall be subject to approval of Engineer-in-charge and shall be such that easy access for inspection is assured.
- (4) Bulk cement shall be transported from the port or factory to the site in adequately designed weather tight trucks, or other means where cement will be protected from exposure to moisture. Immediately upon receipt at the site, cement shall be stored in a dry, weather-tight and properly ventilated structure with adequate provisions for the prevention of absorption of moisture, and constructed in such a way that there will be no dead storage. The vents of the bins and silos shall be equipped with dust collectors to reduce loss of cement during handling and inconvenience to the personnel.
- (5) Cement bags shall be stored in weatherproof buildings with a raised, well-ventilated wooden floor, and placed so that each consignment can be segregated if required and used in order of its age. Bags shall not be stacked more than 1.5 m high. Cement shall not be stored outdoors, except for immediate use, and in such event shall be protected during storage and handling by waterproof covers and a raised floor. Unused cement shall be placed back into the storage buildings.
- (6) Cement shall be preferably used in same order in which it has been received at the site. Storage of cement shall be limited to 90 days in bags and 150 days in bulk. Cement that has been in storage for longer than these periods or which may have absorbed moisture shall not be used unless it has been re-tested by the Contractor and approved by the Engineer-in-charge. Cement that has become lumpy shall not be used. The cements coming from different factories or of different makes shall be stored separately.
- (7) The temperature of cement upon arrival to the Site shall not exceed 70°C and when entering the mixers shall not exceed 50°C unless otherwise approved.
- (8) Fly ash (pozzolana) shall not be allowed to be mixed with cement at place other than factory/manufacturing unit. Fly ash (pozzolana) mixed at factory shall conform to IS:3812 and IS:1344.

7.4.2 Aggregate

7.4.2.1 General

- (1) Unless otherwise specified, concrete aggregates shall conform to the requirements of IS:456 and IS:383. They shall be tested in accordance with the provisions of IS:2386
- (2) Aggregate shall consist of clean, hard, dense, durable and uncoated materials and shall have stable moisture content and grading when delivered to the batching plant. Aggregates shall not contain substances, which may impair the quality of the concrete, attack reinforcing steel or reduce bond. The following substances are regarded as being harmful; loam, clay, pieces with large cavities, foam-like or vitreous pieces and organic materials such as topsoil, roots, wood, coal, lignite etc. In doubtful cases the effects of harmful substances shall be established by tests.
- (3) Use of aggregates containing minerals which can cause alkali reactivity beyond acceptable limits will not be permitted. Presence of such minerals in the stones will be determined by testing.
- (4) The shape of the particles shall be generally spherical or cubical. The amount of flat or elongated particles shall not exceed 25% by weight. A flat or elongated particle is defined as one in which the width to thickness, respectively length to width ratio is greater than 3. Rock, which breaks down into such shape, regardless of the type of processing equipment used, will not be approved for use in the production of aggregates.

- (5) The contractor shall make provisions for crushing and processing of material in accordance with recommendations contained in IS:383 to meet the gradation and other requirements of these specifications, in order to obtain the total amount of aggregate required for concrete manufacture. Crushing, screening and washing operations, beneficiation of aggregates and blending of crushed and natural aggregates shall at all time be subject to the consent of the Engineer-in-charge.
- (6) The handling, transporting and stockpiling of aggregates shall be such that there will be a minimum amount of fines resulting from breakage and abrasion of material resulting from free fall and improper handling. Excess in any of fine or coarse aggregate sizes shall be disposed of in approved manner.
- (7) The contractor shall remove all rejected aggregate from the site.

7.4.2.2 Fine Aggregates.

- (1) The term 'fine aggregate' is used to designate aggregate in which the maximum size of particles is 4.75mm. Sand obtained from natural sources like river shall be used as fine aggregate. Fine aggregates shall be tested for their gradation, specific gravity, water absorption, fineness modulus, soundness, petrography analysis, deleterious constituent and alkali aggregate reactivity to assess the suitability.
- (2) The gradation of fine aggregate shall conform to specifications of IS 383 and the sand shall not fall into grading zone I and IV.
- (3) The percentage of deleterious substance in the fine aggregate shall conform to IS:383, except that the fine aggregate shall contain not more than 0.1% by weight of deleterious (reactive) ferrous sulphide. The total percentage of deleterious substance must not exceed 5% by weight.
- (4) Fine aggregate having specific gravity of less than 2.6 shall be rejected. Fine aggregates, when subjected to soundness test with a solution of sodium sulphate, after five cycles of tests, shall not suffer a loss of weight in excess of 10 percent.
- (5) Fineness modulus of fine aggregate shall be 2.1 to 3
- (6) Fine aggregate, upon delivery to the batching plant, shall have uniform and stable moisture content. The Bulk age of sand shall be less than 20%.
- (7) Sand shall be free from harmful quantity of organic impurities as per IS 2386 Part II. Sand that are producing a color (obtained by dissolving 9 grams of chemically pure Ferric Chloride and 1 gram of CP Cobalt in 100 ml of water to which one-third ml of Hydrochloric Acid has been added) darker than the standard in the test (Organic test for organic impurities) shall be rejected.

7.4.2.3 Coarse Aggregates

- (1) The term "coarse aggregate" is used to designate aggregate which is retained on sieve opening 4.75mm. The coarse aggregate shall be well graded and its gradation will be decided based on the laboratory tests to obtain dense mass of concrete. The gradation will be approved by the Engineer-in-charge before production of the concrete.
- (2) The coarse aggregate shall be tested for gradation, specific gravity, water absorption, impact and abrasion values, soundness, spectrographic analysis, deleterious constituent, flakiness and elongation indices and alkali aggregate reactivity as per IS 2386-1963(Part I to VIII) and other relevant standards.

- (3) Coarse aggregates shall be stored separately in stockpiles or bins in such a manner to avoid intermixing of different size of aggregates. The storing shall be done in following sizes.

5-10 mm

10-20 mm

20-40 mm

40-80 mm

80-150 mm

- (4) The percentage of deleterious substance in the coarse aggregate shall conform to IS:383 except that the coarse aggregate shall contain not more than 0.3% by weight of deleterious (reactivity) ferrous sulphide. The total deleterious material shall not exceed 5% by weight.
- (5) Coarse aggregate shall have a loss not more than 40% as determined by Los Angeles Abrasion test as specified in IS:2386 (Part IV). However in extreme cases, because of non-availability of such aggregate in near vicinity the Engineer-in-charge may allow aggregates having this value as 50%.
- (6) When subjected to sodium sulphate soundness test, coarse aggregate shall not suffer a loss of weight in excess of 12% after five cycles.
- (7) Coarse aggregate shall be hard, dense, durable, non coated rock fragments. Rock having an absorption greater than 3% or specific gravity less than 2.5 shall not be used.
- (8) Aggregate delivered to the batching plant shall have uniform and stable moisture content.

7.4.2.4 The nominal maximum aggregate size in relation to the structure dimension shall be fixed as per IS 456 & IS 457 and as per the approved drawing. Coarse aggregate shall be well graded and shall conform to the grading specified in Table II of IS 383.

7.4.2.5 Aggregate storage.

- (1) Aggregates shall be stored in a manner so that each size of aggregate is separate in free-draining piles in a manner that reduces breakage, deterioration, contamination and segregation to a minimum. Each grade of aggregates is to be stored separately. Storage arrangements shall be subject to acceptance by the Engineer-in-charge.
- (2) The Contractor shall maintain sufficient aggregate storage at the site at all times to permit continuous placement of concrete in accordance with the contractual time schedule.
- (3) The moisture content of aggregates shall be controlled as far as practicable, by wetting the stockpiles and by adequate drainage. All aggregate shall remain in a free-draining stockpile for at least 12 hours prior to use. To minimize moisture variation, the height of the stock piles shall be kept 1.25m to 1.5m and the lowest layer of about 30cm height shall be used as drainage layer and not used till end. Fine aggregates of the bottom 30cm layer shall not be used for concrete.

7.4.3 Water

- (1) A reliable and adequate water supply shall be installed and maintained by the contractor for washing of aggregates, manufacturing and curing of concrete. The water shall be clean and

free from harmful quantities of oil, acids, alkalis, sugar, salt, silt and other organic matters and shall conform to IS:456.

- (2) Permissible limit of Solids in water shall conform to Table I of IS 456. Water shall contain not more than 200mg/l of organic, 3000mg/l of inorganic, 400 mg/l of sulphates (SO_3), 500 mg/l of chlorides (Cl), and 2000mg/l of suspended matter.
- (3) Adequate water storage shall be provided at the batching plant to ensure smooth concrete production.
- (4) Contractor shall familiarize himself with source and quality of water available. Attention is drawn to the possible requirement of settling pond and other facilities that he may be required to provide.

7.4.4 Admixtures

- (1) Admixtures shall be proposed by the contractor and shall be used only upon written approval of the Engineer-in-charge. Only admixtures, with satisfactory evidence that its use does not adversely affect the properties of concrete particularly its strength, volume changes, durability, and has no harmful effect on the reinforcement, shall be permitted. All admixtures shall be manufactured by a reputed company(ies), supported by a fully staffed technical service organization and research group.
- (2) The contractor may use the following admixtures when required with the approval of the Engineer-in-charge.
 - a) High-range water-reducing admixtures (HRWRA)/ Super plasticizer to improve workability without reducing the strength or durability of the mix.
 - b) Air-entraining agent,
 - c) Non-shrink agent,
 - d) Accelerating agent in the concrete, mortar or grout to increase the rate of hydration, shorten the setting time or increase the rate of hardening or strength development
- (3) Admixtures shall comply with the provisions of IS:9103 or in case of lack of corresponding IS, the ASTM specifications C494 and C260.
- (4) Admixtures shall be stored and handled so as to avoid contamination or damage to their properties by temperature or moisture changes or other influences.
- (5) The quantity of admixture and the method of mixing shall be strictly in accordance with the manufacturer's printed instructions or as required to produce specified results as established by mix design whichever is less, and approved by the Engineer-in-charge. No excess admixtures shall be used for getting more workability than functional requirement of structure. The contractor shall be liable for penalty for such overuse of admixture. No payments shall be made for the concrete produced in case of such overuse of admixture.
- (6) The contractor shall be held liable for any damages and difficulties resulting from the selection and use of admixtures such as delay in concrete placing or damage to concrete during forms removal and shall not be entitled to any time extension or claims resulting there from.

7.5 CONCRETE MIX DESIGN

- (1) Denomination of concrete classes is based on the nominal cube compressive strength in Newton per square mm and maximum aggregate size, e.g. M20A20

- (2) The cube compressive strength is defined as the strength as measured at 28 days. The strength shall comply with the requirements of IS:456.
- (3) The specific class of concrete to be used in each area will be shown on the Approved Construction Drawings or as designated by Engineer-in-charge.
- (4) At least 4 months prior to commencement of any concreting of permanent works, the contractor shall start the testing of materials, propose the composition of concrete mixes and prepare trial mix of each of the proposed concrete class. The contractor shall prepare the trial mixes using the cement, water, aggregates and admixtures intended for the work and which conform to the requirements specified in this section.
- (5) Contractor shall determine, in accordance with IS standards and/or ACI Manual of Concrete Practice, the mix proportions for the designated classes of concrete. In proportioning concrete the quantity of both cement and aggregate shall be determined by weight. Water shall be either measured in volume in calibrated tank or by weight. The proportion of ingredients shall be such that concrete has adequate workability for conditions prevailing at work in question and can be properly compacted. The contractor shall submit the test reports to the Engineer-in-charge for approval.

7.6 QUALITY CONTROL

7.6.1 General

- (1) The contractor shall be completely responsible for performing detailed quality control program during the execution of the work. This quality assurance program shall be subject to inspection and checking by the Engineer-in-charge or his authorized representative.
- (2) The Contractor shall keep records of test results, which shall be presented to the Engineer-in-charge upon request.
- (3) Should the Contractor wish to change his approved testing program he shall notify the Engineer-in-charge of these changes 2 weeks in advance.
- (4) Besides Contractor's testing program the Engineer-in-charge will make control test to the extent as he deems necessary. The Contractor shall give all required assistance in sampling and provide for the proper storage and transport of the specimens to be tested by the Engineer-in-charge.

7.6.2 Site Laboratory

- (1) The Contractor shall build, equip and operate the site laboratory in which the tests included in the Quality Control Programme will be carried out. In some cases where special tests are required, they will be made in other specialized laboratories after approval by the Engineer-in-charge.
- (2) The laboratory shall be equipped with all the necessary equipment to carry out the tests indicated below.
 - a) Tests on aggregates as per IS 2386 (Parts I,II,III,IV)
 - Sieve analysis
 - Compressive strength
 - Specific gravity
 - Water absorption
 - Flakiness
 - Sand equivalent
 - Soundness and organic matter
 - Los Angeles abrasion
 - Impact test
 - b) Tests on cement
 - Equivalent alkaline content (IS 4032)
 - Specific Blaine surface (IS 4031(6))
 - Standard Mortar Compressive Strength (IS 4031(6))
 - Shrinkage (IS 4031 (10))
 - Setting time (IS 4031(5))
 - (c) Tests on fresh concrete
 - Consistency through slump test (IS 1199)

- Workability
- (d) Tests on hardened concrete
 - Compressive strength on all classes of concrete (IS 516)
 - Shrinkage (IS 4031(10))

7.6.3 Concrete Sampling and Testing

7.6.3.1 Aggregates

- (1) Aggregate samples shall be taken from silos at the batching plant or from the conveyor belt.
- (2) The sampling shall be done at the frequency of one every 1,000 m³ of produced concrete (cumulative of all concrete classes) and once a week at minimum.
- (3) The following tests will be carried out.
 - Sieve analysis
 - Sand equivalent
 - Cleanliness of gravel
 - Flakiness of gravel
 - Los Angeles abrasion

7.6.3.2 Cement.

- (1) Quality control of cement shall first take place at the cement factory. This will be exercised by the factory itself under the supervision and the follow-up of the owner. The quality control program at site will be established jointly with the contractor and shall be submitted for the approval of the Engineer-in-charge.
- (2) The following tests will be carried out at both laboratories of the factory and the contractor and compared.
 - Setting time,
 - Expansion
 - Specific Blaine surface
 - Equivalent alkali content
 - Standard mortar compressive strength
- (3) Furthermore, each week, a sample of cement shall be taken at the batching plant and the following tests shall be carried out.
 - Setting time,
 - Specific Blaine surface,
 - Standard mortar compressive strength at 3, 7 and 28 days.

7.6.3.3 Admixtures.

- (1) Admixtures to be used for concrete production shall be tested for their suitability with the cement and other materials under actual working conditions. Each shipment of admixtures shall be tested for density and dry extract.

- (2) Admixtures older than 12 months after their manufacturing, shall be tested for deterioration.
- (3) Total lot of admixtures from which the tested sample failed the criteria, shall be rejected.

7.6.3.4 Water

A sample of water will be taken from the concrete batch plant every 3 months and submitted to chemical analysis as described in IS 3025-1964.

7.6.3.5 Fresh Concrete

- (1) A random sampling shall be adopted. Sampling should cover all mixing units and spread over the entire period of concreting.
- (2) Minimum frequency of sampling of concrete of each grade shall be as per IS 456-2000.
- (3) Three test specimens shall be made from each sample as described in IS 456.
- (4) The test strength of samples shall be average of three specimens. Individual variations shall not be more than 15 percent of the average.

7.6.3.6 Hardened Concrete

- (1) Set of six samples for compressive strength tests at 7 and 28 days will be taken and tested for each part of the work, being defined as per the volume poured in one concreting operation.
- (2) Compressive strength specimens shall be prepared by the Contractor and shall be performed in accordance with Indian Standards and Code of Practice.

7.6.3.7 Analysis of Results.

- (1) The test results will include the different components analysis, the values obtained on fresh and hardened concrete and the characteristics of the corresponding batch given by the printer of the batching plant.
- (2) The contractor shall present regularly to the Engineer-in-charge a synthesis of all the results in the form of tables, charts, statistical analysis (weekly and monthly reports).

7.6.3.8 Concrete Plant

Monthly checks, or when requested by the Engineer-in-charge of the concrete plant's weigh-batching accuracy, including the accuracy of any admixture dispenser, shall be made by the contractor in the presence of the Engineer-in-charge. When checked by standard weights and volumes, its accuracy shall be within 0.5% or as specified by the manufacturer.

7.7 ACCEPTANCE CRITERIA

- (1) The acceptance criteria for hardened concrete shall be as per IS:456. About 20% of the cubes cast for each day may have values less than the specified strength provided that the lowest value is not less than 85% of the specified strength.
- (2) If analysis of test cube results indicates poorer concrete in the structure as per the acceptance criteria of IS:456, the Engineer-in-charge will order the contractor to provide core tests. Location and number of cores will be decided by the Engineer-in-charge. The contractor shall take out the specified sizes of cores from the structure.
- (3) In case the concrete cores fail to meet the specifications and the Engineer-in-charge is not satisfied with various tests results and quality, he will then instruct the Contractor for removal or subsequent suitable strengthening measures for such works at no extra cost. Wherever necessary the Engineer-in-Charge may make necessary changes in the proportion

of mix and the contractor shall have to effect these changes and shall not be entitled to any compensation on account of such changes.

7.8 BATCHING AND MIXING

7.8.1 General

- (1) The contractor shall furnish the plant lay out and the method of concrete production, transportation and placing to the Engineer-in Charge. The contractor shall provide, operate, and maintain at the site automatic batching equipment to determine and control the quantity of each individual material entering the concrete. Batching equipment shall be designed for such capacities, which will permit performance of the concrete work in accordance with Contractual Construction Program.
- (2) Water, cement, admixtures, fine aggregate and coarse aggregates shall be measured separately and not cumulatively. The accuracy of the measuring devices shall be maintained so that the indicated measure does not vary by more than 1 percent from true measure throughout their range of use. The devices shall be capable of being operated to control the delivery of materials so that the combined inaccuracies in feeding and measuring do not exceed the following limits.

Material	Percent (by weight)
Cement	1
Water	1
Aggregates	3
Admixtures	1

7.8.2 Batching Equipment.

- (1) At the batching plant, standard certified test weights shall be provided and such other auxiliary equipment as may be necessary to check the operating performance of each scale of other measuring devices. When required by the Engineer-in-charge, operator shall make these tests in his presence. Unless otherwise required by the Engineer-in-charge, check tests of equipment used for measuring water, cement, aggregate and admixtures shall be made at least every week. After completion of each check test, operator shall report the results to the Engineer-in-charge and make such adjustment, repairs or replacement as the Engineer-in-charge deems necessary to secure satisfactory performance before further use of the measuring devices.
- (2) The batching equipment shall be so constructed and arranged that the sequence and timing of the batcher discharge gates can be controlled to produce an intermixing of the aggregate, water and cementing materials, as the materials pass through the charging hopper into the mixer. The batching controls shall be so interlocked that a new batching cycle cannot be started until all the weighing hoppers are completely empty.
- (3) The operating mechanism in the water measuring device shall be such that no leakage will occur when the valves are closed and the discharge valve cannot be opened until the filling valve is closed.
- (4) The dispensing device for adding admixtures shall be interlocked with the batching and discharging operation of the water so that the batching and discharging of the admixtures

will be automatic. The device shall be capable of permitting the quantity of admixture being batched to be adjusted should this prove necessary, and shall be equipped with a suitable warning device to indicate when the level in the reservoir tank is low.

- (5) The batching equipment shall include an accurate recorder for providing a continuous visible record of the measurement of each separate material, including all added water and admixture.
- (6) The measuring and recording equipment shall be supported on foundations independent of those for the mixing plant to prevent them from being affected by vibration.
- (7) Effective communication system including telephone shall be provided between the concrete plant and the point of placement at all times, and such facilities shall also be available at either location for use by the Engineer-in-charge as required.
- (8) Volume batching will not be permitted.

7.8.3 Mixing

- (1) Concrete shall be mixed in power driven stationary batch mixer of approved type and size. They shall be kept clean and in proper working order. The mixing blades in the drum shall be replaced when worn by 10% of their design dimensions.
- (2) The batching plant shall be provided with a bypass such that the mix materials can be discharged directly into a transit mixer drum. This bypass is to be used only in emergency and with permission of the Engineer-in-charge.
- (3) The mixing equipment shall be capable of combining the aggregate, cementing materials, water and other ingredients, within the time specified, into a thoroughly mixed and uniform mass, and of discharging the mixture without segregation.
- (4) The mixers shall be so charged that some water will enter in advance of cement and aggregate and all materials shall continue to flow in as rapidly as possible. The construction of the mixers should prevent loss of materials during charging.
- (5) The mixers shall not be charged beyond their rated capacities and the entire contents of the mixer shall be discharged before recharging.
- (6) Unless otherwise authorized by the Engineer-in-charge for mixers of 1m³ capacity or less, the mixing of each batch shall continue for not less than 1.25 minutes as specified in IS:457 (but not more than 5 minute when mixing air-entrained concrete) after all materials, except the full amount of water, are in the mixer. For mixers of larger capacity, the minimum mixing time will be increased by 15 seconds for each additional 0.5m³.
- (7) The mixing time shall be increased when, in the opinion of the Engineer-in-charge, the charging and mixing operations fail to result in the required uniformity of composition and consistency within the batch and from batch to batch.
- (8) Each mixer shall be equipped with a mechanically or electrically operated timing and signaling device for indicating and assuring the completion of the required mixing period and for counting the batches.
- (9) Should a mixer at any time prove unsatisfactory, it shall be replaced or its use discontinued until it is made satisfactory.
- (10) Each mixer shall be cleaned after each period of continuous operation and shall be maintained in such a condition that the mixing action will not be impaired.

- (11) On no account shall any addition be made to any component of a concrete batched, once that batch has been mixed and discharged from the mixer, whether for the purpose of retempering or for any other reason.
- (12) Batching and mixing of concrete shall not commence unless due notice, at least 24 hours in advance, has been given to the Engineer-in-charge and written approval has been obtained for the placing arrangements, and for the preparation and accuracy of the part of the works in which concrete is to be placed.

7.9

HOT AND COLD WEATHER CONCRETING

- (1) Hot weather and Cold weather concreting shall be done as per IS 7861 Part I and Part II. The maximum temperature developed after placement should not be higher than 40°C and the concreting shall be temporarily suspended during excessive hot weather when the temperature inside the form work exceeds 63°C or the condition is such that the concrete can not be placed at the required temperature.
- (2) Whenever required, the ingredients of concrete and the exposed surface of fresh or green concrete shall be adequately shaded from direct rays of the sun and protected against premature setting. The exposed faces may be kept under fine spray of water.
- (3) Concreting shall be done at night during hot weather.
- (4) For mass concrete in spillway and dam/barrage, the maximum lift height shall be 1.5m.

7.10

CONVEYING

- (1) The method and facilities for concrete transport shall be selected by the contractor within the limitations of these specifications, and he shall be responsible for adequacy and suitability of the transporting system. The time elapse between mixing and the initial set of the concrete shall be taken into consideration. All methods used shall be reviewed by the Engineer-in-charge.
- (2) The concrete transporting methods and facilities shall be such that will prevent segregation of coarse aggregate, excessive loss of slump and loss of ingredients. Equipment such as transit mixers, buckets, cars, conveyers and pumping equipment which may be used for conveying concrete, shall be of such size, design and condition as to ensure an even and adequate supply of concrete at the placement area. All equipment shall be kept clean and in good working condition.
- (3) The use of chutes to convey concrete will not be permitted, except that chutes less than 3m in total length may be used immediately adjacent to or in the forms with acceptance of the Engineer-in-charge. Where chutes are used, they shall be so constructed and arranged as to permit continuous flow of the concrete without separation of the ingredients.
- (4) There shall be no vertical drop greater than 1.5m, except where equipment, satisfactory to the Engineer-in-charge, is used to confine and control the falling concrete.
- (5) Concrete may be dropped through flexible elephant-trunk chutes, provided methods are used at the lower end to retard the speed of the falling concrete and prevent it from segregation. Where it is necessary to drop concrete from more than 1.5m it shall fall into a hopper with a capacity of 1m³ more than the total capacity of the full trunk.
- (6) All conveying plant shall be supported independently of the forms, except as specifically permitted by the Engineer-in-charge.
- (7) The conveying plant shall be kept free from hardened concrete and foreign materials, and shall be cleaned at frequent intervals.

7.11 DRILLING HOLES AND GROUTING ANCHOR BARS IN ROCK.

In case of rock foundation, as shown in the approved drawings or as directed by the Engineer-in-Charge, holes shall be drilled into the rock to receive bars for anchoring concrete structures or parts thereof to the rock. The types and dispersions of the anchor bars and the locations, diameters and depths of the anchor bar holes shall be as shown on the drawings or as directed. The diameter of each hole shall not be less than 1 ½ times the largest transverse dimension of the bar specified for that hole subject to a minimum of 12mm over the bar diameter. Anchor bars shall be cleaned thoroughly before being placed. The holes shall be washed out and cleaned thoroughly and shall then be completely and compactly filled with grout of proper proportions. Each anchor bar shall be forced into place to full depth immediately after the grout has been placed and shall then be rapped or vibrated until the entire embedded surface of the bars is in intimate contact with the grout. Special care shall be taken to prevent any movement of bars after they have been placed till the grout has adequately hardened. Alternatively the insertion of the anchor bar into the fresh grout filled hole may be carried out immediately prior to placement of concrete in the location, the hardened concrete will then prevent undesirable vibration being imparted to the anchor bar and lead to avoidance of separation.

7.11.1 PLACING ANCHORS IN CONCRETE

Anchor bolts, structural shapes, plates and bearings required in connection with the installation of gates. Gate hoists and operating machinery shall be placed in concrete as shown on the drawings or as found necessary. Wherever practicable, anchors shall be installed before the concrete is placed and except as otherwise provided drilling for the installation of anchors in the concrete will not be permitted. Where the installation of anchors prior to placing the concrete is not practicable, satisfactory formed openings shall be provided and the anchors shall be grouted in to the openings later. Anchor bolts for machine may be placed in approved pipe sleeves to facilitate installation of machinery and the sleeves shall be completely filled with grout after the locations of the holes are finally determined.

7.12 PLACING

7.12.1 General

- (1) Contractor shall place concrete in a given location only after the Engineer-in-charge has agreed with the placement of such concrete. All concrete shall be placed in presence of the Engineer-in-charge. Concrete placed without prior knowledge and approval of the Engineer-in-charge may be required to be removed and replaced at contractor's cost.
- (2) The contractor shall furnish, install, maintain and operate a telephone system or radio, linking the points of placing concrete with the concrete batching and mixing plant. These facilities shall also be available to the Engineer-in-charge at all times.
- (3) When placing the concrete by pumping, direct communication shall be maintained between the concrete placing crew and the pump operator.
- (4) In order to reduce bleeding, slump shall not be higher than necessary to achieve proper placement and consolidation. Concrete shall be placed before initial set has occurred, initial set time being determined in the laboratory.
- (5) No concrete shall be placed when the atmospheric conditions are, in the opinion of the Engineer-in-charge, such that proper placing and hardening of the concrete are not guaranteed. Specifically, the contractor shall have the responsibility for meeting the hot and cold weather concreting requirements and for postponing concreting whenever such requirements cannot be met or, based on weather forecast, probably cannot be met. Even if

the above requirements are fulfilled, the contractor has the responsibility of delivering concrete product that meets specified requirement.

7.12.2 Preparation for concrete placing.

- (1) Concrete shall not be placed until all formwork, installation or embedded parts, reinforcing steel, and surfaces against which concrete is to be cast have been accepted by the Engineer-in-charge.
- (2) All surfaces of form and embedded items that have become encrusted with dried material from concrete previously placed shall be cleaned of all such material before the surrounding adjacent concrete is placed.
- (3) Concrete shall not be placed in any structure until all water entering the space to be filled with concrete has been properly cut off or diverted by pipes, or by other means, and carried out of the forms clear of the work. Water shall not be allowed to stand on any concrete surface until it has attained its final set. Water flow over the concrete, which may injure the surface finish will not be allowed.
- (4) Pipes, conduits, dowels and other items to be embedded in concrete shall be so positioned and supported prior to placement of concrete to be stable and provide sufficient clearance (50mm min.) between said items and steel reinforcement to allow proper concreting. Securing such items in position by wiring or welding to reinforcement will not be permitted.
- (5) Where excavated surfaces which are to form the foundations for structural concrete, are absorptive or likely to become otherwise unsuitable, or where shown on the Construction Drawings, the contractor shall place a 'blinding course' consisting of a layer of Class M10 or M15 concrete 50 to 100 mm. Thick, as directed by Engineer-in-charge, uniformly over the foundation such that the upper surface is at grade elevation. Blinding concrete shall be placed before installing reinforcement or formwork.
- (6) Immediately before concreting, the forms and all other surfaces which will be in contact with the fresh concrete shall be cleaned of all loose material and debris including shavings, wood chips, sawdust, pieces of wire, nails, fragments of hardened concrete and mortar. Clean-out holes which may be needed for this purpose shall subsequently be securely closed in order to obtain the required surface finish.
- (7) The use of compressed air for cleaning will be allowed only if adequate precautions are taken to avoid the deposition of suspended oil or construction joint surfaces, reinforcement or other items which are to be bonded to concrete.
- (8) The contractor shall provide such personnel and equipment so that the performance of the concrete work is in a satisfactory manner. The transporting and placing equipment shall be clean and in good condition, adequate, and properly arranged to proceed with the placing without undue delays. The number and condition of vibrators for use and standby shall be ample for the requirements during placement. The lighting system shall be sufficient to illuminate the inside of the forms when concrete is placed at night.
- (9) The contractor shall have protective coverings available for fresh concrete surfaces if there is a possibility of rain or hail.
- (10) Rock surfaces against which concrete is to be placed shall be clean and free from oil, standing or running water, mud, loose rock, objectionable coating, debris, and loose or

unsound fragment. Faults, fissures and seams shall be cleaned to sound rock, and if directed, backfilled with dental concrete, shotcrete or dry-pack as appropriate.

- (11) Immediately before concrete is placed, all surfaces shall be cleaned thoroughly by the use of high velocity air-water jets, sweeping with brooms, wet stand blasting, bush-hammering, or other satisfactory means including combinations of the above.
- (12) Rock surface against which concrete is to be placed shall be kept wet for at least 12 hours during the 24 hour period prior to placing concrete and shall be in a damp condition at the time of placing, with all pools of water removed.
- (13) Foundation of porous or free draining material shall be thoroughly compacted by flushing and subsequent tamping or rolling, if necessary. The finished foundation surface shall then be blanketed with a layer of tar paper or closely woven burlap carefully lapped and fastened down along the seams so as to prevent the loss of mortar from concrete.
- (14) Before any concrete is cast against previously placed concrete the surface of the old concrete shall be prepared as described in sub-section "Construction Joints".
- (15) If concreting is not started within 24 hours of the approval being given, it shall have to be obtained again

7.12.3 Placing and Compaction.

- (1) Concrete shall be carefully placed in designated position. Where dense reinforcement or deep forms may cause segregation of concrete while placing, suitable methods shall be used to prevent segregation. The free fall of concrete shall not exceed 1.5m.
- (2) Concrete shall be placed directly in its permanent position and shall not be worked along the forms to that position. Vibrations shall not be used to move concrete laterally.
- (3) The addition of water into concrete after batching to compensate for stiffening of the concrete before placing shall not be permitted.
- (4) All concrete, with exception of concrete tunnel lining, shall be placed in continuous approximately horizontal layers. The size of the concrete lift shall be as shown on the construction drawings. The lift height shall generally not exceed 1.5m. The thickness of the layers shall not exceed 500mm for mass concrete, and for structural and all other concrete. Each layer shall be soft when a new layer is placed upon it so that no seams or planes of weakness within the section can form, and the two layers shall be made monolithic by penetration of vibrators.
- (5) The Engineer-in-charge reserves the right to order a reduced thickness of layers where the layers as stated above cannot be placed in accordance with the requirements of these specification.
- (6) Time interval between successive lifts of mass concrete shall be determined by the Engineer-in-charge. Nevertheless a minimum of 72 hours shall elapse between successive lifts.
- (7) No concrete shall be placed under water except where shown on the Construction Drawings or specifically so required by the Engineer-in-charge. No concrete shall be placed in running water. Water shall not be allowed to rise over freshly poured concrete until final set has been achieved.
- (8) Each layer of concrete shall be consolidated to the maximum practicable density, be free from pockets of coarse aggregate, completely fill all recesses in forms and around embedded parts, and be free of all voids. The concrete shall be compacted and worked into

all corners and angles of the forms, around reinforcement and embedded items without permitting the component concrete materials to segregate.

- (9) No layer of concrete shall be placed until the previous layer in the same lift has been thoroughly consolidated. Each layer of concrete within a lift shall be covered with fresh concrete as soon as possible, but certainly within the period when the lower layer is still capable of being revibrated so that successive layers can be thoroughly worked together.
- (10) The maximum permissible time between the placing successive layers in a pour shall not exceed initial setting time of cement or 45 minutes, whichever is less, and shall be reduced to suit the temperature, humidity and job conditions. Concrete shall not be piled up in the forms in a manner that causes movement of the unconsolidated concrete, or permits mortar to escape from the coarse aggregate.

(11) Treatment of Cold Joint

In placing the concrete, delay may occur resulting in cold joints within a lift. When placement is resumed while concrete is still green and not fully hardened (and therefore capable of ready bonding) ,all laitance shall be removed by scrubbing the wet surface with wire or bristle brushed off with a hand pick, care being taken to avoid dislodgement of any particle of coarse aggregate. The surfaces shall then be thoroughly wetted, all free water removed and then coated with neat cement grout. The first layer of the concrete to be placed on this surface shall not exceed 160mm in thickness and shall be well rammed against old work, particular attention being given to corners.

- (12) Concrete shall be consolidated with the aid of approved immersion type mechanical vibrators complying with IS:2505 or electric or air driven vibrators operating at speed of at least 7,000 cycles/minute when immersed in the concrete. The vibrating equipment shall at all times be adequate in number of units and power to penetrate concrete when it is being placed, to the satisfaction of the Engineer-in-charge. Vibrators with flexible operating shafts shall be used for reinforced concrete and for concrete in restricted forms. At least one extra vibrator in working condition shall be constantly on hand at each point of placement for emergency use.
- (13) Application of the vibrators shall be made systematically and at such intervals that the zones of influence overlap and the concrete is properly compacted.
- (14) Every vibrator shall be operated in a near vertical position and the vibrating head shall be allowed to penetrate under the action of its own weight. In consolidating each layer of concrete, the vibrating head shall be allowed to penetrate and vibrate the concrete in the upper portion of the underlying layers. Extreme care shall be taken to ensure that the vibrators do not touch or disturb the reinforcing, embedded steel or forms.
- (15) To ensure even and dense surfaces which are free from aggregate pockets, honeycombing or air holes, it may be necessary to supplement internal vibration with hand-spading along the boundaries of the concrete and around embedded part while the concrete is plastic under the vibratory action. Should slip forms be used, the equipment and methods shall be such that the finished concrete will be well consolidated and homogeneous.
- (16) Form vibrators shall not be used unless the forms are designed for form vibration and unless specifically authorized by the Engineer-in-charge.

7.12.4. Pumping Concrete.

- (1) Positive displacement pumping or other approved methods may be used to place concrete in locations approved by the Engineer-in-charge. The type and arrangement of equipment

shall be subject to approval and the equipment shall be operated only by experienced persons. Pneumatic placing will not be allowed.

- (2) The equipment and its method of operation shall allow the concrete to enter the forms at a lower velocity.
- (3) Concrete pumps and auxiliary equipment shall be in good condition and shall be maintained as such throughout the duration of the work. Thorough washing down of all parts that come in contact with concrete shall be performed after each concreting operation.
- (4) Pump lines shall consist of rigid steel pipe or flexible pipe made of rubber, spiral-wound flexible metal or plastic, or combination of both. Use of aluminum pipe for pump lines shall not be permitted. Couplings shall be leak proof and strong enough to withstand handling during erection and poor support along the lines. They shall provide a full internal cross section with no constrictions of the smooth flow of concrete.
- (5) Immediately prior to the start of all concrete pumping, the pump and pump lines shall be primed by pumping an approved grout mixture through the equipment.
- (6) Concrete pumping operations shall be planned in such a way that concrete does not set before the succeeding layer is placed thereon. An adequate supply of fresh concrete shall be provided at all times.

7.12.5 Concrete in Blockouts, Second Stage in Restricted Locations, etc.

- (1) All concrete required to be placed in block outs to permit the installation and adjustment of mechanical and other equipment, around formed holes and second stage concrete in other locations shall be included in respective concrete as described in these specification.
- (2) The concrete surfaces of block outs and first stage concrete at other locations shall be chipped and roughened as described herein before second stage concrete is placed at such locations.
- (3) Exceptional care shall be taken to place concrete in block outs in order to ensure satisfactory bond with concrete previously placed and to secure complete contact with all metal works in the block outs.
- (4) The roughening of the first stage concrete surfaces shall be attained by chipping or sand blasting as approved by the Engineer-in-charge and in such a manner as not to loosen, crack or shatter any part of concrete beyond the roughened surfaces.
- (5) After being roughened, the surfaces of concrete shall be cleaned thoroughly of loose fragments, dirt and the objectionable substances and shall be sound and hard to ensure good mechanical bond between the existing and new concrete.
- (6) Second stage concrete shall be placed in lifts of not more than 3.0m and concrete placement rate shall not exceed 1.5m per hour except as otherwise approved by the Engineer-in-charge.

7.13 FINISHING OF CONCRETE

7.13.1 General

- (1) The quality of the surface finish shall be in accordance with the requirements for the particular class of finish specified hereunder. The finished surfaces of concrete shall be free from areas of honeycombs, segregation, loss of cement or fine material, from damage due to stripping of forms, from bolt holes, abrupt irregularities caused by movement of forms or components, loose knots and similar features and bulges or depressions in the general plane of the surface.

- (2) Only one type of formwork shall be used for all parts of a concrete structure which is visible from any direction.
- (3) The classes of finish shall be as shown on the construction drawings or as directed by Engineer-in-charge.

7.13.2 Bush Hammer Finish

Bush hammer finish shall be applied on the surfaces when required by the Engineer-in-charge, But hammering shall not commence until at least one month after placement of concrete. The tool used for bush hammering shall be electrically driven and have a head 3 cm² with 16 pyramid shaped teeth. The surfaces shall be finished at a rate of 250 to 400 cm²/ minute indenting the concrete surface approximately 2 mm.

7.14 CONSTRUCTION JOINTS IN CONCRETE STRUCTURES

- (1) Construction joints are defined as concrete surfaces on or against which concrete is to be placed and to which new concrete is to adhere and which have become so rigid that the new concrete cannot be incorporated integrally with that previously placed.
- (2) Construction joints shall be located in the position shown on the construction drawings or as required by the Engineer-in-charge and the contractor shall not be permitted to form any additional joints or deviate from the joints indicated on the Drawings, without the written authorization of the Engineer-in-charge. Necessary re-arrangement of steel reinforcement arising from such modifications shall be to the contractor's debit.
- (3) Horizontal construction joints shall be arranged, wherever possible, to coincide with joints in the formwork.
- (4) Joints at exposed surfaces of concrete shall be straight and continuous. Feather-edged construction joints will not be permitted.
- (5) The faces of vertical joints shall be shuttered with expanded metal or other approved rough materials. The expanded metal shall be removed as far as possible before the adjacent lift is poured. If required, the surface shall be cleaned by wet sandblasting and roughened by light bush-hammering.
- (6) The surface of construction joints upon or against which new concrete is to be placed and to which new concrete is to adhere shall be clean, rough and free of water when covered with fresh concrete. The laitance, loose or defective concrete and foreign material shall be removed from the surface of existing concrete. The previous concrete lift shall be saturated by water but surface dry when the successive lift is placed.
- (7) The surface of the hardened concrete shall be cleaned and roughened by wet-sandblasting and washing thoroughly with air-water jet. Care shall be taken to prevent undercutting of aggregate in the concrete during sandblasting.
- (8) Wet-sandblasting equipment shall be operated at an air pressure or approximately 7 bars. Sand to be used for blasting shall be dense, hard, not easily broken and sufficiently dry.
- (9) In lieu of wet-sandblasting the contractor may propose high-pressure water blasting utilizing pressures not less than 400 bars, provided that such high-pressure water blasting produce equivalent results to those obtainable by wet-sandblasting.
- (10) The horizontal surfaces of construction joints may be treated by cutting with an air-water jets ("green-cutting"). This shall be performed after the initial set has taken place but before the concrete has become too hard for effective cutting. This is generally done within 8 to 16 hrs of laying the concrete. The fresh concrete surface shall be cut with air-water jets to

remove all laitance and to expose clean, sound aggregate. For effective green cutting, the air pressure should not be allowed to fall below 6.33 kg/cm². After cutting, the surface shall be washed with clean water. Care shall be taken that the treated surface does not become contaminated before new concrete is placed upon it. Should the surface become contaminated that a satisfactory joint with new concrete is not ensured the contractor shall clean it by means of wet sandblasting.

- (11) Water used in cutting, washing and rinsing of concrete surfaces shall be disposed of in such a way that it does not stain, discolour or affect exposed surfaces of the structures.
- (12) When necessary, as determined by the Engineer-in-charge structural concrete placement in forms shall be started with an over sanded mix with 20 mm maximum size aggregate, an extra 50Kg of cement per cubic meter and a 100 mm slump. This mix will be referred to as a starter mix and shall be placed approximately 50mm deep.
- (13) Disturbance of the surface at a joint during the early stages of hardening shall be avoided , and traffic on the concrete will not be permitted until the concrete has hardened sufficiently to withstand such treatment without injury.
- (14) All construction joints shall be kept continuously moist until they are covered with concrete, provided that, if it becomes necessary to delay the placement of new concrete on or against a construction joint for an extended period, moist curing of the surface of the joint may be discontinued at the expiration of the regular prescribed curing period. If the moist curing is so discontinued, it shall be resumed not later than 24 hours prior to the placement of new concrete against the joints.

7.15 CURING AND PROTECTION OF CONCRETE.

- (1) Plant for curing and protection of concrete shall be available at the location of each concrete placement before concrete placement is started. The water used for curing shall meet the requirements for water used for mixing concrete. The curing water temperature shall not exceed 25°C.
- (2) Exposed surface of concrete, which has been finished as specified, shall be protected from the direct rays of the sun for at least 3 days after placing. Freshly placed concrete shall be protected from damage by rainfall.
- (3) Exposed surfaces shall be kept moist or the moisture in the concrete shall be prevented from evaporating for at least 14 days after placing by means of continuous sprinkling or spraying with water, or by covering with saturated materials like burlop/hessian cloth etc or a system of perforated pipes, mechanical sprinklers or hose or by any other methods approved by the Engineer-in-charge.
- (4) Care shall be taken not to disturb the steel reinforcement projecting from any placement for at least 24 hours after the completion of such placement.
- (5) The contractor shall not move any load on concrete surfaces which in the opinion of the Engineer-in-charge have not attained sufficient strength. In case loads are required to be moved, the Engineer-in-charge may permit contractor to do so on condition that contractor provides the means for protecting the concrete surface subject to approval of the Engineer-in-charge.
- (6) The Engineer-in-charge may permit the use of curing by means of membrane forming compounds. Sealing compounds proposed by the contractor will be subject to sampling and testing and will have to be approved of the Engineer-in-charge.

- (7) Curing compounds shall be applied according to the manufacture's recommendations to provide a continuous uniform membrane over all area. Curing compounds shall be applied only after moist curing has been carried out for at least 24 hours. Curing membranes shall be protected from damage at all times.
- (8) Curing compound shall not be used on any uniformed surface where, in the opinion of the Engineer-in-charge, the irregularities in that surface would prevent the membrane forming an effective seal, on any surface which has a temperature lower than manufacturer's recommended application temperature, on any surface where a bond is required for additional concrete or where a bonded surface coating is to be applied. Where a curing compound is placed on a surface where a bond is required, it shall be removed by sand blasting or by other means satisfactory to the Engineer-in-charge.
- (9) Curing compounds used for surfaces exposed to view shall degrade completely when exposed to air for more than 3 months. They are to remain at least 80% impermeable for 1 month after application.
- (10) In case any curing operations are inadequate or unsatisfactory, the Engineer-in-Charge shall be entitled to take such steps as he may feel necessary to make good the deficiencies and defects, at the contractor's risk and cost.
- (11) Curing and protection should confirm to latest amendment of IS 457.

7.16 REPAIR OF CONCRETE

7.16.1 General

- (1) Repair of damaged or defective concrete shall be performed by skilled workmen only, and in the presence of the Engineer-in-charge. No repair work shall be carried out until the Engineer-in-charge has inspected the location of the proposed repair and accepted the method of repair proposed by the contractor.
- (2) Contractor shall correct all imperfections on the concrete surface within 24 hours of removal of forms. The proven methods of repair of concrete are outlined in the USBR Concrete manual, which include Dry-pack Mortar, Replacement Concrete, Replacement Mortar, Replaced Aggregate Concrete, Epoxy Concrete etc.
- (3) Where concrete is exposed to flowing water or to weather, porous and fractured concrete and surface concrete to which additions are required to bring it to prescribed lines shall be removed by chipping into the concrete a minimum of 75mm below the reinforcement or to the depth required by the Engineer-in-charge if sound concrete is not encountered at 75mm. Repair areas shall be formed and area filled with fresh concrete. If the concrete section to be repaired contains no reinforcement, concrete shall be chipped to a minimum depth of 100mm.
- (4) The chipped openings shall be sharp edged and keyed and shall be filled to the require lines with fresh concrete or patching mortar, as approved by the Engineer-in-charge. Where concrete is used for filling, the chipped openings shall not be less than 75 mm in depth and the fresh concrete shall be reinforced and doweled to the surface of the openings, as directed by the Engineer-in-charge.
- (5) Dry pack mortar for patching shall consist of 1 part cementing material, 2 parts by volume of regular sand, and just enough water so that after thorough mixing of the ingredients the mortar will be held together when compacted by squeezing with the hand. The mortar shall be fresh when placed, and any mortar that is not used within 1 hour after preparation shall be washed. Just prior to mortar application, the surface to which the mortar is to bond shall

be kept wet for at least 2 hours, then scrubbed with a small quantity of cement grout using a wire brush.

- (6) When repairs are more than 25mm deep, the mortar shall be applied in layers not more than 20 mm thick to avoid sagging. After each layer, except the last is placed, it shall be thoroughly roughened by scratching with a trowel to provide an effective bond with the succeeding layers. The last or finishing layer shall be smoothed with a trowel to form a continuous surface with the surrounding concrete. All patches on exposed surface shall be neat and smooth and as nearly as possible of the same colour as the adjoining concrete. All patches shall be thoroughly bonded to the surfaces of the chipped openings, shall be cured to the satisfaction of the Engineer-in-charge and shall be sound and free from shrinkage cracks and drummy areas.
- (7) For concrete surface where high velocity flows may occur and as required by the Engineer-in-charge, repairs to surfaces having F3 and U3 finishes shall be bonded with an epoxy adhesive approved by the Engineer-in-charge and used in accordance with the manufacturer's instructions.
- (8) All repairs to the surface of concrete required for flowing water shall be ground smooth to meet the tolerances specified for that surface.

7.16.2 **Sealing works in Concrete Lining of Underground Structures.(Not Applicable)**

- (1) The contractor shall carry out sealing work to reduce water inflow and water losses through, and to guarantee the normal water tightness of the concrete lining of underground structures according to criteria stated hereafter and as directed by the Engineer-in-charge.
- (2) The work shall consist of sealing the cold joints, construction joints, shrinkage cracks both vertical and horizontal, honeycombs, and poorly grouted or sealed grout holes. The work shall be performed intermittently, whenever water inflows are observed and measured wide cracks are discovered (especially after performance of tunnel pressure testing), or the future impermeability, in the judgment of the Engineer-in-charge, is doubtful.
- (3) The sealing work shall be carried out when following phenomena are encountered.
 - a) Water inflow equals or exceed 1 liters/min measured at each single inflow source.
 - b) Any water inflow from grout holes and through honeycombs is unacceptable.
 - c) Cracks or joints, regardless whether they are dry or wet, of width greater than;
 - 0.2mm in tunnels and shafts containing reinforcing steel
 - 0.5mm in unreinforced stretches of tunnels or shafts
 - d) Areas of porous concrete (e.g. due to poor vibration) where depth of porosity is obviously deeper than superficial.
- (4) The sealing work shall be executed as follows:
 - a) Crack or joint 0.2-0.6 mm wide shall be repaired as stipulated in the Section "Drilling and Grouting"
 - b) Crack or joint wider than 0.6mm shall be repaired as under (1) above, followed by cutting a groove 25x25mm along the joint or crack and subsequent filling with an epoxy mortar.
 - c) Wet joint may also be sealed by applying the "Oberhasli Method", which consist of cutting a groove as for the dry joint and by collecting the seepage water into one or several flexible plastic pipes. As soon as the groove is without running water shall be

filled with a quick-setting mortar and, after its hardening, followed by pumping the cement bentonite-water slurry through the plastic pipe.

- d) Areas of porous concrete shall be grouted under high pressure (30 bar) with cement grout mix W/C=0.7 by weight, containing suitable water-reducing air-entraining admixture. Grout holes shall be drilled at 500 mm spacing until the rock. After grouting, the area shall be repaired with epoxy mortar.
- e) Grout holes filled only with water/cement mix shall be redrilled up to 2/3 of the theoretical lining thickness and filled with dry-pack mortar.

7.17 PARTICULAR REQUIREMENTS FOR INDIVIDUAL CONCRETE STRUCTURE

7.17.1 Concrete in the Spillway glacis:

- (1) Where the over break in excavation below the theoretical lines and grades exceeds acceptable limits as determined by the Engineer-in-charge, the contractor shall place blinding unreinforced concrete over the rock foundation in such thickness that the upper surface is at the theoretical grade elevation. Surface shall be roughened before placing the structural spillway concrete.
- (2) No construction joints shall be allowed in the spillway conveyance structure, unless otherwise approved or directed by the Engineer-in-charge. In case such joint is permitted, additional steel reinforcement shall be placed across the joint and the joint surface shall be shuttered with expanded metal.
- (3) Construction joints shall be executed at the distances shown in the drawings. The surface of the joints shall be painted with bituminous coat or other approved bond breaker.
- (4) All movement joints exposed to flowing water shall be chamfered 1:1 on upstream side and 1:8 on downstream side as the case may be.
- (5) The top layer of the spillway glacis concrete shall be terminated approximately 300-500 mm below the final surface to provide room for placing the special concrete to increase the abrasion resistance of the structure. Similarly in the walls, which will come into contact with rapidly flowing water recesses will be blocked out to a depth of 300-500 mm and height of approximately 2m.
- (6) This high performance concrete shall be obtained by adding silica fume and/or steel fibres in the concrete. Depending on the mix, design quantity of silica fume will be approximately 40 Kg. Per cubic meter and/or steel fibres of 60 kg. Per cubic meter. Mix proportions to be used will be determined by trial mix design. Test samples shall be made in accordance with IS:1199, tested as per IS:516 and analyzed as per IS:456. Source of aggregate for high performance concrete shall meet the requirement of wearing surface and shall be as identified by Engineer-in-charge.
- (7) Silica fume shall comply with SABS CAN/CSA-A23.5-M86 or equivalent international standards. In addition, it shall meet the following requirements.

Particle size	Average not more than 0.2 micro, max. 0.4 micron
SiO content	Not less than 85%
Carbon content	Not greater than 5%
Total alkali content	Na ₂ O + 0.658 K ₂ O not greater than 1.5% and when combined with OPC not greater than 0.6%.

In addition to the standard requirements for individual materials, the blended cement and silica fume for high strength concrete shall comply with the following requirements (IS:4031(3), (50, (6) and (10) 1988 and IS:4032-1988).

Min. compressive strength at 28 days	60Mpa
Min. initial setting time	90 minutes
Masx. Mortar shrinkage at 28 days	0.07%
Max. sulphate content (SO ₄)	5%
Max autoclave expansion	0.5%
Max.CaO content	45%

The contractor shall present the results of quality control tests carried on a representative sample by the supplier. Once approved, the silica fume shall only be supplied from the same production plant. Deliveries shall in impervious sacks weighing about 40 kg. and shall be accompanied by manufacturers quality assurance certificate.

- (8) Steel fibres shall be Dramix ZC 60/0.80 or equivalent, hook bends bundled fibres with normal dissolving. The fibre shall be clean and free from rust oil and deleterious materials. The method of storage shall be such as to prevent oxidation. Rusted fibres shall be refused.
- (9) The concrete surface finishes in the gate structures and chute shall be F3, F3C, U3 and U3C. For surfaces in contact with high velocity water flow the permissible surface irregularities shall not exceed the following values.

Abrupt Gradual Measured along a line parallel to flow direction -- 5mm to 10mm

Measured along a line traverse to flow direction -- 3mm to 6mm

- (10) Abrupt irregularities are offset caused by displaced or misplaced form sheathing or lining or form sections, or by loose knots in forms or otherwise defective form lumber. They shall be tested by direct measurements.
- (11) Gradual irregularities are all other irregularities and shall be tested by a 2m long template. The templates will be a straight edge for plane surfaces or a "shaped" template for curved or warped surfaces.
- (12) Furthermore the following shall apply if not otherwise shown on the construction drawings or directed by the Engineer-in-charge.
 - a) Abrupt irregularities parallel to the flow direction shall be eliminated completely by grinding to bevel of 1 to 20 ratio of height to length.
 - b) Abrupt irregularities traverse to the flow direction shall be eliminated completely by grinding to bevel of 1 to 50 ratio of height to length.

(1) **Concrete in the Plunge Pool**

- (2) Concrete used for construction of the Plunge pool and the nallah channel at the diversion tunnel outlet shall be class M20 A40.
- (3) Where the overbreak in excavation below the theoretical lines and grades exceeds acceptable limits, as determined by the Engineer-in-charge, the contractor shall place blinding unreinforced concrete over the rock foundation in such thickness that the upper surface is at the theoretical grade elevation. Surface shall be roughened before placing the structural concrete.

- (4) Contraction joints shall be executed at the distances shown on the drawings. The surface of the joints shall be painted with bituminous coat or other approved bond breaker.
- (5) The top layer of the Plunge pool concrete shall be terminated approximately 300-500 mm below the final surface to provide room for placing the special concrete to increase the abrasion resistance of the structure. Similarly, in the walls which will come into contact with rapidly flowing water, recesses will be blocked out to a depth of 300-500 mm and height of approximately 2m.

7.17.2 Concrete in Gravity Structures.

- (1) Concrete used for the construction of mass concrete gravity structures shall be class M15/A80-150 unless otherwise approved or directed by the Engineer-in-charge. However concrete surface exposed to weathering and standing or flowing water shall be constructed of class M20/A80 concrete or as indicated on the construction drawings. Where higher strength concrete is used, part of each lift will therefore normally be composed of two classes of concrete. Water cement ratio shall not exceed 0.45.
- (2) Reinforcement shall be provided at the surfaces in contact with standing or flowing water and at all openings in mass concrete.
- (3) Mass concrete of dam, and spillway shall be water cured for at least 10days unless otherwise directed by the Engineer-in-charge. When curing compound is used as a bond breaking membrane at contraction joints, it shall be also be considered acceptable in meeting the curing requirements.
- (4) Where the overbreak in excavation below the theoretical lines and grades exceeds acceptable limits, as determined by the Engineer-in-charge, the contractor shall place blinding unreinforced concrete class M15/A40 over the rock foundation in such thickness that the upper surface is at the theoretical grade elevation. Surface shall be roughened before placing the structural concrete.

7.17.3 Parts Embedded in Concrete.

- (1) Anchors, anchor bolts, structural shapes, plates shapes, plates for gates, hoists, valves, machinery etc. and other miscellaneous parts shall be installed in the concrete by the contractor, as shown on the construction drawings or as required by the Engineer-in-charge. Wherever practicable, anchors shall be installed before the concrete is placed. Except as otherwise specified, drilling and installation of anchors in the concrete after concrete is placed will not be permitted. Before being placed in position, all anchors and embedded parts shall be thoroughly cleaned of rust, grease, paint, splashed concrete, or other anchors is not practicable before the concrete is placed, formed openings shall be provided, and the anchors grouted into the openings at a later time in a manner acceptable to the Engineer-in-charge.
- (2) Embedded anchors shall be supported during embedding and embedded so that the tolerances specified will not be exceeded. Care shall be taken not to disturb or displace embedded items during concrete placement.
- (3) Concrete may be placed to embed items erected by other agencies in the locations and to the dimensions shown on the construction drawings or as required by the Engineer-in-charge. The methods of placement and rates of placing concrete shall be subject to the approval of the Engineer-in-charge. Care shall be exercised that such parts shall not be damaged or disturbed by placing operations.

Unless otherwise specified the contractor shall provide any foundation, wall or roof openings and coverings, concrete floor filling sleeves in foundations, inclusive of metal works supplied by other contractors. All adjustments to foundation levels, embedding, bedding and grouting works on foundations, and cementing works into walls and floors, shall be done by the contractor including all leveling and adjustment of works in foundations and Grouting.

7.17.4 Concrete in Blockouts for Equipment Embedding.

- (1) The contractor shall form blockouts, place reinforcement and concrete as shown on the construction drawings or as directed by the Engineer-in-charge, and in such manner as to ensure good bond with the existing concrete, to secure complete contact with the metalwork to be embedded in the blockout concrete and to avoid displacement of the metal work.
- (2) Blockout concrete shall include the concrete around second stage gate parts, anchor bolts and anchor plates etc.
- (3) Before placing concrete, all parts to be embedded shall be checked to ensure that they are firmly fixed in their required position. The surfaces of blockouts or holes shall be thoroughly cleaned and wetted. Oil and grease shall be removed by brushing and chipping of affected surfaces to a sufficient depth, or by application of approved chemicals and flushed with clear water.
- (4) The parts to be embedded shall be cleaned of rust, mill scale paint, oil or grease before they are set into place. Where bond between metal parts and concrete or grout is not desired, approved material such as flake graphite or paraffin shall be applied to the metal parts. The metal surfaces shall be wetted before placing the concrete or grout.
- (5) Concrete containing an approved non-shrink agent shall be used for concrete in blockouts for equipment embedding as shown on the construction drawing.

7.17.5 Grouting of the Equipment Bearing Plates and Anchors

- (1) Limited spaces and small blockouts where equipment bearing plates anchors, rails, etc. are placed shall be grouted under pressure.
- (2) The grouting shall be performed using non-shrink cement-based grout or non-shrink epoxy grout as proposed by the contractor and approved by the Engineer-in-charge. All mixing and grouting shall be performed in accordance with the manufacturer's recommendations and shall be tested prior to grouting. Technical service by manufacturer shall be organized by the contractor upon request by the Engineer-in-charge.
- (3) Before placing grout, the surfaces of the base concrete to which the grout will be bonded shall be roughened and cleaned of all laitance, loose or defective concrete, any coatings or other foreign material, followed by thorough washing with water.
- (4) Forms for grouting shall be installed where necessary and care shall be taken that the grouts fill all spaces under the plates leaving no voids. The exposed surfaces of the grout shall be cured as recommended by the manufacturer and no loads shall be applied until the grout has reached the design strength.

7.17.6 Porous Concrete

- (1) Porous concrete shall be placed where free drainage is required and shall be produced by gap grading or single size aggregate grading.

- (2) The strength requirements for porous concrete shall be as for class M10/A40 concrete. The porosity shall be such that water will pass through a slab 30 mm thick at a minimum rate of 500 l/mi/m² with a constant depth of water on the slab of 100 mm.
- (3) Porous concrete shall not be vibrated but only placed and lightly rammed. Formed surfaces shall be Class F1 finish. Exposed surfaces of the porous concrete shall be sealed in an approved manner, such as the use of polyethylene or rendering with sand and cement, before structural concrete is placed against it.

7.17.7 Tests

- (1) All cost associated with testing as described in this section shall be borne by the contractor. These shall include, but not be limited to the following.
 - a) The costs for all tests to be carried out prior to the start of concrete work, whether carried out at site or elsewhere.
 - b) Routine tests for quality control during the execution of the concrete work carried out by the contractor as specified herein and as directed.
 - c) Other tests required during execution of the work to be carried out by an approved test laboratory(ies).
 - d) Preparation, storage, handling, curing and delivery of samples to a laboratory designated by the Engineer-in-charge, if so required for additional independent testing.
- (2) Should the contractor fail to adhere to his testing program, all test deemed necessary by the Engineer-in-charge to check concrete work will be performed by the Engineer-in-charge or a laboratory assigned by him, at Contractor's expense.

7.18 FORM WORK

7.18.1 Procedure for Form, Centering and temporary works.

- 7.18.2 All centering, for work and temporary works shall be constructed according to the approved drawing and specification.

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

- 7.18.3 The approval to the general scheme of centering as well as design criteria and loading shall be obtained in good time to facilitate all preparatory works. Any delay on this account shall be the responsibility of the contractor.
- 7.18.4 After approval of the general scheme, the contractor shall prepare detailed design and drawings for execution of the form work, centering and temporary works. These shall be forwarded to the Engineer-in-Charge for approval. No work shall be carried out without prior approval of the Engineer-in-Charge.
- 7.18.5 Notwithstanding the approval given to the design criteria and loading and the general scheme for the centering, the entire responsibility for the satisfactory execution of centering and all temporary works for withstanding concreting and removal of form work after stipulated interval, shall rest with the contractor and he shall be liable to pay all claims and compensation arising

from any loss or damage to life and property due to any deficiency, failure or malfunctioning of the centering or the temporary works.

- 7.18.6 The contractor is responsible to set the forms to line and grade, achieve tightness of forms and braced sufficiently to stay in alignment and strong enough to hold the concrete. There should be no loss of mortar causing any honey-combing. Stability is a very important consideration in form work. Contractor shall ensure that the forms do not suffer from inadequate cross-bracing and inadequate horizontal bracing. Immediately before concrete is placed, the forms should be properly treated with suitable form of oil or other suitable coating material to prevent sticking to the concrete. Joints between the form work and existing concrete structures shall also be grout tight. Form work shall be arranged to facilitate removal of the various parts in correct sequence, without jarring or damaging the concrete. Fixing blocks, bolts or similar devices may be embedded in the concrete, provided they do not reduce the strength or effective cover of any part of the structure below the required standard but the use of through bolts shall be avoided as far as possible. Temporary opening shall be provided at all points necessary in the forms to facilitate clearing and inspection immediately before placing of the concrete.
- 7.18.7 Forms shall overlap the hardened concrete in the lift previously placed by not more than 75mm and shall be tightened smoothly against the hardened concrete in the lift previously placed by not more than 75mm and shall be tightened smoothly against the hardened concrete. Particular attention shall be paid in setting and tightening the forms for construction joints so as to get a smooth joint free from sharp deviations or projection. No jute bags or other such materials be allowed to be used to make the joints of shuttering plates leak proof.
- 7.18.8 If a type of form does not consistently perform in an acceptable manner, as determined by the Engineer-in-charge, the type or form shall be changed and method of erection shall be modified by the contractor at his cost.
- 7.18.9 Re-use of Forms etc.
- 7.18.10 Forms required to be used more than once shall be maintained in serviceable condition and shall be thoroughly cleaned and repaired before reuse. When metal sheets are used, the sheets shall be placed and maintained in the forms without lumps or other imperfections. All forms shall be checked for shape and strength before reuse.

7.19 Cleaning of Forms.

- 7.19.1 All rubbish, shall be removed from the interior of the forms. The formwork in contact with the concrete shall be cleaned and thoroughly wetted or treated with an approved composition. Care shall be taken that such approved composition is kept out of contact with the reinforcement. Before concrete is placed, the surfaces of forms designed to produce F1 and F2 finish shall be oiled with commercial form of oil that will effectively prevent sticking and will not stain the concrete surface. Form timber forms, oil shall consist of pure refined, pale, paraffin mineral oil or approved form oil. For steel forms, form oil shall be mineral oil suitably compounded with one or more ingredients which are appropriate for the purpose. Care shall be taken to keep form oil out of contact with reinforcement.
- 7.19.2 Contractor shall give the Engineer-in-charge due notice before placing any concrete in the forms and request him to inspect and accept the form work as to their strength, alignment and general fitness, but such inspection shall not relieve the contractor of his entire responsibility of form work to withstand concreting and for safety of men, machinery and materials.

7.20 Removal of Forms.

- 7.20.1 The Engineer-in-charge shall be informed in advance by the contractor of his intention to strike any form. Forms shall be removed as soon as the concrete has hardened sufficiently. Thus facilitating satisfactory curing and earliest practicable repair of surface imperfections.
- 7.20.2 Form on sloping surfaces of concrete, such as forms on the water sides, shall be removed as soon as the concrete attains sufficient strength to prevent sagging. Any repair or treatment required on such sloping surface shall be performed at once and followed immediately by the specified curing.
- 7.20.3 Forms shall be removed with care so as to avoid damage to the concrete. Damaged concrete, if any, during form removal shall be repaired in accordance with the specification for repair of concrete.
- 7.20.4 The following minimum time intervals of form stripping as per specifications in IS-456-1978 will generally be followed while using ordinary Portland cement.
- Walls, columns and vertical faces 24 to 48 hours or as may be decided by the Engineer-in-Charge.
 - Slabs (Prop left under) 3 days.
 - Beam soffits (Prop left under) 7 days.
 - Removal of props under slabs spanning up to 4.5m 7 days.
 - Slabs spanning over 4.5m 14 days
 - Removal of props under beam and arches.
 - 8.20.10 Spanning upto 6m 14 days
 - 8.20.11 Spanning over 6 m 21 days.

Note:- For other types of cement, the stripping time recommended for Ordinary Portland cement may be suitably modified.

- 7.20.5 The number of props left under their sizes and disposition shall be such as to be able to safely carry full dead load of slab, beams or arch as the case may be together with any live load likely to occur during the curing or further construction.

7.21 Finish of Formed Surface.

- 7.21.1 The classes of finish and requirements for finishing of concrete surface shall be as shown in the drawing or as hereinafter specified. In the event of finishing not being specified in the drawings, The finishes to be followed shall be as directed by the Engineer-in-charge. Finishing on concrete surface shall be performed only by skilled workmen.
- 7.21.2 Completed concrete surfaces will be tested wherever necessary to determine whether surface irregularities are within the limits herein specified.
- 7.21.3 Surface irregularities are classified as 'abrupt' or 'gradual'. Offsets caused by displaced form sheathing, or lining or form sections or by loose knots or otherwise defective will be considered as abrupt, other irregularities shall be considered as gradual irregularities and will be tested by use of template, consisting of a straight edge or the equivalent there of for curved surfaces. The length of the template shall be 150cm for testing of formed surfaces and 300cm for testing unformed surfaces.
- 7.21.4 Table for finish of form work.
- F1 finish F2 finish.
 - Surfaces of the raft remaining below NSL 1. Deck of the Bridge.

- Block joint.
 - Key for Intermediate construction
 - Cubes
 - Faces which are not exposed for public
- 2. Piers.
 - 3. Abutment & flank wall
(river side)
 - 4. Abutment & flank wall
(river side)
 - 5. Exposed surface of upstream
side barrage section i.e. glacis the
profile Rigid, apron, slope.

SECTION-8

GENERAL SPECIFICATION FOR EARTH DAM

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

LIST OF INDIAN STANDARDS

Sl. No.	Short Title	B.I.S. Number
I	CEMENT	
1.	Specification for ordinary and low heat Portland Cement	IS 269-1976
2.	Specification for Portland Pozzolana Cement	IS 1489-1976
3.	Portland Slag Cement (Third revision)	IS 455-1976
4.	Method for physical tests for Hydraulic Cement (Reaffirmed -1980)	IS 4032-1976
5.	Method of chemical analysis of Hydraulic Cement (First Revision)	IS 4032-1985
6.	Rapid hardening Portland Cement	IS 8041-1990
7.	Hydrophobic Portland Cement	IS 8043-1990
8.	43 Grade Ordinary Portland Cement	IS 8112-1989
II	STEEL	
1.	Code of practice for bending and fixing of bars	2502-1963
2.	Specification for cold worked steel deformed bars for concrete	1786-1979

CONTRACTOR

SENIOR MANAGER (CIVIL)

	reinforcement	
3.	Code of practice for welding of MS Bars used for reinforced concrete construction.	2751-1966
4.	Code for practice for use of Metal are welding for general construction of mild steel	818-1989
5.	Deformed bars for concrete reinforcement hot rolled mild steel and medium tensile steel (Revised)	1139-1966
6.	Recommendations for detailing of reinforcement in reinforced concreted works	5525-1969
7.	Specification for Mild Steel and medium tensile steel Bars for Concrete reinforcement.	432-1966(Part I)
8.	Code for practice for safety and health requirement in Electric and Gas welding and cutting operations	818-1968
9.	Code for practice for fire precautions in welding and cutting operation.	3016-1965
10.	Measurement of building and Civil Engineering works, method part VIII steel work and iron work	1200-1974 (Part VIII)
11.	Code of procedure for manual or metal ARC and welding of Mild steel	823-1964
12.	Specification for filler rods and wires for gas welding	1278-1972
13.	Recommendations for welding cold worked steel bars for reinforced concrete construction	9417-1979
14.	Hard drawn steel wire fabrics for concrete reinforcement	1566-1982
III	AGGREGATES	
1.	Specification for coarse and fine aggregate from natural source for concrete	IS 383-1970
2.	Specification for sand for masonry mortars	IS 2116-1965
3.	Method of test for aggregates for concrete	IS 2386-1969
4.	Standard sand for testing of cement (First revision) with amendment 1 & 2 reaffirmed 1980	IS 650-1966
5.	Methods for sampling of aggregates for concrete	IS 2430-1969
6.	Method of test for determining aggregates impact value of soft coarse aggregates	IS 5640-1970
IV	CONCRETE	
1.	Method of Measurement of building and Civil Engineer works Part-II cement concrete works.	1200-1968 (Part-II)
2.	Code of practice for plain and reinforced concrete	456-2000
3.	Specification for pre cast concrete coping blocks.	5751-1969
4.	Methods of tests for strength of concrete	516-1959
5.	Code of practice for laying in situ cement concrete Lining on canals	3873-1993
6.	Specification for Admixtures for concrete	9103-1979
7.	Method of Test for Autoclaved cellular Concrete Products.	6441-1972-73 (Part-I to IX)
8.	Method of Sampling and Analysis of concrete	1199-1959
9.	Specification of Batch type concrete mixtures	1791-1963
10.	General requirements for Concrete Vibrators immersion type	2505-1980
11.	Specification for concrete vibrating tables	2514-1963
12.	Method of test for permeability of cement mortar & concrete	3085-1965
13.	Specification for fly ash for use as pozzolana as admixture for Concrete	3812-1981 (Part-II)
14.	Specification for Portable swing weigh batch for concrete(single and double bucket type)	2722-1964
15.	Code of practice for installation of joints in concrete pavements	6509-1972
16.	Code of practice for general construction of plain and reinforced concrete for dams and other massive structures	457-1957
17.	General requirement for concrete vibrator screed board type (First	2506-1985

	revision)	
18.	Code of practice for concrete structures for shortage of liquids	3370(Part-1 to 4)
19.	Code of practice for use of immersion vibrator for consolidating concrete(First revision)	3558-1983
20.	Method for testing performance of batch type concrete mixer	4634-1968
21.	From vibrators for concrete	4656-1968
22.	Concrete batching and mixing plant	4925-1968
23.	Ready mixed concrete (First revision)	4926-1976
24.	Code of practice for sealing joints in concrete lining in canals	5256-1992
25.	Vibrating plate compactor	5889-1970
26.	Concrete transit mixer and agitator	5892-1970
27.	Concrete pavers	7245-1974
28.	Concrete slump test apparatus	7320-1974
29.	Method of making curing and determining compressive strength of accelerated cured concrete test specimen	9013-1978
IV.	EARTHWORK	
1.	Method of measurement of Building and Civil Engineering works method (Part-I, Earth Work)	IS 1200-1969 (Part-I)
2.	Safety code for piling and other deep foundations	IS 5121-1969
3.	Code of practice for design installation, observation and maintenance of uplift pressure pipes for hydraulic structures on permeable foundations	IS 6532-1972
4.	Safety code for excavation works	IS 3767-1966
5.	Code of practice for protection of slope for reservoir embankments	IS 8237-1985
6.	Method of test for soils: Part-II, Determination of water content	IS 2720-1973 (Part-II)
7.	Method of test for soil determination of Water content dry density relation using light compaction	IS 2720-1974 (Part-VII)
8.	Method of test for soil determination of dry of soils in place by the sand replacement method	IS 2720-1974 (Part-XXVIII)
9.	Method of test for soil determination of dry of soils in place by core cutter method	IS 2720-1975 (Part-XXIX)
10.	Classification and identification of soils for general engineering purpose (First revision)	IS 1498-1970
11.	Safety code for blasting and related drilling operations (with Amendments No.1) (reaffirmed 1978)	IS 4081-1967
12.	Portable pneumatic drilling machine (First revision)	IS 5441-1986
13.	General requirement for blast hold drilling rigs	IS 7209-1974
14.	Safety code for working with construction machinery	IS 7293-1974
15.	Code of practice for stability analysis of earth dams	IS 7894-1975
16.	Guidelines for design of under seepage control measures for earth and rock fill dams	IS 8414-1977
17.	Filtration media-sand & gravel	IS 8419-1977(PartI)
18.	Guidelines for design of large earth and rock fill dams	IS 8826-1978
19.	Methods of test of soils	IS 2720 (Part-I to X)
20.	Ammonium nitrate for explosive	IS 4668-1967
21.	Method of test for commercial blasting explosive and accessories	IS 6609 (Part-I to V)
22.	Detonators	IS 7632-1975
23.	Methods of load soils (Second revision)	IS 1888-1982
24.	Method for standard penetration test for soils (First revision)	IS 2131-1981
25.	Glossing of terms and symbolic relating to soil engineering	IS 2809-1972
26.	Method of sampling and preparation of stabilized soils fore testing	IS 4332 (Part-I) of 1967
27.	Code for practice for in-situ permeability test (Test in over burden)	IS 5529 (Part-I) of 1985
28.	Code for practice for in-situ permeability test (Test in bed rock)	IS 5529 (Part-II) of

		1985
V.	STONE PITCHING AND LAUNCHING APRON	
1.	Method of test for determination of strength properties of natural building stones	IS-1121-1975 (Part-I to IV)
2.	Method of test for determination of true specific gravity of natural building stones (First revision)	IS-1122-1974
3.	Method of identification of natural building stone (First revision)	IS-1123-1975
4.	Method of test for determination of absorption apparent specific gravity and porosity of natural building stones (First revision)	IS-1124-1974
5.	Method of test for determination of weathering of natural building stones (First revision)	IS-1125-1974
6.	Method of test for determination of durability of natural building stones (First revision)	IS-1126-1974
7.	Recommendation for dimensions and workmanship of natural building stones for masonry work (First revision)	IS-1127-1970
8.	Recommendation of dressing of natural building stone (First revision)	IS-1129-1972
9.	Method of determination of resistance to wear by abrasion of natural building stones (First revision)	IS-1706-1972
10.	Stone facing	IS-01-1967 (Part-I)
11.	Method of test of determination of water transmission rate by capillary action through natural building stone	IS-4121-1967
12.	Method of test for surface softening natural building stones by exposure to acidic atmospheres	IS-4210-1967
13.	Methods of test for determination of permeability of natural building stones (First revision)	IS-4348-1973
14.	Method of test toughness of natural building stones	IS-5218-1969
15.	Gujarat State, Section-2, Engineering properties of building stones	IS-7779-1975 (Part-I/ Section-2)
16.	Recommended practice for quarrying stones for construction purpose	IS-8881-1977
VI.	ROAD WORK	
1.	Paving bitumen (Revised) (with Amendment No.1)	IS-73-1961
2.	Cut back bitumen (Revised)	IS-217-1982
3.	Glossary of terms relating to bitumen and tar (2 nd revision)	IS-454-1961
4.	Digboi type cut back bitumen (Revised)	IS-454-1961
5.	Distributors for hot tar and bitumen (First revision)	IS-2093-1974
6.	Heaters for tar and bitumen (First revision)	IS-2094-1974
7.	Hot asphalt mixing plants (with amendment No.1)	IS-3066-1965
8.	Bitumen emulsion for roads (anion type)	IS-3117-1965
9.	Asphalt pavers finisher (First revision) (with amendment No.1)	IS-3251-1965
10.	Bitumen drums	IS-3575-1977
11.	Recommendations on stacking and storage of construction materials at site (First revision)	IS-4082-1977
12.	Bitumen mastic for bridge decking and roads	IS-5317-1969
13.	Methods for determining aggregates impact value of soft coarse aggregates	IS-5640-1970
14.	Safety code for construction involving use of hot bituminous materials	IS-5916-1970
15.	Methods of test for determination of stripping value of road aggregates	IS-6241-1971
16.	Course aggregates for water bound macadam (First revision)	IS-6579-1981
17.	Adhesive, bitumen emulsion	IS-7393-1974
18.	Code practice for road gullies	IS-774-1975
19.	Bitumen emulsion for road roads (Cationic type)	IS-8887-1976
20.	Methods for testing tar and bituminous materials	IS-9381-1976

21.	Determination of effect of heat and air by thin film over test	IS-9382-1979
22.	Standard Specification & Code of Practice for Road Bridges Section-I, General Features of Design (Seventh Revision)	IRC : 5-1998
23.	Recommended Practice for 2cm thick Bitumen & Tar Carpets (Second Revision)	IRC : 14-1997
24.	Specification for Priming of Base Course with Bituminous Primers (First Revision)	IRC : 16-1989
25.	Tentative Specification for Single Coat Bituminous Surface Dressing	IRC : 17-1965
26.	Standard Specification & Code of Practice for Water Bound Macadam (Second Revision)	IRC : 19-1997
27.	Recommended Practice for Bituminous Penetration Macadam (Full Grout)	IRC : 20-1996
28.	Tentative Specification for 2 Coats Bituminous Surface Dressing	IRC : 23-1996
29.	Tentative Specifications for Bituminous Macadam (Base & Binder Course)	IRC : 27-1967
30.	Guidelines for Design of Flexible Pavements (Second Revision)	IRC : 37-2001
31.	Tentative Specification for Built-up Spray Grout	IRC : 47-1972
32.	Tentative Specification for Bituminous Surface Dressing using Pre-coated Aggregates	IRC : 48-1972
33.	Recommended Practice for Use & Upkeep of Equipments, Tools & Appliances for Bituminous Pavement Construction	IRC : 72-1978
34.	Code of Practice for Maintenance of Bituminous Surface of Highways	IRC : 82-1982
35.	Guidelines for Section, Operation & Maintenance of Bituminous Hot Mix Plant	IRC : 90-1985
36.	Specifications for Dense Bituminous Macadam	IRC : 94-1986
37.	Hand Book of Quality Control for Construction of Roads & Runways (Second Revision)	IRC : SP: 11-1988
38.	IRC Highway Research Board, State of Art: Granular & Bound Bases & Sub-Bases	IRC : HRB : Special Report 11, 1992
39.	Specifications for Road and Bridge Works (Fourth Revision)	IRC : 2001
40.	Rural Road Manual	IRC : SP: 20-2003

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

General Specification:

8.0 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(s) may also be issued as per necessity. During the course of execution there may be changes in dimensions, specifications and shapes of components. The changes in the drawings 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 the Engineer-in-charge will prepare revised additional drawings and specifications as may be required to suit the stage of the work.

8.1 Where the drawings are not consistent with the text of the specifications, the text shall govern.

8.2 The percentage rate shall be for finished items of works as per description in schedule of quantities and according to drawings, specification and conditions of contract. The percentage rate quoted shall be for execution of finished items of work & the specifications of which confirm to the details furnished in the Agreement 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 in succeeding Para for the convenience of the tenders but are not exhaustive. Omission of any such items here in but required

CONTRACTOR

SENIOR MANAGER (CIVIL)

for delivering finished items of work, shall not be plea, that such items are not covered by the percentage rate quoted.

- 8.2.1 Formation and maintenance of haul roads including river and drainage crossings within the work site is to be made by the Contractor at his own cost. The existing approaches and haul roads, if any under the control of the Department may be used but improvement, if required, shall be done by the contractor at his own cost.
- 8.2.2 Labour and materials required for construction of reference points, benchmark pillars etc. for setting out work shall be at contractor's cost.
- 8.2.3 Scaffolding and gang-ways as and when required for the work will be done by the contractors at his own cost. No additional payment on this score will be entertained.
- 8.2.4 The rate includes all leads, lifts & de-lifts.
- 8.2.5 Form work complete includes cost of materials, labour, maintenance, erection and removal.
- 8.2.6 Construction of coffer dam and dewatering required if any during execution of work is the responsibility of the contractor.
- 8.2.7 Protection of components of work during the rainy season shall be the responsibility of the contractor. The responsibility for the safety of the structure rests, entirely on the contractor and any damages that may occur has to be made good by the contractor at his own cost.
- 8.3 The sequence of construction adopted by the Contractor shall have to be approved by the Engineer-in-Charge.
- 8.4 The contractor has to make his own design for coffer dam or any type of cross bund required during course of execution. All materials for the coffer dam or cross bund shall be arranged by the Contractor at his own cost. The contractor shall maintain the coffer dam till completion of the work.

8.5 QUALITY CONTROL:

- 8.5.1 Before collecting materials required for execution of the respective items of work as 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 laboratory for testing.
- 8.5.2 All such testing charges shall be borne by the Contractor. The contractor will provide necessary assistance for collection of samples.
- 8.5.3 On the basis of satisfactory test results confirming to technical specification collection of materials shall be started in the field. The testing of materials shall be checked in the field Laboratory by the Department as well as staff of Quality Control Organization. If the field test result is found unsatisfactory, the materials shall be rejected and action taken to remove the same from work site by the contractor at his own cost. In no case the defective materials shall be used in the work.
- 8.5.4 On receipt of notice from the Engineer-in-Charge and on observation of Quality Control Division, in charge of the project, the contractor will rectify the defect in stipulated 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 cost for the same from the dues of the contractor.
- 8.6 A quarry chart indicating possible source of materials may be seen in the office of the **Executive Engineer, Chikiti Irrigation Division, Chikiti, Dist- Ganjam** The contractor must however satisfy himself that the materials as will be made due to non-availability of materials as per required specification and quality in the quarries shown in the departmental quarry chart. The quarry chart is only an indication of source of material and the department does not accept the responsibility if the materials are not available in full quantity and quality.
- 8.7 No claim for carriage of water whatsoever will be entertained.

8.8 Decision regarding usefulness of excavated materials rests fully on the Engineer-in-charge.

8.9 The item marked “N/A” Not Applicable “do not apply in this contract.

8.10 DISCHARGE RECORDS

RECORDS 8.11 DISCHARGE

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

SECTION- 8.12 SETTING OUT OF WORK

(A) Temporary bench marks shall be fixed at suitable location connecting G.T.S. bench marks fixed by Survey of India. Temporary Bench Marks shall be set up by the Department at every 0.5 Km .interval at convenient locations along the Dam/canal to serve as reference levels. The contractor shall establish additional reference Bench Marks as may be needed at his own cost for facilitating the setting out and taking levels for measurement of work, with the approval of the Engineer-in-Charge. The bench mark shall be marked on a concrete pillar 30 cm. (1) x 30 cm (b) x 75 cm (d) which shall be embedded 55 cm into firm ground and projecting 20 cm above the ground. The Bench Mark pillar shall be constructed in plain cement concrete of M-10. The pillar shall be protected from being disturbed. The RL of bench marks shall be conspicuously carved and painted on the pillar.

(B) Before starting any work and during execution (if required), the contractor shall erect reference Bench Marks. Reference lines and check profiles at convenient locations as per the direction of the Engineer-in-Charge. The centerline of the Dam/canal and the reference line for all alignments for demarcation purpose shall be laid by dug belling on the ground. The reference line shall comprise the base line properly dug belled on the ground with the numbered concrete/masonry RD pillar suitably spaced.

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

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

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

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

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

CONTRACTOR

SENIOR MANAGER (CIVIL)

The locations of different structures indicated in construction drawing shall also be clearly marked on the ground along the alignment of the Dam/ canal. The control structure locations of off taking canals shall also be clearly demarcated, so that unnecessary excavation or filling at these locations can be avoided.

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

- (F) To ensure accuracy in execution of cutting, the Dam/canal embankment, spoil banks and the structures, their layout shall be given in an appropriate manner with pegs and pillars suitably placed in relation to outer dimensions of these elements.
- (G) All materials and labour for setting out works including construction of reference bench marks, reference lines, check profiles and surveys as may be required at the various states of the construction, shall be supplied by the contractor at his own cost. The cost of such works shall be deemed to have included in the cost of items in schedule.

8.13 CLEARING AND GRUBBING:

A. CLEARING AND LEVELING SITE:

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

B. GRUBBING:

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

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

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

PREPARATION OF BED:

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

The contractor shall therefore examine the site before tendering and provided for all items to be done under his earth work tender rate. Old bunds will be benched or sloped as directed by Engineer-in-charge before addition of earth, the benches being 500 mm x 500 mm unless other sizes are specified. The benches or slope shall be inspected by the Engineer-in-charge or engineer designated for the purpose and approved before new earth work is keyed into them.

C. DISPOSAL OF CLEARED AND GRUBBED MATERIAL:

CONTRACTOR

SENIOR MANAGER (CIVIL)

The disposal of cleared and grubbed materials shall be in accordance with clause 4.1.1. of IS 470-1982 code of practice for earth work on canals. All waste materials to be burnt shall be piled neatly and when in suitable condition shall be burnt completely to ashes. Pilling of waste material for burning shall be done at such a location and in such a manner as would not cause any fire risk. Suitable materials and equipments for prevention and suppression of the fire shall be kept available at all times.

The materials to be disposed off shall be buried.

D. PAYMENT

For the clearance of light jungles, heavy jungle with or without uprooting etc., payment will be made as provided for in the bill of quantities. No payment towards removal of small stones and boulders of size less than 0.5 cubic meter will be made, and the rate quoted for excavation will be considered to include this item. However, payment will be made for the removal of surface boulders of sizes greater than 0.5 cubic meter. Either loose or partly embedded in the ground, at the rate quoted in bill of quantities for the actual quantity so removed based on stack measurement applicable for the relevant strata classification after deducting 40% towards voids.

8.14 - USE OF WATER :

8.14.1 WATER FOR DUST ABATEMENT

A. GENERAL

The contractor shall procure and apply water for dust abatement.

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

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

8.14.2 PREWETTING OF DAM/ CANAL PREMISES AND ADJACENT AREAS:

A. GENERAL

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

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

8.15 - SITE DRAINAGE:

8.15.1 CROSS DRAINAGE:

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

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

8.15.2 DRAINS, BERM DRAINS AND DOWEL BANKS:

A. DRAINS:

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

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

B. BERM DRAINAGE AND DOWEL BANKS:

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

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

Payment will be made for constructing Dowel banks and sloping berm and cost thereof shall be included in the unit price per cubic meter bid in the bill of quantities for construction for Dam/canal embankment including reconstructing and 170 remodelling.

8.16 MONSOON DAMAGES:

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

8.17 REMOVAL OF SILT AND WATER:

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

8.18 PROCEDURE FOR MEASUREMENT:

Before commencement of work, initial levels to indicate existing ground levels shall be taken at 10m intervals longitudinally along the alignment of the Dam/canal. The level points transversely along the cross sections shall be maximum at 5 m. Intervals in flat ground and 3 m. In undulating terrain. The cross sections shall be extended beyond the limit of work to a suitable distance and minimum 5 mtr. Beyond the toe lines of slopes on both the sides. The interval stipulated shall be made closer depending on the topography or any stipulation made by the Engineer-in-charge.

All initial levels shall be recorded in ink/ball pen in authenticated level books issued by the Engineer-in-charge and shall be signed by the Junior Engineer / Assistant Engineer when he

records the levels. The Assistant Engineers and junior engineers shall exercise checks strictly in accordance with the codal provisions.

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

If the work is awarded to any agency the level shall be recorded in the presence of the contractor or his authorized agent. The contractor or his authorized agent shall sign each page of the level book/field book in token of acceptance. Without acceptance of the level by both the parties, the work shall not commence. Dispute if any arises, the decision of the Engineer-in-Charge shall be conclusive and binding. These cross sections shall form the basis of all future measurements and payments. Each dimension shall be measured to the nearest 0.01m, areas shall be computed to nearest 0.01sqm. Volume shall be computed to nearest 0.01 cubic metre.

SECTION-9**EARTH WORK****9.1 EARTH WORK - GENERAL**

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

Drawing showing the typical section of the canal annexed to these specifications provides such details as would enable the contractor to execute the work in general conformity there-with under these specifications which have been prepared as definitely and in as much detail as possible with regard to design data presently available. These drawings will be supplemented by such additional, general and details drawings or directions as may be considered necessary or desirable as the work progresses. For all changes in approved drawing/design the recommendation of Chief Construction Engineer, Superintending Engineer and approval of Chief Engineer will be essential. Where details shown on these drawings differ from the requirements of these specifications. The requirement of specifications shall govern. The contractor shall do no work without proper drawings. He shall check all drawings and specifications carefully and advise the Engineer-in-charge if any errors and omissions are discovered where upon the Engineer-in-charge will prepare and lodge such revised additional drawings and specifications as may be required to suit the stage of the work. All such additional general and detailed drawings whether original or revised lodged in the office of the Engineer-in-charge and signed by him for purpose of identification shall be open for inspection by the contractor under the same terms and conditions as provided in agreement.

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

9.1.1 SETTING OUT WORKS :

Temporary Benchmark in the vicinity of the dam embankment, set up by the Department at convenient locations along the dam axis. The contractor shall establish sufficient numbers of references bench marks for facilitating the setting out and for measurements of works with the approval of the Engineer-in-charge and taking levels for purpose of measurement at his own cost. The benchmark shall be 30cm. x 30cm. x 75cm. with concrete pillars which shall be embedded 55 cm. into firm ground and 20 cm. projecting above the ground.

The contractor shall take all such precautions to see that the lines, points and bench marks fixed by the Department are not disturbed by his work and shall make good of any such damage at his own cost.

LAYOUT :

Before starting any work and during execution, the contractor shall erect reference bench marks, reference lines and check profiles at convenient locations as per the direction of the Engineer-in-charge. The axis of the dam and the reference line shall be laid by properly dug

belled on the ground. The reference line shall comprise with the numbered concrete/ masonry R.D. pillars suitably spaced.

The check profiles shall be located at 30 m. apart or closer as directed by Engineer-in-charge so as to ensure execution of all slopes, steps and elevations to the profile or profiles indicated in the approved drawings. All important levels and all control points with reference to bench marks and reference lines shall be fixed and co-related by the Engineer-in-charge.

To ensure correctness of execution, the edges of cutting the lines of the embankment and those of spoil bank shall be marked carefully with pegs at close enough intervals so as to obtain layout in plan free links. The pegs shall then be connected by stretching string from peg to peg and dug belling into ground along the strings. The line so connected shall be corrected wherever necessary to provide a stream lined plan of the Dam features. Special care shall be taken at curves to ensure uniform curvature of the alignment.

All materials and labour for setting out works including construction of reference bench marks, reference lines, check profiles and surveys, as may be required at the various stage of the construction, shall be supplied by the Contractor at his own cost. Benchmark should be constructed in P.C.C.M.-10 and the cost of such work shall be deemed to have been included in the costs of the items rate quoted by the Contractor.

9.1.2 CLEARING AND GRUBBING OPERATIONS :

- a) Cleaning and grubbing operations shall be performed in excavation areas including a 20.00 m. wide strip measured beyond and continuous to the limit line of the areas. These sites should be cleared of all tree stumps, roots, rubbish bushes and other objectionable materials. All non-useful materials from cleaning operations shall be burnt/ removed from the work site or otherwise disposed off as approved. All the materials to be burnt shall be burnt completely. Piling for burning shall be done in such a manner and in such a location as to cause the least fire risk. The burning shall be so thorough that all the materials are reduced to ash. Special precautions shall be taken to prevent fire from spreading to area beyond limits of the areas specified and suitable equipment and supplying for preventing and suppressing fires shall be available at all times. The stumps shall be grubbed to its full depth and the roots shall be entirely removed. The ownership of all the useful materials so removed from clearing sites shall rest with the department.
- b) Cleaning and grubbing shall be performed in advance of earthwork operation and in accordance with the requirements of the specification.
- c) All operation in connection with clearance of jungle such as clearing, cutting and disposal etc. shall be subject to provision of forest rules.
- d) All holes whether originally existing or produced by digging of roots, stumps etc. shall be carefully filled up with the earth, well rammed and leveled off as may be directed.

9.1.3 RECORDING OF CROSS SECTIONS :

- a) Before stripping and prior to the beginning of excavation, initial cross sections of existing ground shall be taken at every 10 m. interval along axis of dam upto sufficient distance outside the limits of the work. Levels on these cross sections shall be taken at 10 m. or closer intervals for dam works. While for structures works, they shall be taken at 3 m. or closer intervals as directed by Engineer-in-charge and entered in ink in the level book by the Engineer-in-charge in the presence of the contractor or his authorized agent and shall sign the levels in level books in token of acceptance. These cross sections shall form the basis of all future measurements and payments. The original cross sections duly signed by the Contractor and the Engineer-in-charge shall be preserved. All linear dimensions shall be measured to the nearest 0.01 m. Areas shall be computed nearest to 0.01 sqm. Volumes shall be computed nearest to 0.01 Cum.

- c) No separate payment will be made to the Contractor for the required labour and materials for taking the cross sectional levels.
- d)

9.2 STRIPPING :

- a) The entire area of stripping of embankment including toe drain area as shown in the drawing shall be stripped manually/ mechanically with standard units to a sufficient depth as directed to remove all unsuitable materials. The unsuitable materials shall include all debris, top soils, vegetable matter including root grass, bushes, loose rock, organic silt, stump materials and other perishable or objectionable materials which are unsuitable for use in permanent construction or that might interfere with the proper bonding of the embankment with the foundation, or the proper compaction of the materials in the embankment, or that may be otherwise objectionable. The stripping shall be kept well in advance of other items of works to ensure that no undesirable materials will get mixed with approved embankment materials and to enable proper inspection and measurement. Materials out of stripping operation shall be deposited off at the downstream side within 3 Kms. lead in such a way as not to detract from the finished appearance of the project or as directed by the Engineer-in-charge.
- b) Measurement and Payment : Measurement and payment will be on the basis of volume of work involved based on levels recorded before and after stripping and cleaning the site. The unit rate includes cost of all labour, tools and plants and other incidental expenses involved in the work.

9.3 EXCAVATION :

(Cut off trench, Heel trench & Toe drain, etc.)

The cut-off trench, heel trench, toe drain etc. as shown in drawings shall be excavated in the foundation to the established levels, slopes, lines and grades. The alignments and cross sections shown in the drawings will be subjected to such changes as may be found necessary as per condition disclosed after excavation for which the contractor will have no claim. Accurate trimming of the slope of the excavation will not be required, but excavations shall confirm as closely as practicable to the established lines and grades.

9.3.1 CLASSIFICATION :

The sub-surface logging has been indicated in the longitudinal section of the dam as carried during exploration studies. The information is furnished only as an indication of nature of soil met with during excavation.

Materials once excavated will not be classified for payment. Except or otherwise provided in these specification, materials excavated will be measured for excavation, to the lines shown on the drawings or as provided in these specifications and all materials required to be excavated will be paid for at the applicable rates in the schedule for excavation. No additional allowance above the rates in the schedule will be made on account of any of the materials being wet and requiring additional time for drying, stock piling and re-handling. Except for area of rock all areas to be excavated and materials to be used shall be pre-wetted, so that at the time of excavation, moisture content shall be about optimum. Bidders and contractors must assume all responsibility for deductions and conclusion as to the nature of the materials to be excavated and the difficulties of making and maintaining the required excavations.

The classifications of excavation shall be decided by the Engineer-in-charge and will be binding on the contractor. In case of dispute, the decision of Chief Engineer shall be final. Merely, the use of explosive in excavation will not be considered in areas on the higher classification unless blasting is clearly necessary in the option of the Engineer-in-charge.

9.3.2 Excavation of soil and D.I. Rock :

This excavation shall include all over burden dry or wet and shall comprise of all kinds of soil such as vegetable or organic soil, turf, sand, silt, loam, clay mud, Peat black cotton soil, soft soil, loose or compact moorum, soft soling/ heavy/ hard shale, stoney earth mixed with gravel and moorum etc. inter spread with boulders upto 0.5 Cum. size soling of roads, paths, hard core, macadam surface, lean concrete, stone masonry, brick work, soft conglomerate, stoney earth such as lime stone, sand stone, laterite, soft conglomerate etc. which does not require blasting and can be quarried by mechanical means or by pick axes and crowbar etc. However, the contractor resorts to blasting in such D.I. rock for his convenience, no extra payment will be made.

9.3.3 a) CONVEYANCE AND DISPOSAL OF EXCAVATED MATERIALS :

The materials, when suitable for use with varying lead and lifts in the embankment either immediately or after stock piling as convenient, the suitable or otherwise of materials and zone of the embankment in which it is to be placed will be determined by the field Laboratory, materials excavated from cut-off trench etc. shall not be placed in the embankment till the foundation for the embankment has been cleared, stripped and prepared as specified and adequate arrangements made of watering and rolling the layers of earth fill in the embankment. These materials shall subject to the same degree of embankment control as per the materials obtained from the borrow areas.

- b) Excavated materials which are suitable for or are in excess of other earthwork requirement shall be wasted as directed by the Engineer-in-charge with all leads and lifts. Waste pipes shall be located where they shall not interfere harmfully with the natural flow of stream, with the operation of the reservoir, on with the flow of water to form the spillway of outlet works and where they will neither detract from the appearance of the completed project, nor interfere with the accessibility of the structures for operation or cause interference to public and other works. The waste pipes shall be leveled and trimmed to reasonable regular lines so that it shall not cause any interference to public and other works.
- c) Steps shall be taken to keep the materials clean as subsequent cleaning will be difficult and imperfect.
- d) No extra payment shall be made, in case, the materials excavated from cut off trench, base stripping etc. is stock piled and then re-handled for use in coffer dam, haul road etc.

9.3.4 DEWATERING :

- a) The method of removal of water from foundation shall be efficient and effective, where the excavation for cut-off trench in the foundation extends below the water table shall be dewatered in advance of excavation.
- b) The dewatering shall be accomplished in a manner that will prevent loss of lines from the foundations, will maintain stability of the excavated slope and bottom of cut off trench and will result in all construction operation being performed by dry condition. The use of sufficient number of properly screened well or other equivalent methods shall be approved for dewatering sumps by pipe drains leading to sumps from which water shall be of uniform diameter for each run and shall be provided with ground connections and returns at 15m interval and shall be embedded in reasonable well graded gravel or like material.
- c) During placing and compacting of the impervious materials in the cut off trench, the water level at every point in the cut off trench shall be maintained below the bottom of the earth fill until the compacted fill in the cut off trench at that point has reached a depth of 3 m. after which water level shall be maintained at least 1.5 m., below the top of the compacted fill. When the fill has been constructed to an elevation which will permit the dewatering systems to maintain water level or below the designed elevations as

determined by the Engineer-in-charge, the pipe drains including surrounding gravel shall be filled with grout composed of water and cement or clay.

- d) The contractor has to make his own arrangement for dewatering during execution of the work at his own cost and the unit rates of each item of work, quoted by the contractor shall include the cost of dewatering.

9.3.5 FINAL EXCAVATION, FOUNDATION PREPARATION & CLEANING :

When the excavation has reached the final level, the surface shall be cleaned off all mud and rock debris. If foundation surface is satisfactory, further excavation shall be stopped under the supervision of the Engineer-in-charge. All portions of protruding rock and overhangs shall be removed and sharp and brittle edges hammer dressed, if any.

9.3.6 PAY LINE :

The excavation shall be made to the lines, dimensions, side slopes and levels shown on the drawing. Pay line for excavation in all soils and rock including subsequent removal of the extra depth shall be to the dimensions, slopes, grades and levels as shown on the drawing unless otherwise specified.

Payment for excavation done shall be strictly as per designed section or for the section as directed by the Engineer-in-charge. No payment shall be made for excavation done beyond the pay lines shown on the drawing and defined as above unless otherwise specially indicated.

9.3.7 SLIPS :

Slips shall be avoided, but, if any slip occurs on account of nature of soil or due to failure of slopes in the opinion of the Engineer-in-charge, the extra excavation involved shall be properly resorted to restore stability. In such case, payment for necessary excavation and back filling will be made for this extra work under relevant items.

9.3.8 MONSOON DAMAGES :

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

9.3.9 MEASUREMENT AND PAYMENT :

- a) The payment will be made on volumetric basis for the quantities excavated to the required extent. The cross sections shall be taken initially after stripping and before commencement of excavation. Lines, levels and grades of excavation shall be marked for excavation. On completion of excavation, final cross section shall be taken. These sections will be marked on the initial cross sections taken prior to commencement of work. The quantities between initial and final cross sections, the pay lines shall be worked out and paid for. It shall be clearly understood that no excavation beyond pay line will be measured and paid. The rate is inclusive of dewatering and conveyance and disposal of excavated materials in varying leads maximum upto 3 Kms.
- b) Rate for payment :
The rate for the respective items of excavation provides all costs for labour materials, tools and plants, machinery, taxes, drilling, blasting, excavation, transportation and all incidental operation required for carrying out and completing the respective items of work in accordance with specifications drawing and as directed by the Engineer-in-charge including.

- i) Setting out Works
- ii) Site clearance
- iii) Marking out, providing and forming model sections, lock spitting, straining and stakes as may be considered necessary by the Engineer-in-charge to guide the contractor in excavating and depositing.
- iv) All cost of drilling on ripping with all cost.
- v) All safety measures.
- vi) All dewatering of surface and ground water till completion of the work including construction, maintenance and removal of coffer dam with necessary diversion arrangement for allowing excess water in coffer dam.
- vii) Providing temporary ramps and steps at the sites of deep trenches and subsequent removal.
- viii) Transporting the excavated materials mechanically with a variable lead maximum upto 3 Km. and depositing the same on site or work, spoil bank or stacking in stock piles including re-handling for use or final disposal.
- ix) Construction and maintenance of haul roads.
- x) Removal of silt during execution.
- xi) Water applied for pre-wetting in excavation areas.
- xii) All works necessary to maintain the excavation in good order during excavation.

9.4 BORROW AREA :

9.4.1 GENERAL :

All materials required for the construction of the embankment and back fill for cut off trench which are not available from cut off trench excavation or other required excavation, shall be obtained from the designed borrow areas after stripping as shown in drawing or as designated by the Engineer-in-charge in consultation with the field laboratory subsequently.

The limit of each borrow area to be used in the various zones embankment shall be flagged in the field and materials from each borrow area shall be placed only in the zones for which it has been specified.

The depth of cut in all borrow areas will be designed by the Engineer-in-charge and the cuts shall be made up to such designated depths only. Shallow cuts will be permitted in the borrow area if un-stratified materials with uniform moisture contents are encountered. Each designated borrow area shall be fully exploited before switching over to the next designated borrow area. Haphazard exploration of borrow pits shall not be permitted. The type of equipment used and the operation in the excavation of materials in borrow areas shall be such as will produce the required uniformity of mixture of materials for the embankment.

Borrow areas shall not be located within a distance of 10 times the height of the dam from the upstream heel and 5 times the height from the downstream toe of the dam. Borrow pits shall be operated so as not to impair the usefulness or mark the appearance of any part of the work or any other property. The surface of wasted materials shall be left in reasonably smooth and even condition.

No compensation whatsoever for change in limits and location of the borrow areas for getting suitable earth shall be paid to the contractor.

9.4.2 PREPARATION OF BORROW AREAS :

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

Particular care shall be taken to exclude all organic matter from the materials to be placed in the dam, dyke embankment. All cleared organic materials shall be completely burnt to ashes or disposed of as directed. The cleared areas shall be maintained free of vegetable growth during the progress of work.

9.4.3 STRIPPING OF BORROW AREAS :

Borrow area shall be stripped of top soil, sods and any other objectionable materials to the required depth as directed by Engineer-in-charge. The work may be done manually or with suitable machine. Stripping operation shall be limited only to designated borrow areas. Materials from stripping shall be deposited off in exhausted borrow or in the approved adjacent areas as directed.

9.4.4 BORROW AREA WATERING/ DEWATERING :

- a) Borrow area watering will be done where necessary and in the manner considered necessary by the Engineer-in-charge of the work.
- b) The initial moisture content of materials in the borrow area shall be estimated with the help of laboratory test. The optimum moisture content for the material in particular, the initial moisture content and the amount of additional moisture, as decided shall be introduced into the borrow area by watering well in advance of the excavation to ensure uniformity of moisture content.
- c) If, in any location of a borrow area before or during excavation, there is excessive moisture, steps shall be taken to reduce the moisture to secure the material with moisture content closest to optimum by excavating drainage ditches, by allowing adequate time for drying or by any other means. To avoid formation of pools in the borrow areas during excavation operations, drainage ditches from borrow areas to the outlets shall be excavated wherever necessary. The borrow pits shall be excavated to such lines and grades that there is no occurrence of earth slides and shall be so finished as to prevent hazards to persons and livestock's and to prevent conditions favourable for breeding of mosquitoes. No payment shall be made as it is deemed to have been included in unit bid price of schedule of quantities.

9.4.5 STOCK PILING :

Stock piling shall be done at approved locations only. Before any area is used for stock piling, it shall be cleared and stripped of all vegetation and top soil as necessary to prepare the stock pile area.

Stock piling of fill materials by end dumping the materials down a sloping face/ chute shall not be permitted, if, segregation of the materials takes place. No extra payment is admissible for stock piling the borrow earth.

9.4.6 HAUL ROAD & APPROACH ROAD:

Construction and maintenance of approach roads and haul roads will be the responsibility of the contractor. The department will have full right of way to those road for inspection purposes. Proper road signs as directed have to be provided for safety. For haulage of earth, the contractor shall construct ramps and haul roads of sufficient width along the shortest but most practicable route and shall maintain and illuminate them in a satisfactory manner. Watering of the road shall be done by the contractor as often as necessary to prevent raising of dust formation of

cuts and consequent deterioration of the surface. Wherever service roads meant for public thorough fare, traverse through or run close to the borrow area, the contractor shall direct his excavation and haul operation in such a manner as to ensure uninterrupted use of the service roads 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 is admissible, as this is deemed to have been included in the unit bid price of schedule of quantities being contingent to the main work.

9.5 BACK FILLING OF CUT OFF TRENCH

- a) Cut off trench shall be back filled with selected impervious materials of specification desired and compacted as in the same manner as per embankment of the dam. The impervious materials shall be placed in continuous and approximately horizontal layers not more than 15cm. (loose) and compacted by Vibromax roller or any equivalent machinery under optimum moisture content to the required degree of compaction.
- b) Rolling shall be done along the cutoff trench and the roller shall be taken close to the sides of the trench.
In case, where the compaction by rollers is not possible, compaction to the required density shall be achieved such other means as specified by the Engineer-in-Charge.
- c) Each layer shall be compacted to achieve the required dry density of not less than 98% of the maximum dry density (Proctor's density) for the type of material at optimum moisture content.
- d) During placing and compaction of impervious materials in the cut off trench where dewatering is involved, the subsoil water level at every point in the cut off trench shall be maintained below the bottom of the every fill until the compacted fill in the cut off trench at that point has reached a height of 3m after which water level shall be maintained at least 1.5m below the top of compacted fill.
- e) The quantity for payment shall be the compacted volume of cut off trench measured in cubic meters. The unit bid price includes cost of all operations as per specification. The payment for earthwork will be as per dam embankment and payment for compaction will be as per dam compaction. The arrangement of water will be at contractor's cost. (Earthwork payment will be made on finished level section only)

9.6 DAM EMBANKMENT :

9.6.1 GENERAL :

- a) The embankment shall be constructed to the lines and graded shown in the drawing with the homogeneous earth filling having designated parameters of density, cohesion, permeability etc. so as to ensure the highest practicable degree of stability and performance of the whole dam embankment. The quality control organization of the project will carry out requisite tests for the suitability of construction materials well in advance and the contractor shall ensure that only approved materials are brought to place to fill and used for construction of embankment. In case of change of slope and level, also the unit bid price will remain same. Reference pillar shall be constructed near both sides of embankment while construction.
- b) No bushes, roots, sods or other perishable or unsuitable materials shall be placed in the embankment. The suitability of each part of the foundation for placing embankment

materials thereon and of all materials for the use in embankment construction will be determined by the field laboratory.

- c) The difference in elevations of the dam embankment during construction at any cross section shall not be exceed 1.0M unless specially authorized by the Engineer-in-Charge. The placing of layers for the embankment portion programmed for construction in the season shall be continuous and approximately horizontal. In case the whole of embankment is not constructed simultaneously, the incomplete embankment shall be at slope not steeper than 1 in 4.
- d) For proper in bond of the embankment done in the previous season with the new embankment the work shall be carried out as detailed below.
 - i) In case of the old bank to be extended horizontally, it shall be cut to a slope not steeper than 1 in 4 and the surface so prepared shall be scarified and made loose at least for a depth of 15cm. Necessary watering shall be done and the earth surface shall be thus prepared to receive the new embankment. The bank material shall be laid in layers and compacted to the required degree of compaction to have a proper bond with the old one.
 - ii) If the old bank is to be raised vertically, vegetation shall be cleared followed by scarifying, watering and placing of the new earth layers as specified above.
 - iii) The surface which are damaged due to rain be made good by filling with proper soil duly compacted by tampers or pneumatic rammers.
- e) A cross slope away from the centre of fill of about 1 in 80 shall be maintained to ensure proper drainage in event of rainfall.
- f) No extra or separate payment shall be made for these items of work are these re contingent to the main work of construction of embankment and consolidation and deemed to have been included in the item rates.

9.6.2 PREPARATION OF SEAT UNDER EMBANKMENT :

9.6.2.1 No materials shall be placed in any section of the earth fill portion of the dam embankment until the embankment seat for that section has been dewatered, suitably prepared and has been approved by the Engineer-in-Charge. All portions of excavation made for test pits or other sub surface investigation, all holes, hollows and all other existing cavities found with in the area to be covered by earth fill, which extend below the established lines of excavation for embankment seat, shall be filled with suitable earth fill for the embankment and suitably compacted. All test pits within the distance of 10 times of the height of the dam embankment from the upstream toe shall be filled with impervious materials and properly compacted as directed. Pools of water shall not be permitted in the foundation for embankment and such water shall be drained and cleared prior to placing the first layer of fill.

Surface of masonry concrete walls, against which the fill is to be placed shall be cleaned and moistened prior to placing the earth fill. The foundation immediately adjacent to the masonry structures shall be thoroughly cleared of all loose materials and moistened. On sloping ground

benching of size 450mm X 450mm shall be done with slope towards the inside of the benching so as to give good grip to the embankment soil with the sub-grade.

9.6.2.2 FOUNDATION PREPARATION SHALL BE DONE SUBSEQUENT TO STRIPPING AND EXCAVATION

a) ROCK FOUNDATION

The treatment of the rock surface under the dam shall be done as to ensure tight bond between the embankment and foundation. This shall be obtained by the following procedure.

- i) Before the grout curtain is installed, the area of the rock surface which is to be in contact with the earth fill of the dam shall be fully exposed by removing all the loose and D.I. rock leaving the surface of rock rugged. Hard rock projections and overhangs shall be removed. If blasting is to be restored to, care shall taken to avoid objectionable shock to foundation rock and abutments after rough excavation shall be exposed at one time to enable examination of rock surface characteristics and planning the method of treatment.

ii) Cleaning & Shoveling :

After all the preparation are over, the rock surface shall be thoroughly cleaned. Pockets of silt and sand and all other soil be removed by hand shoveling and soft erodable seams and localized cut portion cleaned out as deep as possible. Loose rock shall be removed by wedging hand picking. Layers of grout filled over from grouting operation shall be chipped and removed to the maximum possible extent. The hand cleaned surface shall be wet, sand blasted to clean the rock surface of set grout particles/fines sitting in the seams of rock. In this process, water shall be used along with sand and air under pressure. Air pressure should be maintained at about 6.33Kg/ Square Centimeter for ensuring effective sand blasting. Percentages of difference sizes of sand particles shall be approximately in following range.

<u>Size</u>	<u>Percentage</u>
8 mesh per inch (25.4 mm)	26
16 mesh per inch (25.4 mm)	30
20 mesh per inch (25.4 mm)	23
50 mesh per inch (25.4 mm)	21

Alternatively, the rock surface shall be cleaned with a high pressure water jet cleaning machine having the capacity of developing the operating pressure in the range 50–15 bars (adjustable) with water jet adjustable to deliver 15litrs/min–30litrs/min. It should have a high-pressure nozzle, 10m high pressure hose and heavy-duty couplings. Such machines are available indigenously along with a small sand blasting attachment. Development of this high- pressure water jet along with sand blasting through use of sand (Ordinarily used in cement concrete mix) will ensure excellent removal of the set laitance.

Lastly, the final clean-up shall be done by an air water jet to be applied through an air water gun, by delivering compressed air at 1.70cubic meter/min. at 6.33Kg/cm² water at 270litrs/min.

Contractor shall have adequate number of air water guns.

- iii) SEALING CRACKS : Deep pot holes or pockets shall be filled with hand compacted soil of concrete. If the work surface in the bottom and sides of potholes is cracked, the crack should be sealed with cement grout. If the rock surface contains so many closely spaced potholes, the entire rock surface shall be covered with concrete. A cement paste

may be used in the smaller cracks. Any open crack in the surface shall be sealed with cement grout by suitable means. Fault zones or larger cracks shall be dug out to a depth as determined by the Engineer-in-Charge and back filled with concrete.

- iv) Foundation rock which is fairly impervious but has very rugged surface shall be treated laying embankment materials at a moisture content slightly above the optimum in thin layers and compacted with mechanical equipment and small tampers to ensure that all irregular depressions in the rock surface have been filled with soil to create an effective and complete bond. The moisture content and layer thickness shall be specified by the field laboratory.
- v) The exposed cleaned surface should be covered with a thin layer of mud leaping just before placing the first layer of the embankment fill. Care should be taken that the embankment fill shall be placed before the mud layer is dried up.

b) SOIL FOUNDATION :

Soil foundation under the seal of dam shall be scarified and loosened by means of a plough, ripper or other methods to a depth about 10cms to 15cms 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 embankment. The purpose of using higher moisture than optimum is to ensure forcing of the soil in any unseen soft zones just below the surface. The first few layers of fill for the embankment shall be of depth of 10cm to 15cm and shall be carefully placed, ensuring uniform compaction and satisfactory intimate bond between the foundation soil and fill materials. Heavy rudder type rollers or Vibratory rollers may be used of compaction because they will follow irregular surface and not bridge over shallow low area as other type of rolling equipment will do. No separate payment shall be deemed to have been included in the unit rate quoted in the schedule of quantities.

c) SAND FOUNDATION :

Sand met with in foundation shall be tested for its natural relative density. In reaches where the relative density is less than 70%, the foundation sand shall be compacted by any of 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 re-adjustment in a loose foundation.

9.6.3 EARTH FILL MATERIAL :

The embankment shall be constructed to the top width and side slopes as shown on the drawing. Suitable excavated materials of desired quality available from cut off trench, prod cutting, heel trench, toe drain and vertical chimney shall be used for construction of embankment. If suitable & adequate material for constructing embankment is not available from excavations, the desired balance material shall be obtained from borrow areas designated for the purpose as per the instructions of the Engineer-in-Charge. Clayey materials shall be placed in the cut off trench.

Only suitable materials as per specification shall be excavated, loaded and conveyed to the point of placement in the embankment. Unsuitable material, if conveyed will be removed and thrown outside the embankment as directed. Stone pebbles and rock fragments etc., placed in embankment shall not be more than 7.5cm. and the quantity of such stone shall not exceed 5%.

9.6.4 PLACING EARTH FILL:

- a) The embankment shall be constructed with homogeneous earth fill of required materials as per drawing and specification. The fills shall be from lenses, pockets, steaks or layers of materials differing substantially in the texture or gradation from the surrounding materials.
- b) Construction of embankment shall begin at the toe of the fill and in no case, shall embankment be widen by material dumped from the top. The materials shall be placed in the earth fill in the continuous horizontal layers, not more than 15cm. or 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 by carrying out trial compaction shall not be more than 10cm. if compaction is performed by mechanical tampers, not more than 15cm by sheep foot roller and not more than 30cm, if compaction is performed by vibratory or pneumatic rollers or similar equipment. Initially the earth in the embankment fill will be laid in a greater width than the design section. Adequate extra width of about 1m on U/S and on D/S side, shall be provided so that the earth fill up to the lines of the finished dam slopes, shall have the required compaction as per the drawing & specification. Such extra width shall be removed and utilized in the upper layers of embankment along with slope as per drawing for which no additional payment will be made as it is deemed to have been included in bid price.
- c) No fresh layer shall be laid until the properly watered and compacted as per the requirement. If in the opinion of Engineer-in-Charge the surface of the prepared foundation or the rolled surface of any layer of earth fill is too dry or smooth to bond properly with layer of materials to be placed there on, it shall be moistened or worked with harrow, scraper or other suitable equipment in a approved manner to a sufficient depth to provide a satisfactory bonding surface before the next succeeding layer of earth fill materials is placed if the rolled surface of any earth fill is found to be too wet for proper compaction of the layer of earth fill materials to be placed there on, it shall be raked up and allowed to dry or be worked with harrow, scraper 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.
- d) The materials shall be deposited in row parallel to the dam axis and spread into uniform layers and breaking clods maximum up to 5cm. to 7cm. Loads shall be dumped and spaced so that the progress of spreading shall produce adequate blending resulting in uniform layers not exceeding 45cm. The work of spreading and compaction shall be 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 & watering. The excavation and placing operations shall be such that the materials when compacted shall be blended sufficiently to secure the best practicable degree of compaction, impermeability and stability. If the work is held because of non-completion of rolling and watering or if the work is held up due to failure of machinery, no claim what so ever will be entertained even in case the machinery is supplied by department. The surface of banking shall at all time of construction be maintained true to required cross section.
- e) During construction, a small transverse slope from center towards edges should be given to avoid pools of water forming due to rains.
- f) When compacting the soil against the rock abutment or walls or masonry or concrete structures, the construction surface of the embankment shall be sloped away from the rock or masonry/concrete structures for a distance of 2.5m. to 3.5m. at an inclination of 6:1 or steeper. If the foundation surface is too irregular to allow the use of large roller directly against the structure or rock out crop, the roller shall be used to compact the soil,

as close to the directly against structure or rock out crop, the roller shall be used to compact the soil, as close to the directly against the rock or the structure shall be compacted with pneumatic hand tampers in thin layers. The moisture content of the earth fill placed against the rock or the structure shall be slightly above the optimum to allow it to be compacted into all irregularities of the rock and this shall be determined by the field laboratory. In placing the earth fill under rock foundation, the foundation shall first be prepared as detailed earlier.

- g) Care shall be taken in placing the first layer to the fill above the filter layer so that no damage is caused by the hauling machinery which will get concealed by the spread layer of fill. Vibromax rollers shall not be employed for compaction till the thickness of the layers compacted by other means is greater by 30cm than the teeth of the roller drum. The soil for the first layer shall be at moisture content sufficient to enable satisfactory bonding of the fill with the filter surface.

9.6.5 WEATHER CONDITION:

- a) Embankment materials shall be placed only when the weather condition are satisfactory to permit accurate control of the moisture content in the embankment materials. Before closing work of an 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.
- b) 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 works to protect the slope from erosion due to rain water or rectifying any monsoon damages.

9.6.6 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 needle moisture determination of soil shall be carried out as per designation of USBR/Earth manual (July 74, second reprint 1985 and IS 2720 – 1983).

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

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

9.6.7 COMPACTION :

9.6.7.1 GENERAL :

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.

Having decided on the thickness of layer and range of moisture contents, tests should be made with different type of equipments available, and the required number of passes should also be determined.

In all this work, the state of compaction should be measured in terms of dry density.

Density test 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.

Density test shall be conducted from time on site to ascertain whether the compaction is attained as specified. For every 1500 cum 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 as to obtain the specified density which will be checked again by taking fresh tests at the same locations. Each layer shall be tested after rolling for proper compaction and after that fresh layer over it will be allowed. Necessary un-skilled labour required for carrying out such density tests shall be provided by the contractor. However, testing charges shall be borne by the department.

The contractor shall supply all materials, labour, machinery and equipment at his cost as directed by the Engineer-in-Charge for the work. No extra payment shall be made for these operations as this shall be deemed to have been included in the price bid in schedule of quantities for the item of compaction.

9.6.7.2 COMPACTION EQUIPMENT :

Compaction shall be done by mechanical compactors, standard Vibromax roller hauled by tractor or any standard approved equipment to achieve the require density. While the specification below provide that equipment of particular type and size is to be furnished and used, it is contended that the use of improved compaction equipment shall be encouraged as may be most suited to the prevailing site conditions and programme for construction.

Tampering rollers used for compacting earth fill shall confirm to the following requirements.

- i) **Roller Drums** :- Double drum sheep foot roller shall be used for compaction. Each drum of a roller shall have an outside diameter not less than 142.25cms (56 inches) and shall not be less than 122cms (48 inches) in length. The space between two adjacent drums when on level surface shall not be less than 30cms (12 inches) and not more than 38cms (15 inches). Each drum shall be free to pivot an axis parallel to the direction of travel.
- ii) **Tamping feet** :- The total number of feet drum shall be 88cms. At least, one tamping foot shall be provided for 867cm² (150 sq inches) of the drum surface area. The length of each tamping foot from the drum shall be maintained at not less than 18cms. The cross sectional area bearing surface area of each tamping foot shall not be less than 25.30 Sq. cm not more than 64.5 Sq. cm at place normal to the axis of shank 15cm from the surface.
- iii) **Roller Weight**:- The weight of the roller when fully loaded shall not less than 20,000Kgs and the ground pressure when fully loaded shall not be less than 40Kg/cm². The loading used in the roller drum shall be required to obtained the desired compaction. Tractor used for pulling rollers shall be 165 HP to 210 HP capacity. It pulls the rollers satisfactorily at a speed of 4Kms/Hr. when the drums are fully loaded with wet sand blast. During operation of rolling, the space between the

tamping foot shall be kept clear of materials sticking the drum which could hamper the effectiveness of the tamping roller.

Vibromax roller of standard approved specification shall be used for compacting earth fill.

9.6.7.3 ROLLING :

When each layer of materials has been prepared so as to have the proper moisture content uniform distributed through the materials, it shall be compacted by passing the tamping roller. The exact number of passes for each layer to obtain specified density shall be designated by the field laboratory after necessary test. The layer shall be compacted in strips overlapping not less than 0.6m., rolling shall commence at edges and progress towards center longitudinally. The rollers of load vehicles shall travel in a direction parallel to the axis of the dam. 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 which shall satisfy the compaction standards specified in criteria attached. Standard proctor density tests shall be carried out at regular intervals to account for variation in the borrow area materials as well as that in site excavated material. The locations where compaction of the earth fill material by means of the roller is impracticable or undesirable., the earth fill in such locations shall be specially compacted as specified in para 3.6.7.4.

Earth fill shall be spread in layers not greater than 45cms in thickness when loose, and shall be moistened to have the required moisture content in accordance with paragraph 3.6.6 when each layer of materials has been conditioned to have the required moisture content it shall be compacted to specified density by mechanical compactor like vibromax roller hauled by dozer tractor and such other standard approved equipment. All equipments and methods used shall be subjected to approval based on evidence of satisfactory performances and field compaction tests. The moisture control and compaction shall be equivalent to that obtained in the earth fill actual placed in the dam embankment in accordance with para 3.6.6 and 3.6.7.

9.6.7. 4 TAMPING:

Rollers will not be permitted to operate within 1.0 metre of concrete and masonry structures. In the following where compaction of the earth fill materials by means of roller is impracticable or undesirable, the earth fill shall be specifically compacted as specified below.

- i) Portions of the earth fill in dam embankment adjacent to masonry structures and embankment foundations designated on the drawing as specially compacted earth fill.
- ii) Earth fill dam embankment adjacent to steep abutments and
- iii) Earth fill at locations specially designated
Earth fill shall be spread in layers of not more than 10 cm. in thickness when loose and shall be moistened to have conditioned to have the required moisture content, it shall be compacted to the specified density by special rollers, pneumatic/ hand tempers or by other approved methods. The moisture control & compaction shall equivalent to that obtained in the earth fill actually placed in the dam embankment in accordance with the specifications.

9.6.7.5 COMPACTION OF COHESIONLESS MATERIALS:

- a) Where compaction of cohesion less free-draining material such as sand and gravel is required, the materials shall be deposited in horizontal layers and compacted to the relative density specified in drawings. The excavating and placing operations shall be such that the materials, when compacted, shall be blended sufficiently to secure the highest practicable unit weight with degree of compaction and stability. Water shall be added to the materials, as may be required to obtain the specified density depending on the method of compaction being used.

- b) The thickness of the horizontal layers after compaction shall not be more than 10cm. if compaction is performed by tampers, not more than 15cm by 8 to 10 tonnes rollers and not more than 30cm if compaction is performed by vibratory or pneumatic roller or similar equipments.

9.6.7.6 DRESSING SLOPE :

The outside slopes of the embankment shall be neatly dressed to lines and grades as shown in the drawing as the placing of fill progress compaction shall extend over the full width of the embankment, and materials in slopes shall be compacted as for the rest of the bank. To ensure proper compaction at 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.

All humps and hollows varying more than 300 mm. and 150 mm. respectively from the pay lines of the embankment as shown on the drawings shall be regarded. Material used to fill depressions shall be same type as used in the dam and shall be thoroughly compacted and bonded to the original surface slope shall be maintained until final completion and acceptance. Any material that is lost by rain, weathering or other causes shall be replaced at the cost of the contractor till completion of the works and taking over by the department.

9.6.8 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 dam will not be increased to maintain the design slopes indicated in the drawing for the additional height as settlement allowance. But the following procedure will be adopted. Settlement allowance will be calculated at various levels where the slopes is to be changed and the elevations including settlement allowance will be derived, keeping the embankment widths at the designed levels unchanged.

The edge of the embankment at the increased elevations (including settlement) when joined with the point where the slope has changed earlier, below shall give the slope to be adopted for construction.

If the embankment is raised in more than one season, provision for settlement shall be made in the last seasons construction as described above.

9.6.9 SPECIAL PRECAUTIONS :

- a) During the actual construction of any earth work, maximum use should be made of construction plant and routing of the plant should be carefully controlled to obtain uniform compaction over as wide an areas as possible. Care should also be taken during the compaction operation to shape the surface of the works to facilitate the shedding and to minimize the absorption of rain water, particular attention being given to the prevention of ponding of water. The contractor shall do this at the end of each day's work.
- b) The earth moving machinery shall not be allowed to pass over a compacted portion of the embankment beyond certain limits by varying the hauling routes and ramps, thus ensuring that over compaction does not take place in any particular reach.
- c) During the construction, a small transverse slope from centre towards the edges shall be given and further in the reach when back is being raised , the works shall be tackled in continuous horizontal layers to avoid pools of water and concentration of allow of water during rains, which will cause damages, scours and rain gullies.
- d) Special precautions shall also be taken while rolling the spread soil near structures, conduit, sluice barrels, filters, rock toes at the junctions of bank connections with the structures, using hand or power tampers. It is essential that the compaction of filling should be carried, out in such a manner as to avoid an unbalanced thrust on walls etc. which might displace or damage it. The equipment shall be provided with suitably shaped heads to obtain the required density.

9.6.10. MEASUREMENT AND PAYMENT :

9.6.10.1 MEASUREMENT :

CONTRACTOR

SENIOR MANAGER (CIVIL)

- a) All work shall be measured by levels.
- b) For payments the level books, field books, the cross section sheets and calculation sheets shall be treated as adjuncts to the measurement books.
- c) All linear measurements shall be in metres, correct to 0.01 meter and volume workout in cubic metres correct to 0.01 cubic metres.
- d) The quantities between the level taken after stripping and cross sectional levels taken after construction of consolidated embankments under OMC conditions with the available useful excavation soils within the pay lines shall be worked out excluding rip-rip, rock toes, vertical chimney, filter and filter blankets, it shall be clearly understood that construction of embankments to extra widths as specified in para 3.6.4(b) and extra height formed for shrinkage allowance as specified in para 3.6.8 will not include 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 embankment constructed with the suitable materials from all excavations as specified above and in earlier paragraph.
- f) Final measurement and level shall be taken at the cross sections specified in para 3.1.3 of the completed compacted dam design section after the slopes dressed to ensure that the work is completed as shown as the drawing plus the settlement allowances. The measurements for computation of quantities shall not include the extra section provides as per sub-para 3.6.4(b) and 3.6.8. The quantity of the compacted materials utilizing from borrow area shall be worked out on basis of cross sectional area to the pay lines and the distance between the cross section.

9.6.10.2 RATE FOR PAYMENT :

The rate for dam fill provides all cost of labour, materials, tools and plants, carrying out and completing the item of work in accordance with the specification, drawing and as directed by Engineer-in-charge including.

- a) Site clearance of borrow areas.
- b) Setting out works
- c) Cost component of construction and maintenance of coffer dam with diversion arrangements for allowing to flow the excess water in coffer dam and removal of same after completion of the work.
- d) Cost of stripping of borrow area.
- e) Scarifying and benching etc.
- f) Marking out, providing and forming model section, lock spitting, string and stacks as may be considered necessary by the Engineer-in-charge to grace the contractor in embankment construction.
- g) Maintaining borrow area from vegetation growth, arrangement and moisture control including watering.
- h) Loading, conveyance from designated borrow area, unloading and spreading of suitable fill material including re-handling.
- i) Construction and maintenance of approach roads and haul roads.
- j) Restricted working near sites of structures.

- k) Settlement allowance as per para 3.6.8
- l) Spreading in thinner layers at required places.
- m) Removal of unsuitable materials like bushes, roots, sods, other perishable materials and pebbles etc. from the fill materials.
- n) Providing labour for testing of samples.
- o) The department might review the necessary design on examination at density test results and the contractor shall have no claim arising out of such a review and consequent change if any, in the design.
- p) All safety measures.

9.6.11 MEASUREMENT FOR PAYMENT (COMPACTION):

9.6.11.1 MEASUREMENT:

The measurement will be on volumetric basis for the earth fill arrived from level sections taken after stripping and after compaction under OMC within the pay line after deducting the volume of rip-rap rock toe, filter and filter blankets etc. As specifications and conditions for earth fill will apply for arriving at the quantity for payment but the volume of compacted earth excavated for vertical chimney of schedule of quantity shall also be included in the measurement.

9.6.11.2 RATE FOR PAYMENT:

The rate for compaction of embankment provides all costs for labour, materials, tools and plants, taxes equipment and all incidental necessary to complete the compaction to specification requirements and drawings and as directed by the Engineer-in-Charge including

- (i) All necessary arrangements for conveyance for water, watering including coffer dam and pipe lines etc.
- (ii) Spreading in thin layers at required places
- (iii) Compaction with suitable compactors other than Vibromax roller at required places.
- (iv) Restricted working at required site and working narrow width of the embankment.

9.7 TOE DRAIN :

9.7.1 GENERAL:

Pitched toe drains will be provided through out the length at the downstream toe of the earth dam as indicated in the drawing and as per the detail shown therein. Excavation and paying shall be carried out to the required size and grade as shown in the drawing therein. The specification of quarried hard granite stone to be used shall be hard, durable and good of approved quality.

9.8 FILTER, RIP-RAP AND ROCK TOE :

9.8.1 FILTERS :

- (a) Horizontal filter shall be laid on the foundation in the downstream portion of the earth dam, under the rock toe. Horizontal filter blankets in the upstream portions at 4.0m (at

.....) intervals as shown in the drawing. Number of layer in the filter blankets, thickness of each layers and specification of individual items shall be as specified in the drawing. However, the Engineer-in-Charge may change the thickness of layers of different materials during construction, if required for which no claim what so ever will be entertained.

- (b) Horizontal filter, filter blankets and vertical chimney shall be composed of layers of sand only. The filter of rock toe, toe drains and upstream rip-rap comprises of sand & crushed aggregates as shown in the drawing and shall satisfy filter criteria.

The filter materials shall not be placed until sub-grade has been inspected and finally approved by the Engineer-in-Charge. It shall be ensured that the surface over which the filter is to be laid has been well consolidated to not less than 96% of standard proctor density. The graded filter consisting of aggregate and sand layers shall be laid such thickness and line and grade and specification as shown in the drawing. Sand will be placed & tamped into place in such a manner that mixing of sand with foundation or back fill material will not occur.

- (c) The graded aggregate should be so placed that the smaller sizes of it should be adjacent to the sand layer to avoid intrusion and so as to provide a suitable transition from sand to rock fill material. No compensation whatsoever will be due to Contractor for intrusion of aggregate and sand into coarser layer of materials.

- (d) The filter materials shall consist of clean, sound and well graded sand with tentatively specific gravity 2.6. The finest modulus should be greater than 2.4 % size and bulkage less than 5% and not over than 20% (IS Code -1498-1970) & clean well graded crushed rock. The materials shall be free from debris, brush wood, vegetable matter, decomposed rock and other deleterious matter. The fine materials shall be laid next to the earth work to be followed by progressively coarser materials so as to form a graded filter.

The materials shall be laid in layers not exceeding 15Cm in thickness. The number of layer, the thickness of each layer and size of ingredients shall be as per final design based on laboratory test for which no claim whatsoever from Contractor will be entertained. The gradation of each filter layer shall need the following requirement to satisfy the filter criteria with respect to the materials to be protected and also with respect of adjacent.

Filter material sand shall be compacted to an average relative density of 85% with a minimum relative density of 70%. The filter materials should satisfy the following criteria.

A) Applicable to vertical chimney and horizontal filter.

- i) $\frac{D_{15} \text{ of Filter material}}{D_{15} \text{ of base material}} > 4 < 20$
- ii) $\frac{D_{15} \text{ of Filter material}}{D_{85} \text{ of base material}} < 5$
- iii) $\frac{D_{50} \text{ of Filter material}}{D_{50} \text{ of base material}} < 25$
- iv) Co-efficient of curvature $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} \geq 1 \leq 3$
- v) Co-efficient of uniformity $C_u = D_{60} / D_{10} \geq 6$ for SW & ≥ 4 for GW

SW- Sand well graded
GW- Aggregate well graded

Sand as filter should satisfy either terzaghi's filter criteria as mentioned above or criteria suggested by ISSMFE (International Society of Soil mechanics and Foundation Engineering) as follows:-

$$\frac{D_{15}(F)}{D_{85}(B)} \frac{D_{15}(F)D_{60}(F)}{D_{15}(B)} \frac{D_{85}(F)}{D_{10}(B)} \frac{D_{50}(F)}{D_{50}(B)} \frac{D_{35}(F)}{D_{35}(B)} < 5$$

F= Filter material i.e., Sand.

B= Base material i.e., Soil (foundation and embankment)

There should be frequent periodical check up during construction to ascertain the quality of sand to fulfill the above filter criteria.

The percentage being determined by weight after mechanical analysis.

(e) For filter material under U/S rip-rap

- i) D85 of filter material should not less than 1/10 D15 of rip-rap materials.
- ii) D15 of filter material should not greater than 5x D85 of embankment materials.

Where D10, D15, D30, D50, D60 & D85 represent the particle sizes at which 10, 15, 30, 50, 60 and 85% of total particles by weight are finer respectively.

- f) Chimney filter criteria is same as base filter.
- g) The gradation curve of the filter material shall be nearly parallel to the gradation curve of the Base material.
- h) The filter material does not contain more than 5% of the materials finer than 0.075 mm (Passing through IS sieve No.200).
- i) The maximum size of particles in filter material does not exceed 75 mm.
- j) If more than one filter layer is required, the same criteria are to be followed.
- k) The requirement for the grading of the filter shall be established by the field laboratory on the basis of mechanical analysis of adjacent materials. Mechanical analysis shall be performed on samples which have been compacted by methods equivalent to compaction by rollers so that individual particles of decomposed rock are broken down to their real condition in the embankment.
- l) Following tentative gradation is indicated for the graded gravel/aggregate it shall however, have to be precisely determined by laboratory tests so as to satisfy the filter criteria.

<u>Sieve Size</u>	<u>Percentage Passing</u>
80mm	100
40mm	97 to 56
25mm	84 to 24
10mm	64 to 8
4.75mm	25 to 1

- m) The material brought by the contractor to the site shall subject to the aforesaid test in the laboratory at the project site. The results thereof shall be final and binding. All materials

not confirming to the requirement so determined shall not be permitted for use on the work.

- n) Sand as filter material shall consist of clean sound well graded sand. It shall be free from debris. Silt and clay contents shall be less than 5%.(IS. 1948 – 1970)
- o) The gradation of filter materials and thickness of layers is tentative as shown in plan and may require modifications during actual execution. The contractor shall carry out such modifications without any extra cost.

9.8.1.1 PLACING :

The placement of the graded filter materials shall not be done at any part of the dam until such surface has been duly approved by the Engineer-in-charge. For the foundation the same shall be cleared stripped etc. As specified in earlier paragraph. For rip-rap the compacted embankment shall be trimmed neatly to the slope and graded indicated in the drawings. For chimney the cutting should be done to the dimensions of the drawings.

The filter shall be laid in horizontal layers not exceeding 15cm thickness saturated with water and shall be light rolled by light roller or by passes or chain tractors or by approved type of compactors. The thickness of filter layer could be increased to 30cm if compaction is performed by treading crawler type tractor surface vibrators or similar approved equipments. The thickness of layer shall however not be more than the penetrating depth of the vibrators if compaction is performed by internal vibrator. The work of laying filter shall proceed side by side with the earth work and rock toe care to be taken to see that filter materials do not mixed up with the soil from adjoining layers and within the filter layers of different gradation of multi layer filter required to be provided. The placing of filter is such that segregation is prevented.

In case of inclined filter, the filter shall be raised along the adjoining embankment layers and shall be properly compacted by suitable means. In order to avoid contamination of filter with adjoining earth fill material, the top of filter be kept slightly higher than the adjacent embankment level and any contaminated portion shall be scrapped and removed before adding the new layers.

During or immediately prior to compaction, the material in each layer shall be thoroughly wetted. The filter materials shall be compacted to an average relative density of 85% with minimum relative density of 70% as determined by the standard U.S Bureau of Reclamation (Relative density test for cohesion less free draining soils).

$$R_d = \frac{e_{\max} - e}{e_{\max} - e_{\min}} \times 100$$

Where 'e' = void ratio at the state of compaction

E max = void ratio in loosened state

'e' min = void ratio in most compacted state and

$$\text{void ratio} = \frac{\text{Volume of Voids}}{\text{Volume of solids}}$$

The relative density may also be computed using the maximum and minimum density as follows.

$$R_d = \frac{Y_d - Y_{d \min}}{Y_{d \max} - Y_{d \min}} \times 100$$

Where Y_d Max = Maximum dry density of soil as obtained by the laboratory procedure

Yd min = Minimum dry density of soil as obtained by the laboratory procedure

Yd = The dry density of the soil in its compacted state.

Extreme care shall be taken in placing materials, in the filter zone so as to obtain free from lenses, layers or streak of graded materials. After Compaction for the filter blanket, the earth fill materials shall be placed in 10cm layers and tamped by hand at optimum moisture, and compacted by smooth rollers or poser compactor as directed to thickness or 60cms over the filter blanket. Use of sheep foot rollers for this work is prohibited. However the compaction for earth fill in the initial 60cms thickness shall be subjected to the same quality control regarding to moisture content and dry density as for the rest of the embankment.

9.8.2 CHIMNEY FILTER:

The vertical chimney filter with sand only of the dimension and specification of drawings shall be constructed after excavation of compacted earth fill on the downstream of the axis the dam to the levels dimensions and specification. The thickness of layers of the chimney filter shall be as shown on the drawing. The specification of sand packing and compaction shall be as described in para 3.8.1 and 3.8.1.1 above. The sand should be compacted to an average relative density of 85% with a minimum relative density of 70%. The work shall be carried out in one meter vertical lift. The top of compacted surface (filter layer) shall be covered with impermeable. B.P. Sheets or G.C.I. sheet or any other suitable materials where upon the embankment shall again be built to a height of about one meter and the process of construction shall be repeated so as to have a continuous filter layer. No extra cost for covering filter material by BP sheets or GCI sheets for the above operations of laying filter in the vertical chimney will be paid as the same is deemed to have been included in the unit bid price for the filter items. During the entire period of above operation the contractor is to plan and take all precautions to avoid hazards to the work and workmen.

Each layer of sand filter in vertical chimney of about 1m depth shall be carefully covered with impermeable BP sheets or any other suitable materials as approved by the Engineer-in-Charge to avoid intermingling of overlaying soil particles. The covering sheets shall be removed after excavation of the over laying compacted earth fill of 1m depth for re-use.

9.8.3 GRADED FILTER UNDER RIP-RAP/ROCK TOE :

9.8.3.1 Graded filter shall be constructed under near the rip-rap on the upstream and downstream slopes of embankment as indicated in the drawings and specification.

The graded filter shall consist of sand and crushed stone as shown in the drawings. Sand used shall be clean, sound and durable and shall be free from silt, roots, brush wood and other impurities. Sand used in the filter shall be of size passing 5mm. Screen, crushed stone used for filter shall consist of rock fragments reasonably well graded up to 15cms in maximum dimensions. These should also satisfy the filter criteria as given in para 3.8.1 and 3.8.1.1.

9.8.3.2 PLACING FILTERS UNDER RIP-RAP :

Before the first layer of filter material is placed the embankment shall be trimmed neatly to the slope and grades indicated in the drawings. The filter material shall be taken to avoid segregation of coarse and fine materials in each layer formation of pockets and mixing of materials from one layer with materials of another layer of earth fill, the specification for inclined filter will be applicable here.

9.8.4 RIP-RAP ON THE UPSTREAM SLOPE OF EMBANKMENT :

- 9.8.4.1 Rip-Rap shall be hand placed on the upstream slope of the embankment over the graded filter. The thickness, dimensions and specifications of rip-raplayer shall be as indicated in the drawing. The thickness shall be measured normal to slope of the embankment.

The rip-rap material shall consist of the most durable rock against fragments shall be dense, sound and resistant to abrasion, and shall be free from cracks, seems and shale particles, conglomerate bands and resistant abrasion, and other defects that would tend to increase unduly their susceptibility to destruction by water and weathering action. The shape of the individual rock fragments shall be angular. Fragments having thickness less than 50% of their maximum dimensions shall not be used as rip rap. The individual stones (for at least 50% of the surface) laid in rip-rap would weight atleast 75Kg. These stones shall be evenly distributed over the paved area. No stone shall have any dimension less than 3cm. At least 10% of the surface shall be with stones which are 45cm. in depth. The stone shall be placed on edge with the longer dimension normal to the slope. Rock fragments shall be tightly driven into the interstices to wedge the rip-rap in place and close direct opening to underlying slope stones shall be laid in a compacted manner beginning at the bottom of the slope. The surface shall be finished to line and slope including fixing of wave breakers as shown in the drawing and as directed by Engineer-in-Charge. A tolerance of 75mm plus and 50mm minus in the thickness of rip-rap may be permitted.

Rip-rap shall be placed along with the fill so that a minimum of breakdown will occur during placing & spreading.

9.8.5 ROCK TOE :

- a) The rock toe shall be constructed over the base filter to the dimension of the drawing and specification. The material of rock toe shall consist of the most durable rock fragments of approved quality selected for the purpose.
- b) The quality of rock fragmented shall be dense, sound and resistant to abrasion and shall be free from cracks, seems shale particle, conglomerate bands and other defects that would tend to increase unduly their susceptibility to deterioration by water and weathering action. The shape of individual rock fragment shall be angular. Stones of sizes less than 0.028cum shall not be used in the rock-toe. The rock toe shall be constructed of rock fragments obtain from the excavation for permanent construction and from rock surface, if necessary. The rock fill materials shall consist of rock fragments reasonably well graded and cleaned as determined by the Engineer-in-Charge up to the maximum size available stones.
- c) Successive loads of materials shall be dumped so as to secure the best practicable distribution of material as determined by the Engineer-in-Charge. To the extent practicable the large fragmented shall be placed next to the inner portion of the dam embankment. Rock fill shall be placed in approximately horizontal layer not exceeding 90 cm in thickness. The rock fragment shall be dumped and roughly leveled and hand packed in manner to have reasonable uniform surface and to ensure that the completed fill will be stable dense and well graded and there will be no unfilled spaces within the fill. The voids between the bigger stones after rough leveling shall be filled with rock fragments of smaller sizes only in quantity enough to fill up the voids. The material shall be selected and placed in such a way that larger stone shall be placed nearer the outer slope and the smaller ones to inner slope.
- d) The exposed surface of the rock shall be neatly finished confirm the designed lines and grades as shown in the drawings.
- e) Stones of smaller size shall be laid next to filter layer. The filter materials and stones shall be laid simultaneously I regular layers to the designed slope and width. However, the rock fill shall be placed and packed to obtain a suitable well-graded and free draining fill.
- f) The smaller rock fragments shall be placed adjacent to the filter of embankment and large rock fragments near the outer edge of the fill.

- g) The rock fill shall be placed and roughly leveled in layers not greater than one meter in thickness. The stones shall be properly hand packed and the inter slices shall be well filed with spells and chips and tightly welded to ensure firm packing so as to have dense, well graded fill with no larger voids and cavities.
- h) Contamination of rock toe with finer material from any other zones shall be avoided.
- i) Suitable out fall for draining out the seepage water collected in rock toe shall be provided depending upon the site conditions
- j) The rock toe zone as shown in the plan is tentative, if required modification may be done during execution of the work. The contractor shall do the work according to such modifications as per the instruction of the Engineer-in-Charge without any cost. The contractor shall collect materials for filters, rip-rap and rock toe from the approved quarry or from alternative sources which shall meet the requirements of specification as per the direction of Engineer-in-Charge. The material should be approved prior to being brought to site of work. The material for filter should be brought by contractor to the aforesaid test in the laboratory. The results there of shall be final and binding. All materials not confirming to requirement and specifications so determined shall not be permitted for use in the work and shall be removed by the contractor at his own cost.

9.8.6 MEASUREMENT AND PAYMENT :

- a) Sand: Measurement of quantity of sand, for filters or chimney filter, horizontal filter blanket, upstream/downstream toe, it has been laid and compacted in proper position to line and grade as shown in the drawing on approved surface will be volumetric basis based on initial and final levels before and after laying of materials duly accepted by the contractor on level book and graph sheet on 15m grid or closed as per site conditions taken concurrent points. The payment will be restricted to the quantities within the pay lines as shown in the drawings.
- b) No compensation for intrusion of sand in to the other filter materials and vice versa will be paid. These items shall be paid on quantity basis for the cubic contents of finished work at the rate quoted in schedule of quantities.
- c) The net bid price includes the collection, transportation, loading and unloading, spreading, watering, compaction, tempering, dewatering, all labour, materials, materials, taxes and royalties, tools, equipment, and all incidentals operations necessary to complete the work as per specification and direction of Engineer-in-Charge.
- d) Stone and aggregates: Measurements and payments for quantity of aggregates will be taken in the manner detailed in the para 3.8.6 above. No void will be deducted on the measurement thus made.

9.9 VERTICAL CHIMNEY EXCAVATION :

Excavation of compacted earth in the vertical chimney shall be as per dimension of the drawing. Excavation may be done mechanically within the dimensions and no over cut will be due for payment. The material so excavated in layers of about 1m in height shall be relevant in the construction of dam embankment as per specification in relevant para. The contractor should make arrangement to prevent surface water running into vertical chimney excavation.

Payment will be made only for the cutting operation within the pay line as per drawing. No extra payment for carriage will be made as the same is deemed to have been included in the unit bid price of earth fill.

9.10 FINE DRESSING AND TURFING ON THE DOWNSTREAM SLOPE :

The downstream slope of the dam as per line grades and dimension 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 raked evenly without any additional cost. The entire surface shall then be covered with a layer of dry 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 5cm. 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 or blocks of sods shall be laid in the slope of close contact and then tamped firmly in place so as to fill and close joints between the blocks, interval between the 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 moistened and if necessary, for a sufficient period to re-establish the plant growth. Slopes shall be transplanted generally from July to November. Arrangement of suitable sods is the responsibility of the contractor.

The unit bid price shall be for the finished item including the collection, transportation within 5kms. lead, all lifts and delifts, unloading, surface preparation, transplanting, tamping, watering till survival of sods, all labour, material, taxes, equipment and all incidental operations necessary to complete the work as per specification and direction of Engineer-in-Charge.

9.11 INSPECTION AND TESTS :

9.11.1 GENERAL:

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

9.11.2 SLOPE OF TESTING INSPECTION REQUIRED:

Field control of fill materials will require visual and laboratory checks. The check on the effectiveness of placement and compaction procedure shall be made by field density test at prescribed intervals. The control shall be both of the method type and on end result basis.

Department might review the design if necessary on examination of density test results and the contractor shall have no claim arising out of such a review and consequent changes if any, in the design and method type and on end result basis.

9.11.3 EMBANKMENT TEST SECTION:

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

- i) Layer thickness of fill materials
- ii) Optimum practicable moisture content
- iii) No. of passes of sheep foot roller/ vibratory roller for effective compaction
- iv) For pneumatic tyred compaction equipment, the test required will be such as to determine the most suitable loading. Tyre pressure, moisture contents and number of coverage for compaction of materials.

When an appreciable change in materials occurs, additional test sections should be made during construction. The procedure for construction of test embankment section is as follows:

- a) Select a location on the embankment where uninterrupted placing operations are being performed. This area (15m by 30m) should be fully marked and reference so that its limits will be easily recognized in order to expedite the determination of moisture content to be used more than one test sections may be established on the embankment at the same time.
- b) During construction of test section which will most probably continue for several shifts, a complete record of the procedure should be kept, this record should include the number of layers placed, the spread thickness of each layer, the moisture content at which the material are rolled, the designation (No.1, No.2 etc) of the rollers used, the condition of the roller (clean or dirty), the section of the material being rolled (such as wavy under the rollers, the amount of penetration of the rollers' teeth after different number of roller trips etc.) and borrow pit locations from which the materials are brought.
- c) Check the rollers to make certain that they meet all the requirements of the specifications.
- d) Determine the required spread thickness of layer that will be completed to the specified thickness after rolling, specified numbers of times and maintain the thickness along as number of roller passes is kept the same.
- e) Using the available data from borrow pit investigation of the materials to be used in the test section, the optimum moisture content as determined by the laboratory test will be known and 3% less than this moisture content should be used in the first 3 or 4 layers rolled.
- f) After 3 or 4 layers have been placed at 3% less than the laboratory optimum moisture content, field density test should be made throughout the section. These tests should be made for atleast 100 Sqm. of test section area and should be so disturbed over the area that they will depict the effect of different compaction condition encountered during construction. For example, if the section is located near an abutment, certain part of the area will receive more compaction from tract travel than other, hence some test should be made in the portion compacted only by the rollers and so reported.
- g) The next step is to compact another 3 or 4 layers at the moisture content slightly higher (1% or 2%) than the moisture content previously used, maintaining the same rolled thickness of layers and number of roller passes as in above Field Density test are again made over the test section.
- h) If the resulting field dry density (of material passing the No. 4 sieve) from (g)-above show an increase, with increase of moisture, then increase the moisture again by another 1% or 2% and repeat the test. If an increase in moisture results in 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 a certain roller thickness of layer and given number of roller trips if special studies during investigation have indicated that the material being test should be placed within certain moisture limits to be used have been specified, the procedure outlined above should include test at these moisture contents or at moisture contents both greater and smaller than the specified limits.
- i) The roller compaction curve is now compared with the standard laboratory compaction curve, if the field density of the materials passing the No-4 sieve (from the roller curve) is greater than the standard compaction density at the specified moisture content, the test section should be continued decreasing the number of roller trips while maintaining

specified desirable moisture content until the most economical compactive effort is determined. when the roller trips are decreased, the required spread thickness of the layers that will compacted to the specified thickness of compacted materials should be reckoned.

9.11.4 BEFORE COMPACTION :

Material delivered to the fill shall be visually examined and their properties estimated by way of inspection.

These checks shall include

a) Borrow Areas :

- i. Excavation of borrow areas shall be limited in extent and depth as indicated on plans & in specification-3.4.1 and also as per direction of the Engineer-in-charge.
- ii. Estimation of moisture content of materials by visual examination and feel.
- iii. Samples shall be taken for laboratory analysis in case the soil is of different characteristics.

b) Embankments :

- I. Moisture content tests shall be carried out in the field 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 ensure that the methods of dumping, spreading and moisture conditions are such as will result in reducing segregation and/on variation of moisture content to a minimum.

These inspection checks shall be supplemented by sampling the materials at prescribed minimum intervals and by testing the samples in the laboratory for gradation and moisture content.

The following tests shall be carried out for determining compaction.

- a) Density moisture relation of the soil: In accordance with IS:2720(Part-VII)(1980).
- b) Density of the soil field: In accordance with IS:2720 (Part-XXVII)1974 or IS:2720 (part-XIX)1975.
- c) Moisture Content: In accordance with IS:2720 (Part-II) 1973. Before compaction: Materials delivered to the fill shall be visually examined and their properties estimated by way of inspection.

9.11.5.1 DURING COMPACTION :

It is intended that the checks in operations during compaction shall verify.

- i. That the layer thickness of the material is as specified
- ii. That the fill is compacted at least to 98% of standard proctor's Density (Dry density at OMC) or 70% relative density as the case may be by the specified number of passes of specified machineries as per Annexure-III.
- iii. That no excessive rutting, waving or scaling of the fill occurs during compaction.

9.11.5.2 AFTER COMPACTION :

CONTRACTOR

SENIOR MANAGER (CIVIL)

The condition of the fill after compaction shall be observed and recorded particularly with respect to rutting or waving. However, the properties of materials after compaction shall be determined primarily by field density tests. Routine tests on samples taken from constructed embankment shall include besides density tests, grain size distribution, Attenberg limits, permeability, shear and consolidation characteristics.

9.11.6 FREQUENCY OF TESTING :

- a) It will be necessary to carry out sampling and testing of materials before and after compaction at sufficient frequencies so that effective checks on the fill operations are maintained. Testing frequencies proposed should correspond to the frequencies as mentioned in the relevant paragraphs. 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 frequent interval than those specified in Annexure during initial stages of placing in each zone in order to establish control on testing techniques. Also testing should be conducted at higher rates in case of special problem of control caused by such factors such as material variation, equipment performance and weather.
- c) In addition, these tests shall be made
 - i) In areas, where the degree of compaction is doubtful.
 - ii) In areas, where embankment operations are concentrated.
 - iii) For record tests at the locations of all embedded instruments.
- 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 abutment or cutoff walls.
 - ii) Areas where rollers turn during rolling operations.
 - iii) Areas where too thick layer is being compacted.
 - iv) Areas where improper water content exists in material.
 - v) Areas where less than specified number of roller passes were made.
 - vi) Areas where dirt clogged rollers were used to compact the materials.
 - vii) Areas where compacted by rollers that have possibly lost part of their ballast.
 - viii) Areas where oversized rock is contained in the fill has been overlooked.
 - ix) Areas containing materials differing substantially from the average.

9.11.7 RECORDS AND REPORTS:

Record of borrow area material and embankment placing operations shall be maintained in order to have a continuous check on the suitability and availability of full materials and quality of fill. Thus, it shall be possible to have complete description of materials in any portion of the embankments. The record shall be maintained on the form specified in ANNEXURE-II.

9.11.8 FIELD TEST DATA :

Records of field Test Data results should be presented in the form of statistical analysis sheets and summary sheets in order to provide control required for enforcement of statistical requirements of the specifications. Testing should be as per table Annexure-I.

The test data summary sheets and inspection reports be used to form the basis of construction control report, which should be issued from the site at fortnightly intervals during construction season. The

report would contain narrative accounts of the progress and problems of field constructions, statistical analysis of test data and photographs of the fill operations.

9.12 PROTECTION :

The contractor shall take all precautions necessary for the protection of the bank work by diversion of stream, local surface drainage, rainwater etc., if these are likely to damage the work. Any damage of earth work due to any reason whatsoever shall be made good by the contractor at his own cost till the work is certified as completed and taken over by the department.

9.13 INSTRUMENTATION :

- a) Certain instruments such as piezometer tips (foundation type and embankment type), cross arms surface settlement measuring device, parapet settlement measuring device, automatic water level recorder and base plates for measuring the performance of the high embankment during construction and thereafter are proposed to be procured and installed by the Department at location as specified in the drawing or as decided by the Engineer-in-Charge. The contractor shall allow sufficient time in his placement schedule for installation and observation of instruments and for necessary soil tests near the installed instruments and no compensation for any hindrance to work on this account shall be allowed.
- b) Any damaged to instrument due to any reason whatsoever shall be made good to the satisfaction of the Engineer-in-Charge or shall be replaced by the contractor at his own cost till the work is certified as completed and taken over by the department.
- c) No separate payment shall be made to the contractor for the above work. The installation of instruments shall not be the part of this work as it will be done separately.

SECTION-VI

PRICE ADJUSTMENT/ VARIATION

2/19/2020

Works DepartmentLetter No-15847_1.jpg

GOVERNMENT OF ODISHA
WORKS DEPARTMENT

OFFICE MEMORANDUM

File No. -07556900242019- 15847 W, dt. 19-11-19

Subj:- Codal / contractual provisions regarding Price Adjustment in works contract.

Codal / contractual provisions regarding Price Adjustment in works contract was under active consideration of Government. After careful consideration, Government have been pleased to make the codal/ contractual provisions regarding Price Adjustment clause due to increase or decrease in rate and price of labour, materials, fuels & lubricants and plant & machineries spare component to be incorporated in DTCN / condition of Contract as per Annexure-"A".

- 1- This Office Memorandum shall be a part of the relevant clauses of DTCN and Agreement and shall take effect from the date of issue.
- 2- This has been concurred in by Finance Department vide their File No. FIN-WF1-MISC-0031-2019 (OSWAS) dt.23.10.2019 and Law Department vide their UOR No.2218/L dt.29.10.2019.

Pl. send to
AR SES/SES
18/11/19
SEB

Memo No. 15848

W, dated, 19-11-19

Copy with copy of enclosure forwarded to Principal Secretary to Hon'ble Chief Minister, Odisha for information and necessary action.

Stamp 18.11.19.
FA - cum- Addl. Secretary to Government

Memo No. 15849

W, dated, 19-11-19

Copy with copy of enclosure forwarded to P. S. to Hon'ble Minister, Works, Odisha / P. S. to Hon'ble Minister, Finance, Odisha for information and necessary action.

Stamp 18.11.19
FA - cum- Addl. Secretary to Government

(P.T.O)

Works Department Letter No-15847_2.jpg

Memo No. 15850

NW dated, 19-11-19

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

S. K. Singh 18.11.19
FA - cum- Addl. Secretary to Government

Memo No. 15851

NW, dated, 19-11-19

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

S. K. Singh 18.11.19.
FA - cum- Addl. Secretary to Government

Memo No. 15852

NW, dated, 19-11-19

Copy with copy of enclosure forwarded to All Departments / Managing Director, OB & CC Ltd., Bhubaneswar / Managing Director, OCC Ltd., Bhubaneswar / Chief Architect, Odisha, Bhubaneswar for information and necessary action.

S. K. Singh 18.11.19.
FA - cum- Addl. Secretary to Government

Memo No. 15853

NW, dated, 19-11-19

Copy with copy of enclosure forwarded to EIC (Civil), Odisha / All Chief Engineers, Odisha / All Superintending Engineers / All Executive Engineers (under Works Department) for information and wide circulation among subordinate offices.

S. K. Singh 18.11.19.
FA - cum- Addl. Secretary to Government

Memo No. 15854

NW, dated, 19-11-19

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

S. K. Singh 18.11.19.
FA - cum- Addl. Secretary to Government

Memo No. 15855

NW, dated, 19-11-19

Copy with copy of enclosure forwarded to the Director, Printing, Stationary & Publication, Odisha, Cuttack by e-mail (deputydirectorpp@rediffmail.com) for publication of this Office Memorandum in the next issue of Odisha Gazette and supply 20 (Twenty) copies to this Department for official use.

S. K. Singh 18.11.19
FA - cum- Addl. Secretary to Government

Memo No. 15856

NW, dated, 19-11-19

Copy with copy of enclosure forwarded to A/C-I Section / A/C-II Section / Road Section / Plan Section / Building Section / Budget Section / N.H.s. Section / FC & AA Section / EAP Cell / Legal Cell, Works Department for information and necessary action.

S. K. Singh 18.11.19
FA - cum- Addl. Secretary to Government

ANNEXURE-A**Clause 31 :- Price Adjustment**

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

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

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

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

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

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

The formula (e) for adjustment of prices are:

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

Price adjustment for increase or decrease in 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, New Delhi.

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

12.11.19

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

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

$$V_c = 0.85 \times P_c / 100 \times R \times (C_1 - C_0) / C_0$$

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

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

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

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

$$V_s = 0.85 \times P_s / 100 \times R \times (S_1 - S_0) / S_0$$

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

S_0 = The all India wholesale price index for steel (Mild Steel long products) on 28 days preceding 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.

Change
12.11.19

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

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

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

V_b = Increase or decrease in the cost of work during the month under consideration due to changes in the 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 IOC / BPCL depot at nearest center for the 15th 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 the 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 Whole sale price index of pipe for the period under consideration as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

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

S. K. Singh

18.11.19

31(b): Adjustment of Labour Component

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

(v)

Price adjustment for increase or decrease in cost 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 the 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 15th 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.

Stamp
18.11.19

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

- (vi) Price adjustment for increase or decrease in the cost of plant and machinery spares procured by the Contractor shall be paid in accordance with the following formula:
- $$V_p - 0.85 \times P_p / 100 \times R \times (P_1 - P_0) / P_0$$
- V_p - Increase or decrease in the cost of work during the month under consideration due to changes in the 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 Port land cement
2.	Bars & rods	Rebars	Mild steel long products
3.	Heavy Machinery & parts	Construction Machinery	Manufacture of machinery for mining, quarrying & construction.

S. K. Singh
18.11.19.

31(e): APPLICATION OF ESCALATION CLAUSE:

The contractor shall for the purpose of availing reimbursement/refund of differential cost of steel, bitumen, cement, pipe, P.O.L. 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 alteration in the price of such material, wages of labour and /or price of P.O.L. give notice thereof to the Engineer-in-Charge stating that the same is given pursuant to this condition along with information relating to there to which he may be in a position to supply.

Percentage Table

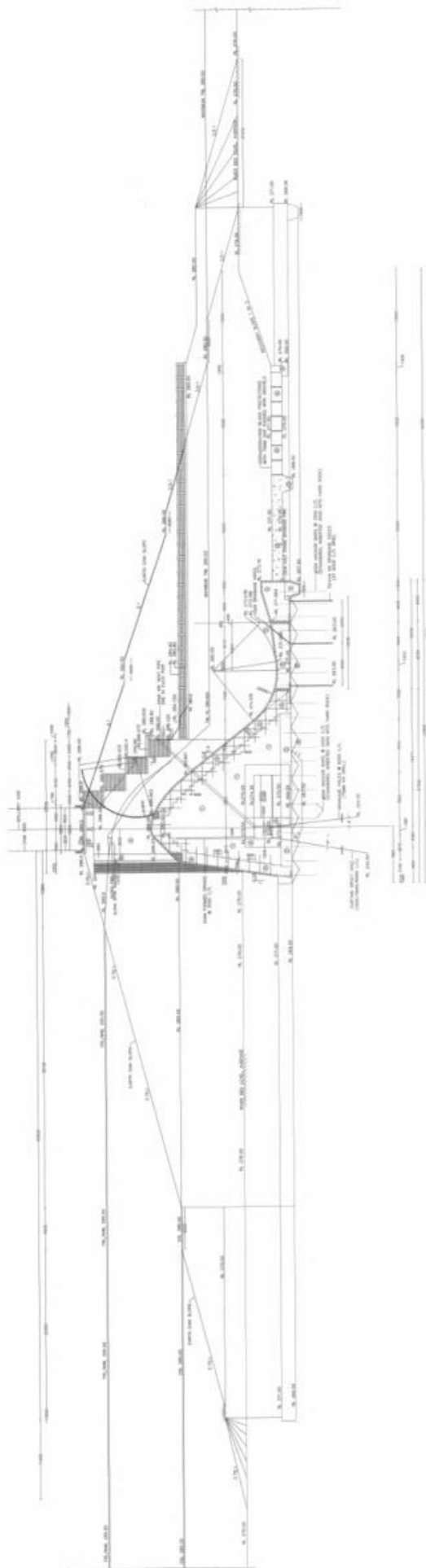
Sl No.	Category of works		% Component (cost wise)		
			Labour (P _l)	P.O.L (P _r)	Steel (P _s) + Cement (P _c) + Bitumen (P _b) + Pipes (P _p) + Plant & Machinery Spare & Component (P _p) + Other Materials*
1	R&B works (% of component)	Road Works	5	5	90
		Bridge works	5	5	90
		Building works	5	5	90
2	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	Pipe- 70% *Machinery + Other material -20%
		Sewer Line	5	5	Pipe- 70% *Machinery + Other material -20%

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

S. Kumar
14.11.19

SECTION-VII

DRAWINGS



LONGITUDINAL SECTION THROUGH SPILLWAY
AT BEACON NO. 2, SECTION Y-Y



LONGITUDINAL SECTION THROUGH SECTION Y-Y

TEMPERATURE (°C) 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670 680 690 700 710 720 730 740 750 760 770 780 790 800 810 820 830 840 850 860 870 880 890 900 910 920 930 940 950 960 970 980 990 1000

SCALE - 1:100
003-1-JTW:CS

0001-1-371436

DOCUMENT OF ID5644
 DEPARTMENT OF WATER RESOURCES
 UPPER LANTH BRIGGATION PROJECT
 UPPER LANTH SPILLWAY
 WITH ACCESSORY DETAILS
 GENERAL ARRANGEMENT DRAWING

WITH ACCESSORY DETAILS
GENERAL ARRANGEMENT DRAWING

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----

Year	Number of cases	Rate per 100,000
1990	1,000	1.0
1991	1,100	1.1
1992	1,200	1.2
1993	1,300	1.3
1994	1,400	1.4
1995	1,500	1.5
1996	1,600	1.6
1997	1,700	1.7
1998	1,800	1.8
1999	1,900	1.9
2000	2,000	2.0
2001	2,100	2.1
2002	2,200	2.2
2003	2,300	2.3
2004	2,400	2.4
2005	2,500	2.5
2006	2,600	2.6
2007	2,700	2.7
2008	2,800	2.8
2009	2,900	2.9
2010	3,000	3.0
2011	3,100	3.1
2012	3,200	3.2
2013	3,300	3.3
2014	3,400	3.4
2015	3,500	3.5
2016	3,600	3.6
2017	3,700	3.7
2018	3,800	3.8
2019	3,900	3.9
2020	4,000	4.0

10/1/2017	10/1/2017	10/1/2017
-----------	-----------	-----------

<p>  </p>	<p>  </p>
--	--

DATE	DESCRIPTION	AMOUNT	BALANCE
1/1/01	OPENING BALANCE		100.00
1/15/01	PAYROLL	50.00	50.00
2/1/01	RECEIVED	25.00	75.00
2/15/01	PAYROLL	50.00	25.00
3/1/01	RECEIVED	75.00	100.00
3/15/01	PAYROLL	50.00	50.00
4/1/01	RECEIVED	25.00	75.00
4/15/01	PAYROLL	50.00	25.00
5/1/01	RECEIVED	75.00	100.00
5/15/01	PAYROLL	50.00	50.00
6/1/01	RECEIVED	25.00	75.00
6/15/01	PAYROLL	50.00	25.00
7/1/01	RECEIVED	75.00	100.00
7/15/01	PAYROLL	50.00	50.00
8/1/01	RECEIVED	25.00	75.00
8/15/01	PAYROLL	50.00	25.00
9/1/01	RECEIVED	75.00	100.00
9/15/01	PAYROLL	50.00	50.00
10/1/01	RECEIVED	25.00	75.00
10/15/01	PAYROLL	50.00	25.00
11/1/01	RECEIVED	75.00	100.00
11/15/01	PAYROLL	50.00	50.00
12/1/01	RECEIVED	25.00	75.00
12/15/01	PAYROLL	50.00	25.00
1/1/02	RECEIVED	75.00	100.00

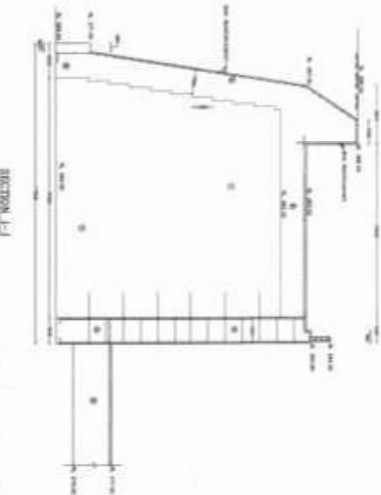
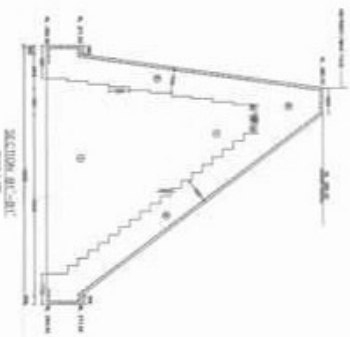
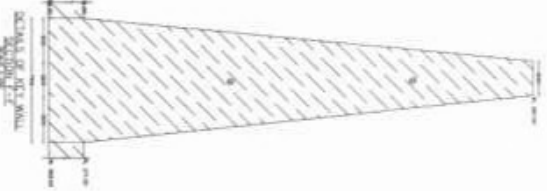
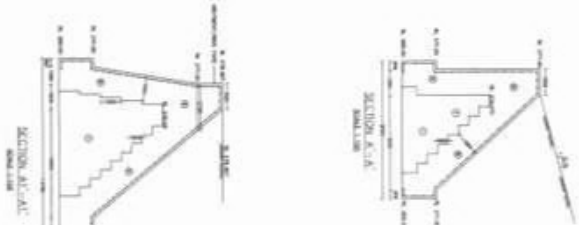
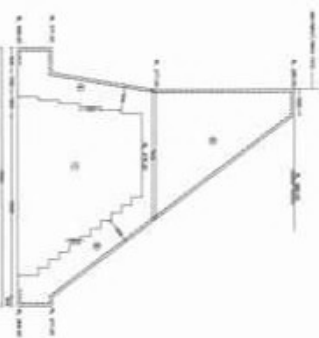
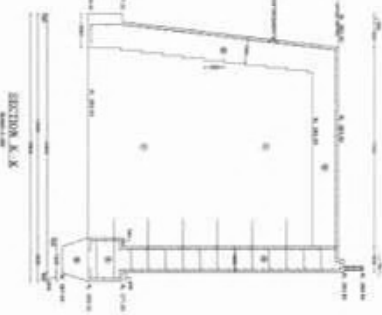
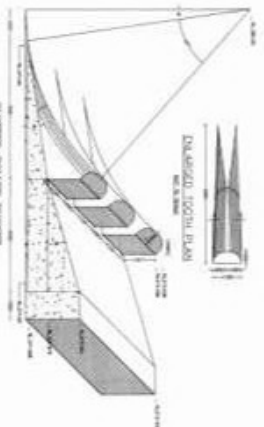
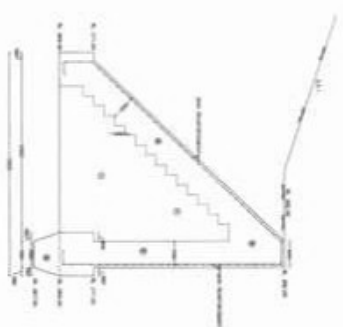
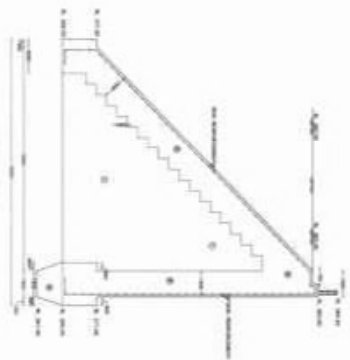
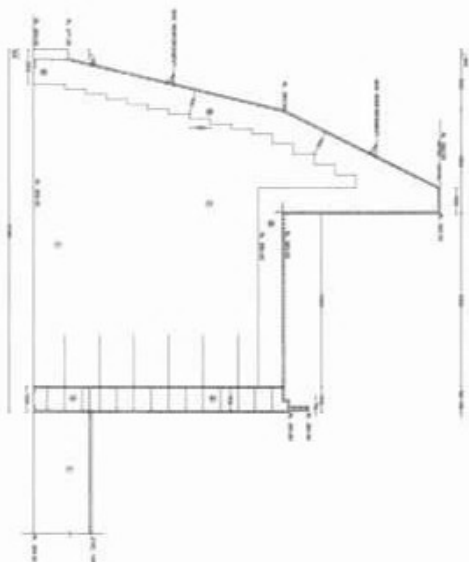
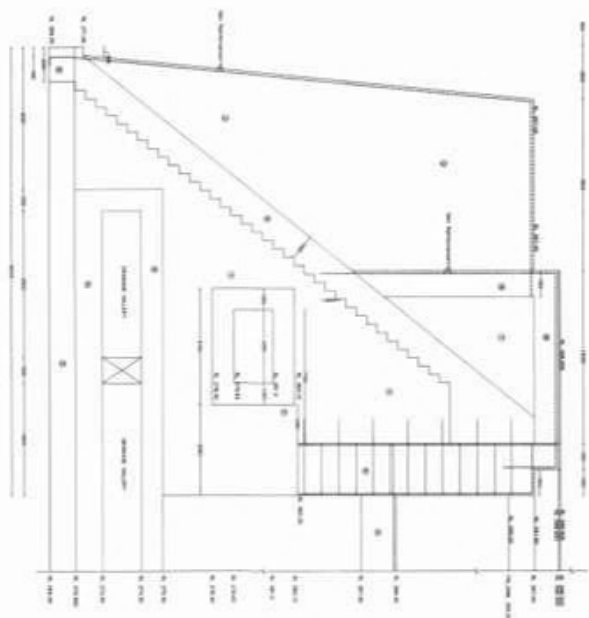
[illegible]

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----

8 V4 0478

TEL BASIN UPPER LAMP SPILL GA 8

9475 (2)



© 2004 Blackwell Publishing Ltd, *Journal of Internal Medicine* 255: 105–112

PC-A12-1.0000

management of water resources

WILLIAM LAMONT, JR., PRESIDENT, CHICAGO
SUBURBAN RAILROAD

WITH ACCESSORY DETAILS
GENERAL ASSEMBLY DRAWING

と	
と	

511

		
---	---	---

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523</
--	---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-------

TEL. AREA UPPER LANTH SPILL GR. 10

94786 (10)

