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DESIGNED TO EXCEL

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

Office of the Senior Manager (Civil),
Lower Suktel Spillway Project, Balangir

COVER – I

(TECHNICAL BID)

Tender Call Notice No. OCC/LSSP/03/2025-26, Dtd.13.02.2026

Name of the Work :-

Second stage concrete of Grade M-45 A-20 for Conversion of construction sluice to depletion sluice at Block No. 05 & 06 of Lower Suktel Spillway Project, Magurbeda, Balangir.

Last date for submission of Tender 24.02.2026 (Upto 03.00 P.M.)

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1. **DETAILS OF DEMAND DRAFTS SUBMITTED BY THE BIDDER WITH THE TECHNICAL BID (COVER-I)**

(DETAILS TO BE FILLED IN BY THE BIDDER)

DETAILS OF TENDER PAPER COST SUBMITTED BY THE BIDDER

Tender Paper cost Rs._____

(Rupees_____

_____) only vide A/C Payee D.D..

_____Dated_____issued by

_____

Bank,_____Branch in favour of " **Odisha Construction Corporation Ltd**" payable at **Balangir**.

Contractor Senior Manager (Civil)

2. **Particulars of the Bidder**

*(Details to be filled in by the bidder in all respect in the blank space **otherwise his tender will not be considered**.)*

Full Name of the Bidder: - …….

Full Address of the Bidder :-

……

……

……

…… PIN - …….

Telephone No. – Land line : ……. Mobile : …….

E-mail ID :- …….

OCC Enlistment No. of the Bidder: ……...

Signature of the Bidder with seal

Contractor Senior Manager (Civil)

3. **OTHER STATUTORY DOCUMENTS SUBMITTED** :- (*Please write the GSTN / PAN / EPF No. etc. in the relevant box and attach the certified copies of the documents*)

i.	GST No.	
ii.	PAN	
iii.	EPF No.	
iv.	Labour License No.	
v.	OCCL Enlistment No. -	Valid upto-
vi.	Any other documents. (As per Tender Call Notice)	

Full signature of the "Bidder" with date and seal

Contractor Senior Manager (Civil)

4. **Undertaking by the Contractor**

I / We Shri _____

(In case of the firm, the name of the proprietor/head of the firm along with the designation & name of firm should be mentioned)

S/o Sri _____, Permanent resident of

Vill./Street _____, P.O. - _____,
P.S.- _____ Via - _____,
Dist. - _____ State - _____, PIN - _____

declare that I/We have thoroughly gone through the tender document and I/We know about the site(s) of works. I/We agree to work at rates quoted by me/us or at settled rates and abide by the terms and conditions of the tender document.

Full signature of the "Contractor" with date and seal

Contractor Senior Manager (Civil)

ODISHA CONSTRUCTION CORPORATION LTD.
(A Govt. of Odisha Undertaking)
Office of the Senior Manager (Civil)
Lower Suktel Spillway Project, Balangir. Email: lsspblrocc@gmail.com

Tender Call Notice No. OCC/LSSP/03/2025-26; Dt. 13.02.2026

1. The Senior Manager (Civil), Lower Suktel Spillway Project, Balangir on behalf of Odisha Construction Corporation Ltd. ("OCCL") invites sealed tender on percentage rate basis on Double Cover from the eligible class of contractors enlisted with "OCCL" for the following work.

Sl. No.	Name of work	Approx. value of work (Rupees in Lakhs)	EMD @ 1%	Cost of Bid document (non refundable including GST) (Rs.)	Period of completion.	Class of Contractor
1	Second stage concrete of Grade M-45 A-20 for Conversion of construction sluice to depletion sluice at Block No. 05 & 06 of Lower Suktel Spillway Project, Magurbeda, Balangir	**9.43 Lakhs**	9430.00	Rs.6000.00 + Rs. 1080.00 (GST 18%) = Rs.7080.00	03 Months	C-IV & Above

2 The tender document can either be obtained from the **office of the Senior Manager (Civil), OCC Ltd., Lower Suktel Irrigation Project, Santipada, Balangir** during office hour from **Dt. 13.02.2026** to **Dt 24.02.2026up to 1.00 P.M**or can be downloaded from the official website of OCCL **www.odishaconstruction.com**. The Bidder (Contractor) have to deposit the non-refundable cost of tender paper specified for the work in the table as above by demand draft to be drawn on or before dt. **24.02.2026** from any nationalized / scheduled bank payable at Balangir in favour of Odisha Construction Corporation Ltd. along with the tender. The tender notice shall also be available on OCCL website at **www.odishaconstruction.com**. Interested Bidders may obtain further information, if any, from the undersigned.

3 The tender must be accompanied with EMD (Earnest Money Deposit) of the amount specified for the work in the table as above drawn Term Deposit Receipt (TDR) / Demand Draft pledged in favour of Odisha Construction Corporation Limited, payable at **Balangir.**

4 The tender is to be dropped in the tender box kept in the office of the Senior Manager (Civil), Lower Suktel Spillway Project, Balangir in **a cover containing Cover-I & Cover-II**.

Cover- I is to contain Copy of valid enlistment certificate as Contractor/job-worker issued by "OCCL"., Copy of PAN card, copy of GST Registration & Clearance Certificate, Copy of EPF registration and Copies of Credential certificates and documents required as per the relevant clauses of DTCN and special conditions if any. The cover is to be sealed and superscribed as **Cover – I(Technical Bid)** for the work: - "Second stage concrete of Grade M-45 A-20 for Conversion of construction sluice to depletion sluice at Block No. 05 & 06 of Lower Suktel Spillway Project, Magurbeda, Balangir".

Cover – II is to contain the price bid duly filled in and signed by the bidder and is to be superscribed as **Cover – II (Price Bid)** for the work: - "Second stage concrete of Grade M-45 A-20 for Conversion of construction sluice to depletion sluice at Block No. 05 & 06 of Lower Suktel Spillway Project, Magurbeda, Balangir". **The bidders are required to write their names over the Cover-II.**

Both the covers are then to be kept inside a third cover duly sealed and super scribed with the name of the work "Second stage concrete of Grade M-45 A-20 for Conversion of construction sluice to depletion sluice at Block No. 05 & 06 of Lower Suktel Spillway Project, Magurbeda, Balangir". In order to ensure that the envelopes are properly sealed, the contractor can seal them with superglue and also add tamper proof tapes as additional precaution.

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5 The bidders are not required to write their name on the outer cover containing the bid documents. They are only required to write the name of the work and Bid Identification Number.

6 The bid must be dropped in the Tender Box kept in office of the Senior Manager (Civil), Lower Suktel Spillway Project, Balangir on or before **3:00 PM** of dt. **24.02.2026.Both Cover –I (Technical Bid)& Cover- II (Price Bid)**Bid will be opened on Dt. **24.02.2026** at **3.30 PM** in office of the Senior Manager (Civil), Lower Suktel Spillway Project, Balangirin presence of the bidders or their authorized representatives, who may like to be present. If there will be a public holiday on the last date of receipt & opening of the tenders as specified above, the tender documents shall be received & opened on the next working day at the same time & venue.

7 **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 drawn in favour of Ödisha Construction Corporation Ltd." payable at Balangir / 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.

I. **where the bid price is below 0% but not below 10% of the project cost put to bid**, noadditional performance guarantee/security percentage is required.

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

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

IV. The additional performance guarantee percentage shall be rounded off to the next lowerpercentage based on whether the decimal point of the percentage of bid price is below0.5% or next higher percentage based on whether the decimal point of the percentage ofbid price is 0.5% or more.

8 If the rate quoted by the SC and ST Category Contractors comes to the rate quoted by the L1bidder(decimal up to two numbers will be taken for all practical purposes) after availing 10% pricepreference as per Para 2 of Works Department Resolution No. 27748 dated. 11.10.1977, the tendershall be finalized by the tender accepting authority through a transparent lottery system along with othercategories of contractors.

9 The Contractors shall have to furnish an affidavit in support of the authenticity/ genuineness of the documents/certificates and credentials submitted along with the tender

Contractor Senior Manager (Civil)

document. In case of production of forged document, the penalty shall be rejection of their tenders, and cancellation of their enlistment with the Corporation. The authority reserves the right to verify the authenticity of documents in case of any doubt or complain.

10 The tender received will remain valid for 90 (Ninety) days from the last date of receipt of tenders and the validity of tenders can also be extended if agreed to by the bidder and OCCL.

11 The Job- Worker has to quote the % (percentage) excess or less or at par of the amount put to tender in the bill of quantity in the format enclosed with the tender document. For evaluation, the amount quoted in words shall be taken, if there is any difference in figure and words in tender document. If more than one bid is quoted **at equal %**, the tender accepting authority will finalize the tender through a transparent lottery system, where all bidders/their authorized representatives, the Senior Manager (Civil) and Accountant or any authorized officer of OCCL will remain present.

12 The successful Job-Worker shall have to execute the work as per scope of work, Methodology of work, technical specifications & price schedule as per direction of Engineer-in-charge and terms & conditions of agreement. The J/W (successful Bidder) has to submit work schedule for approval before drawal of Agreement.

13 The authority reserves the absolute right to accept or reject any or all the bids and to split up the work to award to one or more Job-workers without assigning any reason thereof.

14 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 sub-ordinate courts at Bhubaneswar only.

For Odisha Construction Corporation Ltd.

Senior Manager (Civil)
Lower Suktel Spillway Project
OCC Ltd., Balangir

Memo No. : 149/LSP/SM Dt. 13.02.2026

Copy submitted to the Managing Director, OCC Ltd., Unit-8, Gopabandhu Nagar, Bhubaneswar/ General Manager (Civil), Western Zone, Sambalpur for favour of kind information and necessary action.

Senior Manager (Civil)

Memo No. : 150/LSP/SM Dt. 13.02.2026

Copy forwarded to the Senior Manager (Civil), OCCL, SBD, Unit-VIII, Bhubaneswar-12 for information and necessary action. He is requested to hoist the above notice & Tender document in web site of OCCL.
(By email-nanda8038@yahoo.com)

Senior Manager (Civil)

Copy to Notice Board of Office of the Senior Manager (Civil), Lower Suktel Spillway Project, Balangir for wide circulation.

Senior Manager (Civil)

Contractor Senior Manager (Civil)

INSTRUCTIONS TO BIDDERS

1. Bidder may go through the tenders published in the web site and download the required documents/tender schedules for the tenders he is interested.

1.1 Bidder should go through the tender schedules carefully and submit the documents as asked; otherwise, the bid will be rejected.

1.2 If any further clarifications required, this may be obtained from the project office of General Manager (Civil), Western Zone, Sambalpur. Bidders should take into account of the corrigendum (s) if any, published before submitting the bids.

1.3 The bidder should read the terms & conditions and accept the same to proceed further to submit the bids.

2. Method of submission of Tender Documents

2.1 If the intending bidder is an individual, the documents shall be signed by the individual with his full written name and current address.

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

2.3 If the intending bidder is a firm in partnership it shall be signed by a partner holding the power of attorney for the firm in partnership in which case a certified copy of power of attorney shall accompany in the technical documents.

2.4 If the intending bidder 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.

2.5 The Tender containing all required documents shall be dropped in the Tender Box kept at **the office of Senior Manager (Civil), Lower Suktel Spillway Project, Balangir**

3. Opening of Tender Documents.

The Technical Bid Documents **will be opened on dt. 24.02.2026.at 15.30 hrs.** in the office of the Senior Manager (Civil), Lower Suktel Spillway Project, Odisha Construction Corporation Limited,) Balangir in presence of the bidders or their authorized representatives who wish to be present. Date & time of opening of Financial Bid will be intimated later on to the successful bidders i,e, who have qualified in Technical Bid evaluation.

4. Minimum Qualifying Criteria

The Cover-I shall contain the following documents failing which their bid shall be liable for rejection

(a) Demand Draft towards cost of tender document in Original.
(b) E.M.D. in shape of TDR/Demand Draft.
(c) Photocopy of PAN
(d) GST Registration & Clearance Certificate
(e) EPF Registration No. & Clearance Certificate.
(f) Affidavit towards authenticity/genuineness of certificate in Original (Annexure-A).
(g) Undertaking to pay minimum wages in prescribed proforma in Original (Annexure-D).
(h) Undertaking to pay Royalty in prescribed proforma in Original (Annexure-C)
(i) Valid OCCL Enlistment Certificate.
(j) Income Tax Clearance Certificate.
(k) No Relationship Certificate (Annexure-B).

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5. 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.

6. Further Clarification

The **Senior Manager (Civil), Lower Suktel Spillway Project, Balangir** may be contacted during office hours on any working days during the bidding period for any further clarification.

7. Sample of all Materials : The contractor shall supply sample of all materials at his own cost before procurement for the work for testing and acceptance as may be required by the concerned Engineer-in-Charge.

8. 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 web site and such notice shall form part of the bidding documents.

Contractor Senior Manager (Civil)

General terms and conditions

1. DEFINATIONS

(i) "CORPORATION" means **"ODISHA CONSTRUCTION CORPORATION LTD. ("OCCL" in short)"** with registered office at Unit-8, Gopabandhunagar, Bhubaneswar – 751 012 (Odisha) represented through its Managing Director or any other officer as designated by the "Corporation" from time to time.

(ii) "ENGINEER-IN-CHARGE" means the qualified engineer deployed by the "Corporation" at work site for the work including the Senior Manager (Civil), "OCCL" in charge of the work

(iii) "CONTRACTOR" means the enlisted person/firm/organisation having men, machinery, materials etc. to execute the work satisfactorily as per scope indicated herein within stipulated period.

(iv) "CLIENT" means the State Govt. or Central Govt. organization or any individual from whom "OCCL" has received the work for execution.

2. AGREEMENT

The "Contractor" shall enter into an agreement with the "Engineer-in-Charge" in the format on requisite value of stamp paper prescribed for the purpose by the "Corporation" within a stipulated period to be specified by the "Engineer-in-Charge" failing which the EMD and ISD shall be forfeited. The work may be awarded in favour of some other agency at the discretion of the "Corporation".

3. RATE

The rate quoted by the tenderer is to be indicated in % (Percentage) up to two decimal point excess or less or at par of the total amount of the estimated value of work put to tender, which shall be valid for the full period of execution or till completion of work whichever is later. The % (Percentage) excess or less or at par quoted by the "Contractors" should be firm for the entire period of execution.

The "Contractor" shall quote the rate in % (Percentage) excess or less or at par of total amount put to tender to complete the works as per specifications inclusive of all transportation, handling, loading, unloading, lift, de-lift, taxes, duties, watering/ curing, dewatering, levies, incidental expenses etc. that will be applicable on the work to be executed by him. No claim in this regard in whatsoever form shall be entertained.

4. PAYMENT TERMS

(i) No advance, shall be paid for the work. The rates shall remain firm through out the agreement period.

(ii) The payment to the "Contractor" shall be limited to the measurements taken and accepted by the client. The "Contractor" cannot raise any dispute over the measurements allowed by the "Engineer-in-Charge" for the purpose of payment.

(iii) The Contractor will bear the full cost of rectification or replacement of works required as per direction of "Client" or "Engineer-in-Charge".

(iv) The payment to the "Contractor" against any item shall be released only after receipt of payment by the "Corporation" from the "Client" against respective item.

(v) Any penalty levied by "Client" on "OCCL" due to delay in work will be borne by the "Contractor" in full, if the "Contractor" is responsible for delay.

(vi) The Agreement rate of the Contractor shall be exclusive of GST. GST as applicable shall be paid extra over and above the Running account bills on production of GST invoice.

(vii) Price adjustment/price variation as per Govt Circular, 2019 shall be applicable to the agreement with a condition that the same is accepted by the client. No claim towards price adjustment/Price variation will be entertained prior receipt of the same from the client.

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5. INITIAL SECURITY DEPOSIT (ISD)

The "Contractor" shall deposit Initial Security Deposit (ISD) at the rate of 2(Two) % of the work/agreement value on receipt of letter of intent of work within a period of 15 days from the date of issue but before execution of agreement.

If the "Contractor" fails to deposit such initial security within the stipulated date, the work may be awarded in favour of some other agency at the discretion of the "Corporation" and suitable actions as deemed fit shall be initiated against the L-1 bidder.

6. SECURITY DEPOSIT (SD)

The Security Deposit (SD) at the rate of**5 (Five)%** shall be deducted on the gross amount of each bill of the "Contractor". The security will be released after 6 (Six) months of completion of the work or settlement of final bill of the "Contractor", whichever is later, if no defect in the work is noticed and material account as well as all disputes including compliance of labour rules, ESI rules etc. are settled.

29. ADDITIONAL SECURITY DEPOSIT

The "Engineer-in-Charge" may, if he feels it necessary can deduct and withhold from the bill of the "Contractor" a sum not exceeding 10% and not less than 5% of the gross value of work done as additional security deposit for the rectification of defective and/or unsatisfactory work.

The additional Security Deposit shall be deducted in addition to normal security deposit. Such defects shall be rectified by the "Contractor" within such period as the "Engineer-in-Charge" may fix-up and if the "Contractor" fails to rectify the defects within the specified period, this shall be rectified by the "Engineer-in-Charge" at the cost and risk of the "Contractor". The expenses so incurred in the rectification of the defective works and/or unsatisfactory work done by the "Contractor" shall be recovered from the bills or any other dues of the "Contractor" or otherwise as per law. In this connection, the decision of the "Engineer-in-Charge" shall be final and binding on the "Contractor". The additional security deposit shall be released in full, when the "Contractor" rectifies the defects in time at his cost.

8. WITH HELD AMOUNT FOR EPF, FPF AND ESI DUES

2(Two) % shall be deducted and kept withheld from R.A. bills of the "Contractor" towards EPF, FPF and ESI dues. If the "Contractor" produces either a clearance in support of deposit of EPF, FPF and ESI dues with the concerned authority within 3(Three) months from the end of each financial year then the above withheld amount shall be released. Otherwise, the "Corporation" shall deposit the same with Provident Fund Authority and ESI Authority. Defects, if any, shall be recovered from the "Contractor".

9. INCOME TAX, GST, CESS OTHER TAXES, DUTIES, LEVIES ETC.

(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.

Contractor Senior Manager (Civil)

10. THE AMOUNT OF ROYALTY 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.

11. OPTIMUM USE OF MACHINERY, VEHICLES, EQUIPMENTS, TOOLS, TACKLES, CONSUMABLES AND STEEL MATERIALS

THE "CONTRACTOR" SHALL ENSURE OPTIMUM UTILISATION OF THE PLANTS, MACHINERY, EQUIPMENTS, TOOLS, TACKLES, CONSUMABLES, CEMENT, STEEL MATERIALS ETC. AND SHALL NOT CREATE ANY HINDRANCE FOR OTHERS. THE DECISION OF THE "ENGINEER-IN-CHARGE" REGARDING THE OPTIMUM REQUIREMENT SHALL BE FINAL AND BINDING ON THE "CONTRACTOR"

12. RECORD OF MATERIALS, CONSUMABLES, MACHINERY, EQUIPMENTS, TOOLS, TACKLES ETC.

If steel & cement are to be supplied by the corporation as per the requirement at the work site, the cost of the material will be realized at the following rate.

a) Cement - at estimate rate / procurement rate whichever is higher.

b) Steel - at the procurement rate of SAIL / RINL

N.B :- Transportation charges will be borne by the Contractor.

The "Contractor" shall be responsible for maintaining the data and complete records of issue and consumption of materials and consumables as well as record of plants, machinery, equipments, tools, tackles, cement, steel materials etc. issued to him by the owner and "Corporation". The materials, plants, machinery, equipments, tools, tackles cement, steel materials etc. shall be issued as per requirement and availability only.

The materials supplied by the "Corporation" will be received by the "Contractor" from the "Corporation" store on submission of indent by the "Engineer-in-Charge". Transportation of materials to site of work and storage at site are the responsibility of the "Contractor".

The "Contractor" will keep an accurate record of "Corporation" materials and furnish the consumption statement of such materials. The surplus materials, if any, are to be returned to the "Corporation" store at his cost failing which, the cost of excess materials will be recovered from the dues of the "Contractor" @ 5(Five) times the issue rate of "OCCL" or market rate, whichever is higher.

The materials, if and when supplied by the "Contractor", shall be of the best and suitable quality as per specifications stipulated in the technical specifications and subject to approval of "Engineer-in-Charge"/"Client", whose decisions, as regards quality of the materials, shall be final.

13. <u>RETURN OF PLANTS, MACHINERY, EQUIPMENTS, TOOLS, TACKLES, MATERIALS, CONSUMABLES ETC.</u>

The plants, machinery, equipments, tools, tackles, excess cement, excess steel materials, excess consumables etc. of the "Corporation" are to be returned by the "Contractor" in good working condition after completion of the work/termination of the contract by the "Corporation". The "Corporation" may hire plants, machinery, equipments, tools, tackles etc. from the owner as well as outside for use in work. The same are also to be returned by the "Contractor" in acceptable good working condition with original fittings after completion of the work/termination of the contract by the "Corporation".

Any damage to/ by the plants, machinery, equipments, tools, tackles etc. during use by the "Contractor" shall be booked to the "Contractor" for recovery from his bills.

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The balance unused/excess cement, steel materials, balance consumables etc. of the "Corporation", if any, shall be returned by the "Contractor" in good condition at specified places as per direction of the "Engineer-in-Charge" failing which the cost at 5(Five) times the market rate shall be deducted from the "Contractor".

14. EMPTY CEMENT BAGS AND SCRAP STEEL MATERIALS/CUT PIECE RODS

The cost of empty cement bags against cement issued by "OCCL" shall be deducted by "OCCL" from the bills/dues of the "Contractor" @ prevailing schedule of rate (Post GST)

The scrap steel materials/cut piece rods generated during execution of work out of steel materials issued by ""OCCL"" shall be the property of the "Corporation". It is the responsibility of the "Contractor" to collect and stack them at proper location/locations as per direction of the "Engineer-in-Charge". The "Contractor" shall be responsible for return of the same. An unaccounted loss of 0.5% shall be allowed. Balance has to be returned to the "Corporation". In case of non-return of the same, the cost as decided by the "Engineer-in-Charge" shall be recovered from the "Contractor".

15. ELECTRICITY

Electricity required for execution of work is to be arranged by the "Contractor" or the "Contractor" shall arrange generator for execution of works.

16. MEASUREMENT OF WORK

The quantity of work executed shall be measured and payment made once in a month or on completion of work or on termination of the agreement, when final measurement will be made and account will be adjusted accordingly. The decision of the "Engineer-in-Charge" regarding the rates, progress, measurement and quality of the work shall be final and binding on the "Contractor".

17. INDIAN STANDARDS, DRAWINGS AND SPECIFICATIONS

The work shall be carried with due diligence and in a workman like manner in accordance with relevant Bureau of Indian Standard specifications on the basis of latest approved drawings and technical specifications supplied by "Corporation" in absence of which as per the direction of "Engineer-in-Charge".

The technical specifications in the relevant agreement between the "Corporation" & owner and approved drawings & technical specifications issued by the owner & "Corporation" shall be the basis for execution of work under the agreement. In the absence of approved drawings and technical specifications, the direction of the "Engineer-in-Charge" shall be final and binding on the "Contractor".

The "Contractor" shall make arrangements to take copies of the approved drawings from the office of the "Engineer-in-Charge" for reference during execution of work.

18. PAYMENT TO WORKMEN

The "Contractor" should maintain job register and payment rolls of their workmen and get those checked by the "Engineer-in-Charge" or his authorised representative from time to time. The payment to the workers/ supervisory staff shall be made by the "Contractor" in the presence of the owner and/or "Engineer-in-Charge" or his authorised representative. The paid pay roll register shall be signed by the "Engineer-in-Charge" or his authorised representative as a token of disbursement. The copies of paid pay roll shall be submitted to the "Engineer-in-Charge" within a period of 7(Seven) days from the date of payment failing which no further payment to the "Contractor" shall be released.

19. WORKMEN COMPENSATION

In case of any loss due to accident arising during/in connection with execution of the contract, the "Contractor" will pay compensation to his workmen. The "Contractor" will be fully responsible for his workmen as per workmen's compensation act and labour laws in

Contractor Senior Manager (Civil)

force during entire period of execution of contract. In case, the "Contractor" fails to do so, the "Corporation" may pay the same and recover the same from the bills/ dues of the "Contractor".

20. INFORMATION OF WORKMEN

The "Contractor" will make his own arrangements for procurement of labour and shall furnish all information of workmen employed by him like name, father's name, full permanent address, sex and age to the "Engineer-in-Charge" along with the pay.

21. STATUTORY REQUIREMENTS

The "Contractor" shall comply all statutory requirements applicable at site of work such as minimum wage act, labour act, factory act, workmen's compensation act, provident fund rules, employee's state insurance rules etc. A certificate to this effect shall be enclosed by the "Contractor" with each Running Account Bill for payment.

22. MINIMUM AGE OF WORKMEN

The "Contractor" shall not employ any person, who is below the age of 18(Eighteen) years or unfit for the tendered items. The "Engineer-in-Charge" shall have right to decide, whether any labour employed by the "Contractor" is below the age of 18(Eighteen) years or unfit and refuse to allow any labour, whom he decides to be below the age of 18 years or unfit for any other reason.

23. LABOUR LICENCE

The "Contractor" has to obtain valid labour licence and maintain all records at his own cost as per the conditions laid down in the labour rules in vogue and amended from time to time.

24. MINIMUM WAGE ACT

The "Contractor" shall pay wages of each labour at the rate not less than the wages as per Minimum Wages Act in force and as may be ammended 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 the "Contractor".

25. NON-PAYMENT OF DUES OF LABOURERS

If the "Contractor" fails to pay the dues of labourers engaged by him for this work in time, the same shall be paid by the "Engineer-in-Charge" directly to the deserving workers. The expenditure so incurred on account of non-payment or less payment shall be recovered from the bills or any other dues of the "Contractor".

26. PROVIDEND FUND (PF)

Employees Provident Fund., wherever applicable, shall be payable by the "Contractor" as per the Provident Fund Rules in force and shall keep the "Corporation" indemnified for it. He should get the registration number for this from the Regional Provident Fund Commissioner, Odisha. He shall produce the records in support of payment of EPF/FPF dues to the "Engineer-in-Charge" for check and record by the "Engineer-in-Charge".

27. EMPLOYEES STATE INSURANCE SCHEME (ESI)

The Employees State Insurance Scheme(ESI), wherever applicable, shall be payable by the "Contractor" as per the E.S.I. Rules in force and shall keep the "Corporation" indemnified for it. He should get the Registration Number for this from the E.S.I. Deptt., Odisha. He shall produce the records in support of payment of ESI dues to the "Engineer-in-Charge" for check and record.

28. WORKMEN INSURANCE

The workmen insurance shall be the responsibility of the "Contractor". He shall produce the records in support of workmen insurance to the "Engineer-in-Charge" for check and record.

29.HUTMENTS/TEMPORARY ACCOMMODATION

The "Contractor" has to arrange hutments/temporary accommodation for his own labourers/ workmen at the work site at his own cost.

30. IDLE LABOUR

"OCCL" will not be held responsible for idle labourers of the "Contractor" for any reason, whatsoever and no claim on this account will be entertained.

31. WORKING IN SHIFTS

If necessary, the "Contractor" may be asked to work in two(2) or 3(three) shifts. Normally, the work shall be executed in shifts. The "Contractor" may, if required, have to engage the workmen on overtime to complete the work in scheduled time. The overtime cost shall be borne by the "Contractor".

32. **CLAIMS AND LIABITIES**

All claims/liabilities etc. arising out of Explosives act and labour laws shall be borne by the "Contractor" and he shall keep the "Corporation" indemnified against them and also in case of injuries or death of labourer(s) resulting from accidents during the execution of the work. In case the "Corporation" will have to pay for any such claims under Workmen's Compensation Act, the same shall be adjusted from the pending bills/dues of the "Contractor" or shall be recovered otherwise as per law from him.

33. SAFETY

The "Contractor" should abide by the safety laws and rules of statutory bodies, "Corporation" and owner as per directions of "Engineer-in-Charge" and Safety Officers inspecting from time to time.

34. WATCH AND WARD

The "Contractor" shall arrange watch and ward and safety of the site of work, constructed structures, machinery, vehicles, equipments, tools, tackles, consumables, cement, steel materials etc. of the "Corporation" and owner at his own cost.

35. AUTHORISED PERSON

The "Contractor" may in writing authorise his power of attorney holder or any other person to draw materials, avail facilities, and attend measurements etc. during the course of execution of work. All liabilities created by the authorised person of the "Contractor" by way of loss of materials drawn, amenities availed, unpaid wages created etc. shall be considered as the liabilities of the "Contractor" and such liabilities shall be made good by the "Contractor" or it shall be recovered from the bill/payment due to him.

36. SPLITTING UP WORK

The authority reserves the right to split up the work amongst various "Contractors" and increase or decrease the quantity of work mentioned in the tender document without assigning any reason thereof and no claim whatsoever will be entertained on this account. The quantity as per agreement may also increase or decrease as per actuals.

If "Corporation" desires, different agencies can be engaged at a single site of work for which each agency is to co-operate so that other agency does not face any difficulty in engagement of his machinery, equipments, vehicles etc.

37. BREACH OF CONTRACT

The ISD including EMD, SD and additional SD are liable to be forfeited in the event of breach of contract and the agreement shall be terminated. The dues of the "Corporation" including due of labourers/workmen and other statutory payable liabilities payable by the "Corporation" as principal employer shall be cleared by the "Contractor". The decision of the "Engineer-in-Charge" in this regard shall be final and binding on the "Contractor". The amount remaining as outstanding against the "Contractor" after adjustment of his dues shall be payable by him to "OCCL". If necessary, legal action may be taken for recovery of the dues of the "Corporation" including labour and statutory dues to be cleared by the "Corporation" as principal employer and "OCCL" reserves the right to recover the payable amount from the "Contractor" from works done by his under any other organization or from his properties.

38. TERMINATION OF CONTRACT

The "Engineer-in-Charge" may put an end to the agreement at his option at any time due to (a) Bad workmanship (b) Dis-proportionate progress (c) Non-compliance of labour rules or (d) Any other reason. The decision of the "Engineer-in-Charge" is final in this respect and no claim on this account will be entertained. "OCCL" also reserves the right to take expert measurements, if the "Contractor" does not co-operate in taking final measurements after termination of contract.

39. **RESPONSIBILITY OF CONTRACTOR**

The work shall be completed by the "Contractor" in all respect within the stipulated period of completion and the responsibility of the "Contractor" shall cease only, when the items are fully accepted by the owner after erection at project site.

40. **PROGRESS OF WORK AND PENALTY**

The "Contractor" will achieve the desired progress as per programme.. If the "Contractor" fails to achieve the contracted quantity every month as per programme, penalty at the following rates shall be imposed.

Sl. No.	Failure percentage(%)	Penalty percentage(%)
(i)	Less than 10(Ten)%	1(One)% of value of defaulted quantity
(ii)	Above10(Ten)% and upto 20(Twenty)%	2(Two)% of value of defaulted quantity
(iii)	Above 20(Twenty)% and upto 30(Thirty)%	5(Five)% of value of defaulted quantity
(iv)	Above 30(Thirty)%	To be asked to demobilise with penalty equivalent to 10(Ten)% of value of defaulted quantity.The "Engineer-in-Charge" will off-load the work and get the work done through any other agency or of its own at the risk and cost of the "Contractor". Noclaim will be allowed to the "Contractor" in this regard.

41. REJECTION DUE TO BAD WORKMANSHIP

The rejection due to bad workmanship shall be charged to the "Contractor" at a cost of rejected items plus 20(Twenty) %.

42. **TESTING OF WELDERS AND OTHER SKILLED/SEMI-SKILLED WORKMEN**

The qualification test of welders and other skilled/semi-skilled workmen may be conducted at site by the "Engineer-in-Charge" and only qualified welders and other skilled/semi-skilled workmen shall be deployed for the work. The cost of testing shall be borne by the respective "Contractor".

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43. **QUALITY ASSURANCE AND QUALITY CONTROL**

Quality Assurance/Quality Control Plan shall be prepared before commencement of site activities and shall be followed maintaining stage-wise up-to-date record of the work.

44. **SITE VISIT**

The "Contractor", interested to participate in the tender, should visit the site of work and get himself acquainted with site conditions and tendered work before submitting the tender.

45. **DEVIATION OF PROVISIONS IN AGREEMENT**

The "Contractor" will not vary or deviate from the provisions in the agreement without obtaining prior permission in writing from the "Corporation".

46. RIGHT OF THE "CORPORATION"

The "Corporation" reserves the right to cancel a particular tender call or all tender calls without assigning any reason thereof. The items can be splitted among two or more tenderers at any stage. The offer of any tenderer or all may be cancelled without assigning any reason thereof. The requirement shown in any tender call notice are only indicative and may vary.

47. **APPROACH ROAD, HAUL ROAD ETC.**

The approach road, haul road etc. if required, at site of work are to be constructed and maintained by the "Contractor" at his cost.

48. **SUB-LETTING**

The work under any agreement shall not be assigned or sublet to anybody by the "Contractor". If the "Contractor" shall assign or sublet or attempt to do so, the "Engineer-in-Charge" shall terminate the agreement and shall get the work done through any other agency or of its own at the risk and cost of the "Contractor". No claim will be allowed to the "Contractor" in this regard. "OCCL" reserves the right to have access also to units of the "Contractor" to verify, if works are actually executed by him.

49. EXECUTION OFEXTRA ITEMS AND EXTRA QUANTITIES

All extra items are to be executed by the "Contractor" at prevailing S/R rates. All extra quantities are to be executed at agreement rates.

50. FORCE MAJEURE:

Neither party shall be liable to the other for any loss or damage occasioned by or arising out of acts of God such as unprecedented flood, volcanic eruption, earthquake or other convulsion of nature and other acts such as but not restricted to invasion, the act of foreign countries, hostilities, or war-like operations before or after declaration of war, rebellion, military or unurped power which prevent performance of the contract and which could not be foreseen or avoided by a prudent person.

50. **JURISDICTION**

For all liabilities created under the various contractual obligations/impositions under this agreement, the "Contractor" undertakes not to raise any dispute or litigations in connection there with and shall make all endeavours to resolve all disputes amicably through conciliation and in all such cases, the decision of the Managing Director, "OCCL" shall be final and binding on the "Corporation" as well as on the "Contractor" failing which all such disputes arising out of the agreement shall be subject to jurisdiction of Hon'ble High Court of Odisha at Cuttack and their sub-ordinate courts at Bhubaneswar only. Both the parties agree by mutual consent that any dispute relating to this agreement is barred from arbitration.

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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 for actions as deemed fit.

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. Required Engineering personnel for day-to-day supervision of works will be provided by the Contractor. Engineering personnel of OCCL will monitor the quality and progress of work and will do check measurement for payment.

8. 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.

9. The agency/Contractor has to extend all necessary co-operation to the electrical and P.H contractors selected by OCCL for execution of the electrical & P.H work. During execution of the Civil Portion of work, the agency/contractor must ensure that all the electrical pipeline works are performed by the electrical contractor prior to roof casting. Similarly, provisions towards underground pipeline wiring for electrical and P.H works are also to be kept by the Civil Contractor/agency prior to plastering and flooring of the building.

10. The bidder has to visit the site and quote his rate which should include cost of haul road, dewatering if required by suitable method and other ancillary works for completion of work and no extra payment shall be made.

11. **PERIOD OF COMPLETION:**

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This work is to be completed in all respect within **03 (Three)** month (including rainy season) 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 the Senior Manager as per clauses indicated in the general terms and conditions of OCCL

12. 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.

13. 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 if any 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. However this temporary suspension period will be considered towards extension of time for completion of the work.

14. All materials required for the work shall be approved by the Engineer-in-Charge before use in the work. The contractor must extend necessary co-operation for sampling and testing of materials by OCCL/client. However, testing charges shall be borne by the Contractor.

15. 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 be borne at his own risk and cost. The rate quoted is inclusive of such expenditure.

16. 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.

17. Maintenance of the work during construction and during the **Defect Liability Period of 1 (one) year after completion of the work** is the responsibility of the Contractor.

18. The Contractor shall display notice both in English and Oriya indicating prevailing 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.

19. 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.

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

20. 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.

21. **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.

22. **ACCIDENTS :**

It shall be the Contractor's 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 stating the fact clearly and in sufficient details the circumstances of such accidents and the subsequent action. All other accidents on the works involving injuries to persons of 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 confirm 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

23. **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 / her directly.

(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 are 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(s) is/are made.

(g) Wage actually paid for each period.

24. During excavation of cut-off-trench and other components, shoring, shuttering including cost, carriage of materials including all taxes and cost of dewatering 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.

25. 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.

26. 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.

27. The work will be executed as per approved drawing, design and B.I.S. specification and as per the instruction of Engineer-in-charge.

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28. No claim whatsoever on account of interest will be entertained under any circumstances.

29. The Contractor will remain responsible to arrange all mechanical means whenever required to complete the work in time at his own cost.

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.

32. 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 blasting 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.

33. No extra cost is to be paid to the contractor towards construction of coffer dam, diversion channel, approach road & haul road etc. required for execution of work. The approach road / haul road to work site will be maintained by the contractor.

34. The detail specification enclosed with the tender papers for different item of work should be strictly adhered to during course of execution of work. The work is to be carried out strictly as per OPWD code, BIS specification and as per prevailing standards of State Govt. and Central Govt.

35. 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 for land for such requirement at his own cost.

36. 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.

37. The period of completion is fixed as **Three calendar months (including rainy season)** and cannot be altered except in case of exceptional circumstances with due approval of next higher authority / Client Department.

38. Royalty for stone products, sand, and Borrow earth are to be recovered from the contractor's bill as per prevailing Govt. Notification.

39. The Contractor is required to establish a field labour with required equipments for quality control testing at site at his own cost.

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 contactor.

(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 Govt Quality control testing unit

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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 Govt Quality control testing unit.

41. The Bidders are required to inspect the site and satisfy themselves regarding availability of land for the work and other facilities for execution of same. It may be noted that, he is to complete the work within the time specified. No extension of time will be allowed in any account. If the Bidder fails to complete the work within the scheduled time or leaves the work in complete, he will have no claim on the work so executed and in this matter the decision of the Engineer-In-Charge of the Corporation is final & binding.

42. The work has to be executed confirming to ISI standards and specifications.

43. The rate quoted will be inclusive of all taxes, duties and cess etc.but excluding GST The rates will be firm and binding during the entire period of execution and extension thereof.

44. The contract price will be inclusive of all ancillary works such as approach road to work site, dewatering, desilting, cofferdams, water diversion measures, shoring, strutting, gangways, chutes, ramps, ladders, scaffolding, the quality control testing charges and any other such works, which will not be measured but are necessary for carrying out the proposed construction. No extra payments will be made to the contractor for such ancillary works/jobs.

45. The price of the contractor will be inclusive of all finishing jobs and rectifications works as and when required. The defect liability period will be for a period of 1 year after the date of handing over. Successful completion and handing over on the part of the contractor will not resolve him from the responsibility of attending to all the required rectifications and maintenance of the system during the defect liability period.

46. The contractor will be fully responsible for the safety of the work, property and workmen. The contractor will provide proper insurance cover for the work and property against any damage due to accidents, natural calamities or otherwise from the date of commencement till the end of defect liability period and also insurance cover against possible accidents and personal injuries to workers and workmen during the period of construction.

47. **Lead of stone quarry / earth borrow area**

    i) The bidder / contractor should inspect the site and also proposed quarries of choice for materials, source of water and quote his bid price including quarrying and borrowing, conveyance and all other charges.

    ii) The responsibility of arranging the land for borrow area rests with the bidder / contractor and no separate payment will be made for purchase of land or otherwise. The contractors quoted bid price will be inclusive of land cost.

    iii) In case of stone quarries if the stone products shall be proposed to be quarried from any un-approved quarry, the said quarry is to be approved by the Engineer-in-Charge from technical point of view with the prior approval of CE, Quality assurance following the procedure as laid down above. After technical approval, it is the responsibility of the contractor to obtain necessary permission from the competent authority for quarry operation following the prevailing rules/norms of the Government.

    iv) The quarry area / borrow area operated by the contractor shall be properly fenced by him to avoid any accident.

    v) All the quarry maps clearly showing the location of quarry, haul roads are to be approved by competent authority. The estimates framed will have the quarry maps as an integral part.

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PERCENTAGE RATE TENDER AND CONTRACT FOR WORKS

GENERAL RULES & DIRECTIONS FOR THE GUIDANCE OF CONTRACTORS

1. The work proposed for execution by contract will be notified in a form of invitation to tender posted through websites www.tendersodisha.gov.in&www.odishaconstruction.com

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

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

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

4. The memorandum of work tendered for and the memorandum of materials to be supplied by the OCCL and their issue rates shall be filled in and completed in the office of the Senior Manager (Civil) before the tender form is issued if a form is issued to an intending tender without having been so filled in and completed, he shall request the office to have this done before he completes and delivers his tender.

5. The amount of earnest money to be remitted will be 1% (online).

6. The Engineer-in-charge or his duly authorized assistant will open the tenders in the presence of any intending Contractors who may be present at the time and will enter the amounts of the several tenders in a comparative statement in a suitable form. In the event of tender being rejected the earnest money shall thereupon be returned to the tenderer.

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

8. In the event of a tender being selected for acceptance the Engineer who opened the tenders will, if he is competent to accept the tender, inform the tenderer of the selected.

tender who shall there upon sign copies of the specification and other documents with the agreement. The tenderer of the selected tender shall also deposit the required amount of the security money within the prescribed time. If the tenderer fails to deposit the required amount of the security money within the prescribed time the Engineer-in-charge may reject the tender.

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

9. When a tender is selected for acceptance, the tenderer shall deposit the required amount of the ISD/PSD. No tender shall be finally accepted until the required amount of the ISD/PSD has been deposited.

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10. The amount of Initial security Deposit to be deposited by the tenderer whose tender is selected for acceptance shall be 2 (two) percent of the agreement value of the work, failing which tender shall be liable to rejection.

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

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

12. All tenderers are required to submit a list of works, which are in hand at the time of submitting their tenders. The list of works are required to be submitted in the proforma by the Executive Engineer under whom he has executed the work in order to judge their past performance (vide Works Department Circular No. 15443 dt. 01.08.2005.)

13. The earnest money deposited is liable to be forfeited to Corporation, if the tenderer backs out from the offer before acceptance of the tender by the competent authority.

14. IT towards GST will be deducted at the rate prescribed in the Odisha Goods & Service Tax Act-2017 or as amended from time to time.

Contractor Senior Manager (Civil)

TECHNICAL SPECIFICATION

SECTION-1

EXCAVATION OF FOUNDATION

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 or 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.

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.

1.2 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 Job Worker 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.

1.3 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.

1.3.1 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).

1.3.2 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 Job Worker. In additional to non - payment of such work suitable amounts as directed by the Engineer - in - charge will be recovered from the Job Worker as directed towards any extra cost which may have to bear on account of the Job Workers un-authorized action.

1.4 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 Job Worker in the item of work included in Schedule of requirement of the Quotation or on ancillary

for preparatory work free of charge. Prior approval of the Engineer - in - charge for such free use shall however be taken.

1.4.1 No re-handling of excavated material due to injudicious selection of the place for dumping will be paid for.

1.4.2 Blasting executed by Job Worker in connection with the works shall be carried out in the manner described under "Blasting operations – Instructions to Job Workers" Controlled blasting shall be carried out where desired in the manner as directed.

1.4.3 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.

1.5 MEASUREMENT

1.5.1 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.

1.5.2 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.

1.5.3 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.

1.5.4 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 - 2

STEEL REINFORCEMENT

2.1 GENERAL

a. The section covers specifications for providing steel reinforcement to Dams/barrages and ancillary works and the Job Worker 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 Job Worker 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.

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

2.2 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 Job Worker shall procure high yield strength deformed bars, conforming to IS:1786-1985.

c. The reinforcement bars used by the Job Worker 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.

2.3 **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 Job Worker 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 by25 mm or 1 ¼ 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 ½ 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 1½ 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 Job Worker 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/mm^2.

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 Job Worker shall submit samples of the proposed coupling to the Engineer for approval not les than 60 days prior to their proposed use.

2.6 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 = ± 10mm

ii. For effective depth more than 200mm = ± 15mm

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.

2.7 **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 Job Worker 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 - 3

CONCRETE

(Excluding Framework, Reinforcement and Joints)

3.1 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 Job Worker 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 Job Worker.

(3) The Job Worker shall cooperate with all other Job Workers 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 Job Worker's plants and equipment or their operation or of any construction methods shall not relieve the Job Worker of his full responsibility for the proper and safe execution of concrete work or any obligations under this contract.

3.2 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 slang 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

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 Job Worker 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 Job Worker shall submit to the Engineer-in-charge updated and detailed plans and descriptions, consistent with those submitted with his Quotation and any subsequent amendments and additions agreed to by the Engineer-in-charge and the Job Worker, 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 Job Worker 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.

a) Mode and methodology of concrete compaction and concrete curing.

b) 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.

c) Foundation and surface preparation equipment.

3) At least 56 days in advance of any concrete work being carried out at the site, the Job Worker 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 Job Worker 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 Job Worker 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 Job Worker 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. Job Worker 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 Job Worker 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 Job Worker in writing to commence concrete placement.

c. The Job Worker 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 Job Worker 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 Job Worker 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 70^0C and when entering the mixers shall not exceed 50^0C 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 (pozolana) 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 Job Worker 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 Job Worker 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 Terric 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, course aggregate shall not suffer a loss of weight in excess of 12% after five cycles.

(7) Coarse aggregate shall be hard, dense, durable, nun 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 Job Worker 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 Job Worker for washing of aggregates, manufacturing and curing of concrete The water shall be clean and free from harmful quantities of oil, acids, alkalils, 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) Job Worker 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 Job Worker 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 Job Worker 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 Job Worker 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 Job Worker 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 Job Worker shall start the testing of materials, propose the composition of concrete mixes and prepare trial mix of each of the proposed concrete class. The Job Worker 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.

7.6 Job Worker 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 Job Worker shall submit the test reports to the Engineer-in-charge for approval.

QUALITY CONTROL

7.6.1 General

(1) The Job Worker 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 Job Worker shall keep records of test results, which shall be presented to the Engineer-in-charge upon request.

(3) Should the Job Worker wish to change his approved testing program he shall notify the Engineer-in-charge of these changes 2 weeks in advance.

(4) Besides Job Worker's testing program the Engineer-in-charge will make control test to the extent as he deems necessary. The Job Worker 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 Job Worker 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 m^3 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 Job Worker 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 Job Worker 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 Job Worker 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 Job Worker 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 Job Worker 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 Job Worker to provide core tests. Location and number of cores will be decided by the Engineer-in-charge. The Job Worker 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 Job Worker 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 Job Worker shall have to effect these changes and shall not be entitled to any compensation on account of such changes.

7.8 BATCHIING AND MIXING

7.8.1 General

(1) The Job Worker shall furnish the plant lay out and the method of concrete production, transportation and placing to the Engineer-in Charge. The Job Worker 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 $1m^3$ 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 $0.5m^3$.

(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 40^0C 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 Job Worker 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 $1m^3$ 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.

3.11.1 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) Job Worker 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 Job Worker's cost.

(2) The Job Worker 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 Job Worker 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 Job Worker 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 Job Worker 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 Job Worker 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 Job Worker 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 seems 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 hard 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 cm^2 with 16pyramid shaped teeth. The surfaces shall be finished at a rate of 250 to 400 cm2/ minute indenting the concrete surface approximately 2 mm.

3.14 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 Job Worker 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 Job Worker'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 Job Worker 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/cm^2. 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 Job Worker 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 Job Worker 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 Job Worker to do so on condition that Job Worker 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 Job Worker 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 Job Worker'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 Job Worker.

(2) Job Worker 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 100m.

(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 smoothened 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 Job Worker 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 Job Worker 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_zO + 0.658 K2) 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 Job Worker 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 to10mm

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 a2m 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 Job Worker 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.

3.17.2. 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 Job Worker 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.

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

7.17.4 Concrete in Blockouts for Equipment Embedding.

(1) The Job Worker 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.

3.17.5 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-shink cement-based grout or non-shrink epoxy grout as proposed by the Job Worker 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 Job Worker 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.

3.17.6 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/m^2 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.

3.17.7 Tests

(1) All cost associated with testing as described in this section shall be borne by the Job Worker. 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 Job Worker 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 Job Worker 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 Job Worker's expense.

7.18 FORM WORK

3.18.1 Procedure for Form, Centering and temporary works.

3.18.2 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 Quotation, the Job Worker 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.

3.18.3 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 Job Worker.

3.18.4 After approval of the general scheme, the Job Worker 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 Not withstanding 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 Job Worker 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 Job Worker 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. Job Worker 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 Job Worker at his cost.

7.18.9 Re-use of Forms etc.

3.18.10 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.

3.19 Cleaning of Forms.

3.19.1` 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 Job Worker 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 Job Worker 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 Job Worker 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.
- 8.20.10Spanning upto 6m 14 days
- 8.20.11Spanning 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 propos 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.	2. Piers.
• Key for Intermediate construction	3. Abutment & flank wall (river side)
• Cubes	4. Abutment & flank wall (river side)
• Faces which are not exposed for public	5.Exposed surface of upstream side barrage section i.e. glacis the profile Rigid, apron, slope.

FORMS & ANNEXURES

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.

(Signed by an Authorized of the firm)

Title of Officer

Name of Firm

Date.

Contractor Senior Manager (Civil)

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 :_____

Contractor Senior Manager (Civil)

ANNEXURE-C

UNDERTAKING TO PAY ROYALTY

We do hereby undertake that, Royalty 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 :_____

Contractor Senior Manager (Civil)

ANNEXURE-D

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 :_____

Contractor Senior Manager (Civil)