GOVERNMENT OF ODISHA
DEPARTEMNT OF WATER RESOURCES

Name of the Project - Subarnarekha Irrigation Project

COVER – I

(TECHNICAL BID)

NAME OF THE WORK

Improvement of Black Topping Service Road from RD 25.00KM to RD 37.50KM of Jambhira Left Main Canal.

Superintending Engineer
Jambhira Canal Division
Morada

CONTENTS

CHAPTER - I

GENERAL INFORMATION

DETAILS OF WORKS

Name of the work

Improvement of Black Topping Service Road from RD 25.00KM to RD 37.50KM of Jambhira Left Main Canal.

General Information

1.0. SCOPE OF WORK

The work under tender pertains to Subarnarekha Irrigation Project under Suliapada, Morada, Rasgobindpur Block in the District of Mayaubhanj of the State of Odisha.

The above work primarily comprises of renovation of Black Topping Road by laying WMM grading, Prime coat, Tack coat, Bituminous Macadam, and Semi-Dense Bituminous Macadam along with improvement of service road with Grade-I metaling.

1.1. LOCATION OF WORK SITE.

The site of the work "Improvement of Black Topping Service Road from RD 25.00KM to RD 37.50KM of Jambhira Left Main Canal." is located in the Suliapada, Morada, Rasgobindpur Block Block of Mayurbhanj District of Odisha. The work site is located 35 KM (average) away of the District Head Quarter Baripada. It is 290 KM away by road from Bhubaneswar, the capital city and also connected by rail with nearest Railway Station at Baripada. Nearest Air Port is Bhubaneswar.

1.2 **TRANSPORTATION/ COMMUNICATION FACILITIES:**

The work site is connected with the District Head Quarter Baripada by black topping road.

1.3 **GENERAL INFORMATION**

The information and data related to work and site conditions described thereafter, represent the site conditions in general. It shall be presumed that the contractor visits the site, of proposed works for his satisfaction as to the nature and location of work and local conditions in general and particularly about the availability of power supply, water supply, storage and handling of materials, disposal of soil, road communication data and bore hole data, availability of labour and other related matters required for planning for execution etc., before quoting his percentage rate for the work.

1.4 **AVAILABLITY OF LABOUR**

Labourers required for the works may be available to some extent near project area. It is preferable to engage local labourers as far as practicable and possible. However, the contractor must make his own arrangements for execution of works after proper assessment of availability and requirement of labourers and machineries & equipments.

1.5 TOWNS:

The nearest town is Baripada the District Head Quarter.

1.6 AVAILABILITY OF DIESEL AND LUBRICANT.

The nearest Filling Station for POL is located at Baripada.

1.7 OBSERVATION OF RULES

a) The contractor shall take all precautions to ensure safety to the workers. The Department will not take any responsibility for any accident if occurred at work site or at any place relating to this work. The relevant norms of the Government

must be strictly adhered to for the purpose of compensation and other benefits etc.

b) The contractor shall take action to rectify the defects, if any, required for installation of machineries and equipments, pointed out by the Departmental Engineer in a reasonable time.

1.8 HOUSING

Private houses may be available for housing in nearby villages of the work site. But the Contractor shall make his own arrangements for housing the labourers, materials, staffs and site offices at the work site.

1.9 ELECTRIC POWER SUPPLY FOR CONSTRUCTION PURPOSE

The contractor will take steps to illuminate the borrow area and portions of haul roads as may be required while carrying out the work. No compensation will be paid to the contractor due to failure of electricity to any or entire part of the work site resulting in disrupting the construction activities of the of work and for the idle labour, machinery & equipments. The electric supply for the domestic purpose of the contractor and his labourers will be the responsibility of the contractor. Supplying electricity to work shops, crushers quarries etc. by the contractor is not the responsibility of the department and shall be arranged by the contractor at his own cost. The contractor has to make his own arrangement for power supply. If the department supplies electricity, the contractor may avail the facility on payment of charges fixed by the department from time to time.

1.10 LOCAL ROADS

The Contractor may use the existing approach roads to the site of work, to the extent of availability. The contractor shall, however construct & maintain connecting roads within the working area and in his labour colony areas including drainage crossings. The contractor shall construct and maintain haul roads, and other approach roads including river and drainage crossing etc. as may be necessary for the purpose of execution of the work at his own cost.

1.11 DUMP AREAS

Materials excavated from the foundations of structures and canal excavation and in connection with other items of work shall be dumped as per the direction of Engineer-in-charge, The Contractor shall construct and maintain all roads to the working areas at his own expenses for disposal of excavated materials.

1.12 OTHER CONTRACTORS

In the matter of dumping the excavated materials, haul roads, diversions, excavations etc. the Contractor shall take into consideration the needs and requirements of other Contractors if any, working in the vicinity. There should be proper and adequate co-operation with other working Contractors, if any other contractor is working in the vicinity. The direction of the Engineer-in- Charge must be carried out on this score. Further, the contractor shall not cause disruptions, discontentment or disturbance to the work, labourers or arrangements etc. of the other contractors working in the vicinity of the work site.

1.13 USE OF SITES

a) Construction of temporary houses shall be made by the Contractor at his own expenses on the available Government land acquired for the project, if available and permitted by the Engineer-in- Charge, for storage sheds, office, residence etc for non-commercial use on the land handed over to him. After the completion

of the work, these structures should be dismantled and the site should be cleared before handing over to the Department.

1.14 FLOOD

a) In case of flash and untimely flood in the river during the working season i.e. resulting in overtopping of coffer dam and flooding of the work areas, the Contractor shall make his own arrangements at his own cost to shift the machinery, equipment, materials, labour and any departmental machinery hired by the contractor to a safe place. The work shall have to be resumed after receding of floods and necessary strengthening of Cofferdam. Suitable extension of time shall however be granted on such occasions for the loss of working time on the request of the contractor if, he so desires.

b) The silt, debris, sand and other materials accumulate in the working area, during flash floods or regular floods in the monsoon, shall be removed by the contractor as required for continuing the work at his own cost. If any excavated portion, which could not be filled with concrete or earth by the Contractor, is filled up during the monsoon period with earth and silt during the execution of work whatsoever the reasons may be, the contractor will have to re-excavate such portion of work at his own cost.

c) It is the entire responsibility of the contractor to make all arrangements required from time to time for the work and protect the men, machinery, materials etc deployed by him and the work under progress, the items of work for which the payment has already been made on recorded measurements, against any damage either during working season or during the flood season. The Department accepts no liability for any damage or loss caused.

CHAPTER - II

DETAIL TENDER CALL NOTICE (DTCN)

GOVERNMENT OF ODISHA
DEPARTMENT OF WATER RESOURCES
OFFICE OF THE CHIEF ENGINEER & BASIN MANAGER,
SUBARNAREKHA & BUDHABALANGA BASIN,
AT/PO:- LAXMIPOSI, DIST:- MAYURBHANJ
Mail Id. cebmsbb2019@gmail.com
Government of Odisha "e" PROCUREMENT NOTICE
Bid Identification No. 05/ 26-27 of CEBM, SBB, Laxmiposi

1	Name of Work	Road Work
2	Total No of Projects	3 Nos
2	Estimated Cost	Varies from Rs.454.70 Lakh to Rs.628.71 Lakh
3	EMD	Details can be seen in the DTCN of bid documents of the respected works
4	Period of Completion	Details can be seen in the DTCN of bid documents of the respected works
5	Class of Contractor	"A" Class and Special Class
6	Date & Time of availability of bid document in the portal	22.06.2026 at 10.00 AM
7	Last date/time for receipt of bid in the portal	06.07.2026 up to 5.00 PM.
8	Date of opening of bid	07.07.2026 at 11.00 A.M.
9	Name & Address of the O.I. T	Chief Engineer & Basin Manager, O/o the CE&BM, Subarnarekha & Budhabalanga Basin, Laxmiposi, Mayurbhanj

Further details can be seen from the e-Procurement Portal "https://tendersodisha.gov.in".

Sd/
Chief Engineer & Basin Manager
Subarnarekha & Budhabalanga Basin,
Laxmiposi, Mayurbhanj

CONTRACTOR(AGENCY) SUPERINTENDING ENGINEER

GOVERNMENT OF ODISHA
DEPARTMENT OF WATER RESOURCES
OFFICE OF THE CHIEF ENGINEER & BASIN MANAGER,
SUBARNAREKHA & BUDHABALANGA BASIN,
AT/PO:- LAXMIPOSI, DIST:- MAYURBHANJ
Government of Odisha "e" PROCUREMENT NOTICE
Bid Identification No. 05/ 26-27 of CEBM, SBB, Laxmiposi
Mail Id. cebmsbb2019@gmail.com

The Chief Engineer & Basin Manager, Subarnarekha & Budhabalanga Basin, Laxmiposi on behalf of Hon'ble Governor of Odisha invites on-line percentage rate tenders in double cover system through e-procurement for execution of the work as noted below. The bid should be submitted by eligible class of contractors as mentioned below registered with State Government & contractors of equivalent grade / class registered with Central Government / MES / Railway to be eventually drawn in P_1 form through On-line in the Government website "https://tendersodisha.gov.in." The bidders should have necessary portal enrolment (with own digital signature certificate). The registered bidders outside Odisha State can also participate in this on-line tender process after necessary portal enrolment but shall have to subsequently undergo registration with appropriate authority of the State Govt. within a month of acceptance of bid.

Sl. No	Name of work	Value of work in Lakh	Class of Contractor	Bid Security/ E.M.D.	Cost of bid documents	Period of completion
1	2	3	4	5	6	7
1(a)	Improvement of Black Topping Service Road from RD 25.000 Km to 37.500 Km of Jambhira Left Main Canal.	Rs.628.71 Lakh	"A" Class and Special Class	Rs. 6,28,800/-	Rs.10,000/-	12 (Twelve) Calendar Months
(b)	Improvement of black top service road from RD 31000M to 37000M of Subarnarekha main canal.	Rs.488.19 Lakh	"A" Class	Rs. 4,88,200/-	Rs.10,000/-	06 (Six) Calendar Months
(c)	Improvement of black top service road from RD 00 M TO 7325M of Subarnarekha main canal	Rs.454.70 Lakh	"A" Class	Rs. 4,54,700/-	Rs.10,000/-	06 (Six) Calendar Months
2	E.M.D. required / Bid Security	1% EMD to be paid through Bank Guarantee/ Online mode. BG should be pledged in favour of Superintending Engineer, Jambhira Canal Division, Morada for Sl. No 1 (a) / Superintending Engineer, Subarnarekha Irrigation Division No-1, Jharpokharia for Sl. No 1 (b) & (c)				

CONTRACTOR(AGENCY) SUPERINTENDING ENGINEER

<table>
<tr><td>3.</td><td>Cost of tender paper</td><td>The bidder shall deposit online the cost of bid document for Rs.10,000/- towards cost of the Bid specified for the work in the table above as part of its bid through a process as mentioned under DTCN.</td></tr>
<tr><td>4.</td><td>Mode of submission of Tenders</td><td>Tender should be submitted on-line in “https://tendersodisha.gov.in.
Cover - I
<table>
<tr><th>Sl No.</th><th>Cover Type</th><th>Document Description</th><th>Type</th></tr>
<tr><td>1</td><td>Technical Bid</td><td>Bid Security/ EMD, GST, PAN, Contractor’s R.C., Affidavit, Undertaking declaring no relationship with Department Officials & any other documents as per DTCN.</td><td>pdf</td></tr>
</table>
Cover – II
<table>
<tr><th>Sl No.</th><th>Cover Type</th><th>Document Description</th><th>Type</th></tr>
<tr><td>2.</td><td>Financial Bid</td><td>BoQ</td><td>Xls</td></tr>
</table></td></tr>
<tr><td>5</td><td>Date & Time of availability of bid document in the portal</td><td>From 22.06.2026 at 10.00 AM to 06.07.2026 up to 5.00 PM.</td></tr>
<tr><td>6</td><td>Date of opening of Technical Bid</td><td>07.07.2026 at 11.00 A.M. in the office of the Chief Engineer & Basin Manager, Subarnarekha & Budhabalanga Basin, Laxmiposi.</td></tr>
</table>

7. Bid document consisting of qualification, information and eligibility criteria of bidders, plans, specification and schedule of quantities along with rates of the work are available in web-site https://tendersodisha.gov.in.” and the set of terms and conditions of contract and other necessary documents can be seen in the web-site till last date of availability of tender on-line for bidding.

8 The bids for the work shall remain valid for a period of 90 days from the last date of receipt of bid. If any bidder/tenderer withdraw or modify their bids during period of validity etc., they will be suspended for the time specific in the tender documents.

9. The percentage rate excess or less to be quoted should be up to two decimal point only. In case the percentage rate is excess or less up to two or more decimal points, the first two decimal point will be considered without rounding off.

10. As per Office Memorandum No.173/W, Dt. 03.01.2026 of Works Department, the Additional Performance Security (APS) shall be taken on an incremental basis from the selected bidder for low bid prices in the project works as under:

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

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

III. where the bid price is 20% or more below of the project cost put to bid, the additional performance guarantee percentage shall be incremented by 0.2% for every percentage of bid price below 20% of the project cost put to bid in addition to 1% of

the bid price and this additional performance guarantee percentage shall be applied on the bid price.

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

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

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

Additional Performance Security (As per Memorandum No. 173/W Dated - 03.01.2026) shall be furnished by the bidder when the bid amount is less than the estimated cost put to tender. Only the successful bidder who has quoted less bid price/rates than the estimated cost put to tender shall have to furnish Additional Performance Security (As per Memorandum No. 173/W Dated - 03.01.2026) in shape of National Savings Certificate (NSC)/ Post Office savings Bank A/C Post Office Time Deposit Account/ Kisan Vikas Patra/ Bank Guarantee in favour of Divisional Officer (Superintending Engineer, Jambhira Canal Division, Morada for Sl. No 1 (a) / Superintending Engineer, Subarnarekha Irrigation Division No-1, Jharpokharia for Sl. No 1 (b) & (c)) from any Nationalized / Scheduled Bank in India counter guaranteed by its local branch at Bhubaneswar / e-Bank Guarantee executed on the National e- Governance Services Limited (NeSL) Digital document execution portal/ Insurance Surety bond issued by an Insurance Company authorized by the Insurance regulatory and Development authority of India (IRDAI) in favour of Divisional Officer (Superintending Engineer, Jambhira Canal Division, Morada for Sl. No 1 (a) / Superintending Engineer, Subarnarekha Irrigation Division No-1, Jharpokharia for Sl. No 1 (b) & (c)) within seven days of issue of letter of acceptance (LOA) by the concerned officer (By e-mail) to the successful bidder otherwise the bid of the successful bidder shall be cancelled & the Earnest Money Deposit/ Bid Security shall be forfeited. Further, proceeding for blacklisting shall be initiated against the bidder.

11. The tender accepting authority will verify the originals of the all-scanned documents of the successful lowest bidder only within 5 days of opening of the tender. In the eventuality of failure on the part of the lowest successful bidder to produce the original documents, he will be debarred in future from participating in tender for 3 years and will be blacklisted by the competent authority.

12. Other details can be seen in the bid documents, which is available in web-site “https://tendersodisha.gov.in.”

13. Signing of Bid :- The on-line bidder shall digitally sign on all statements, documents, certificates up loaded by him, owning responsibility for their correctness / authenticity as per

IT ACT 2000. If any of the information furnished by the bidder is found to be false / fabricated / bogus, his/her EMD / Bid security shall stand forfeited and his/her registration in the portal shall be blocked and the bidder is liable to be blacklisted. Authority reserves the right to reject any or all the tenders without assigning any reason thereof. No tenderer can demand the cause of rejection of his/her offer.

14. Authority will *not* be held responsible for system failure, malfunction of internet or traffic jam. Bidders are advised to submit their bids well in advance within the stipulated period.

15. If more than one bid is quoted (decimal up to two numbers will be taken for all practical purposes), either at the estimated cost put to tender or less than the estimated cost put to tender, the tender accepting Authority will finalize the tender through a transparent lottery system, where all the concerned bidders/ their authorized representatives, the concerned SE/ EE of the concerned Division and Divisional Accounts Officer (DAO) will remain present. (As per OM No. 632 dated 09.01.2026).

16. If the rate quoted by the SC and ST Category Contractors comes to the rate quoted by the L_1 bidder (decimal up to two numbers will be taken for all practical purposes) after availing 10% price preference as per Para 2 of Works Department Resolution No. 27748 dated. 11.10.1977, the tender shall be finalized by the tender accepting authority through a transparent lottery system along with other categories of contractors.

17. Annexures appended in the technical bid documents should be filled up properly & uploaded in the website for evaluation of prequalification bid, otherwise the tender will not be considered.

18. The prospective bidder should inspect the work site and quarry sites to assess and ensure the availability and sufficiency of the suitable materials conforming to the technical specification for construction of work and quote their independent rate accordingly. Subsequent claim for any extra lead on the ground of non-availability of construction materials will not be considered.

Sd/-
Chief Engineer & Basin Manager
Subarnarekha & Budhabalanga Basin,
Laxmiposi, Mayurbhanj

CONTRACTOR(AGENCY) SUPERINTENDING ENGINEER

Attention of the Bidders

The bidders are requested to furnish all the documents /information* as per the stipulation of the Bid Document failing which the tender shall be summarily rejected. Any approach either in written or verbal to consider the tender not providing the required document/ information as per the stipulation of the Bid document shall be considered as canvassing for acceptance of tender which may lead for black listing of the concerned agency.

***Where specific proforma is given, the information must be furnished in the specific given proforma, otherwise, the information provided in any other proforma /shape shall not be considered for the technical bid evaluation.**

1. Invitation.

(a) The **Chief Engineer& Basin Manager, Subarnarekha& Budhabalanga Basin,Laxmiposi** on behalf of Hon'ble Governor of Odisha invites sealed on-lined tender in double cover system for percentage rate bid through website to be eventually drawn in P.W.D. form P1/ F2 from '" A" & Special Class only Contractors Registered with the State Govt. of Odisha or from contractors of equivalent grade / class registered with other State Govt. / Central Govt. / M.E.S. / Railways or other Govt. undertakings. All the contractors are to be registered in the State portal and must possess compatible digital signature certificate of Class-II / III for online bidding. The website for online bidding is **http://tendersorissa.gov.in** tender documents can be downloaded from the website identified as http://tendersorissa.gov.infrom **10 A.M. of 22.06.2026 to 5.00 PM of 06.07.2026.The** bidder for participation in on line bidding will have to transfer online the cost of bid document for Rs. 10,000/- (Rupees ten thousand) for each set through a process as mentioned under DTCN. The Bid will be received through e-procurement portal from **10 A.M. of 22.06.2026 to 5.00 PM of 06.07.2026.**

(b) Each set of bid document contains

1st cover (Technical): PAN, GST / GSTIN, Valid Contractor's Registration Certificate, Affidavit, Bid Security, Declaration regarding no relation with Department Officials and any other documents as per SBD/DTCN **(in .pdf format**.)

2nd cover (Financial): Bill of Quantities (BOQ) (in .xls format)

The **1st cover (Technical)** bid will be opened on **07.07.2026 at 11.00 AM** in the office of the **Chief Engineer & Basin Manager, Subarnarekha & Budhabalanga Basin, Laxmiposi** in presence of the tenderers or their authorized representatives who wish to attend. The bidders who participated in the on line bidding can witness opening of the bid from any system logging on to the portal away from opening place. The bids can only be opened by the pre-designated officials only after the opening time mentioned in the bid. In the event of the specified date of bid opening being declared a holiday, the bid will be opened at the specified time and location, on the next working day. Date, time and place of opening of Cover-II (Financial bid) shall be intimated separately to tenderers those who will be found eligible after evaluation of Cover-I (Prequalification bid). The intimation letter will be sent both through their e-mail address and postal address.

c. The value of the work tendered for is **Rs.628.71 Lakh.**

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

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

(f) The bidder shall submit the scanned copies of the documents in the designated locations of **1st cover (Technical) & 2nd Cover('Financial).** Submission of bid documents shall be effected by using DSC of appropriate class and thus shall be in encrypted form. The bidder shall only submit single copy of the document. He is required to check the documents uploaded with the requirement asked for in the bid. Only after satisfying that all the documents have been uploaded, he should activate submit button. His bids shall not be considered responsive and action as per relevant clause shall be taken if he

does not provide the required documents or provided illegible document as mentioned above at clause-1(b). Clarity of the document may be ensured by taking out a sample printing.

1.2 EARNEST MONEY DEPOSIT.

1% EMD to be paid through Bank Guarantee/ Online mode. BG should be pledged in favour of Superintending Engineer, Jambhira Canal Division, Morada for Sl. No 1 (a)

1.3 TAX CERTIFICATES:

The tenderers are also required to upload scanned copy of original valid Registration certificate, PAN card, ITCC (if any), GST/GSTIN along with tender documents failing which his tender shall not be considered.

1.4 TIME OF COMPLETION:

The work is to be completed within **12 (Tweleve) Calendar Months** including monsoon commencing from the date of issue of order to proceed with the work.

2. OTHER INFORMATIONS FOR SUBMISSION OF BIDS THROUGH e-PROCUREMENT PORTAL

2.1 The bidders shall prepare the documents and upload the scanned typed document in PDF format and BOQ in excel format (or as specified in the portal) in appropriate place.

2.2. An intelligent BOQ in MS Excel format shall be made available to the bidder through e-procurement portal. The bidder shall open that particular excel sheet and fill in the percentage rate in figures at the appropriate location. The bidder is not supposed to change or modify the format of the excel sheet in any form. If the bidder does not fill percentage rate for the work, his bid will stand cancelled.

2.3. It is allowed to modify the bid through the e-procurement portal. The bidder shall have to log in the system and resubmit the documents as asked for by the system including the financial bid. In doing so, the bids already submitted by the bidder will be removed automatically from the system and latest bid only will be admitted. But the bidder should avoid modification of the bid at the last moment to avoid system failure or malfunction of the internet or traffic jam. If the bidder fails to submit his modified bids within the designated time of receipt, the bids already in the system shall be taken for evaluation.

2.4. Withdrawal of bid is also allowed in the e-procurement portal. The bidder has to click on the "withdraw" button and record the necessary justification for the same in the space provided. In addition to this, he has to write a letter addressed to officer inviting the bid and upload the scanned document from portal in respective bid. The system shall not allow any withdrawal after expire of the closure of the bid.

3. PRE-BID INSPECTION BY CONTRACTORS:

The tenderers are required to go through each clause of PWD form F-2 carefully in addition to clause mentioned herein before tendering. In any case the tenderer shall be deemed to have carefully examined the tender documents, visited the site of work and its surroundings and satisfied himself as the form and nature of the site approach roads, haul roads, local conditions, assessed all the facilities including requirement and availability of labour and materials needed to complete execution of the work and made an inventory of such information as to the risks, contingencies and other circumstances which would influence or affect his tender before tendering. He should also satisfy himself about the sufficiency of availability of materials in quarry and borrow area. The Department will not be responsible for any misjudgment of the tender on the account for any future claims.

4. VALIDITY OF TENDER:

4.1 The tender should be uploaded bearing the correct identification number mentioned in the tender call notice. Tendering authority shall not be held responsible if the tender uploaded with incorrect Identification number.

4.2 (i) Earthwork, Embankment Filling work, Double Under Reamed Piling work, Concrete work, Rip-Rap & Rock Toe Stone packing Work and Reinforcement work are the main items to be executed for this work. Principal machineries / equipments such as Tipper, Truck, Excavator, Dozer, Vibratory Roller and Batching Plant, Rig with Bentonite pump, Concrete Pump, Vibrator, Compressor, and P.R.R. etc. are required for execution of such items.

4.3 The tenderer must furnish the scanned copy of valid R.C (Registration certificate), GST/GSTIN, PAN, and Affidavit through web-site otherwise his/her bid shall be declared as "non-responsive" & shall be liable for rejection.

4.4 The percentage rate quoted shall remain valid for a period of **90 (ninety**) days from the last date prescribed for receipt of tenders.

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

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

4.7 Letters and communications etc, raising and lowering the percentage rate or dealing with any point in connection with the tender will not be considered.

4.8 Percentage rate quoted should be for complete work considering all the finished items of the work and for sufficiency as per the description of the schedule of quantity and specification and shall include all taxes including rent, royalty, cess, general &incidental charges pertinent to the work, other charges of materials, Octroi duty, ferry tolls, conveyance charges and other costs on account of land and buildings including temporary building required by the tenderer for collection and storage of materials, housing of staff or other purpose for the work.

The tenderer must quote the percentage rate for the complete work to be included in contract and tenders containing indefinite terms and conditions shall not be considered.

4.9 The tenderer shall bear the cost of various incidental sundries and contingencies or of similar category, required for the work as mentioned below.

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

ii) Water arrangements for labourers as well as for the works. No claim for carriage for water, whatsoever, will be entertained.

iii) Fees and dues levied by the Municipality or/and Water Supply Authorities shall be borne by the contractor.

iv) Suitable equipment and wearing apparatus for the labourers engaged in risky operations and medical aid to the labourers engaged for the work.

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

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

(vii)The tenderer shall write the percentage rate of the whole work in figures only in appropriate column.

(viii) Rent, royalties and other charges of materials, octroi duty, entry tax & all other taxes including cess, GST, ferry tolls, conveyance charges and other cost

on account of land and buildings including temporary building and temporary electric connection to work site as well as construction of coffer dam, construction of service road, diversion road and its maintenance till completion of work required by the tenderer for collection of materials, storage housing of staff other purpose of the work

4.10 The tender is to be decided as per prevailing Codal provisions taking into consideration in accordance with the stipulation made in the bid document along with the capacity of the tenderer. **The authority reserves the right to reject any or all tenders without assigning any reason thereof.**

4.11 All the tenderers are required to submit, along with their tender's declaration about the names of their relatives employed in Water Resources Department in the prescribed format appended in **Annexure- "E".** In case, they have no relative in Water Resources Department, a certificate to this effect along with tender required to be submitted that he is not related to any of the officers in the rank of Assistant Engineer & above in the Department of Water Resources. If the fact subsequently proved to be false, the contract will be rescinded, the earnest money & the total security will be forfeited & he shall be liable to make good to the loss or damages resulting in due to such cancellation.

4.12 No Engineer of Gazetted rank or other Gazetted officer employed in Engineering or Administrative duties in an Engineering Department of the State Government is allowed to work as a contractor for a period of two years after his retirement from Government service, without Government permission.

4.13 **1st Cover (Technical)**will be evaluated first and the competent authority will approve a list of qualified bidders based on qualifying criteria fixed by the Department. The date of opening of **2nd Cover (Financial)**of the qualified bidders will be intimated later on.

4.14 An affidavit shall be furnished by the bidder at the time of submission of tender paper about the authentication of tender documents including bid security. The scanned copy of the affidavit is to be uploaded through the e-procurement portal along with the technical bid. The affidavit in original is to be produced before the officer inviting tender prior to opening of the technical bid.

4.15 If more than one bid is quoted (decimal up to two numbers will be taken for all practical purposes), either at the estimated cost put to tender or less than the estimated cost put to tender, the tender accepting Authority will finalize the tender through a transparent lottery system, where all the concerned bidders/ their authorized representatives, the concerned SE/ EE of the concerned Division and Divisional Accounts Officer (DAO) will remain present. (As per OM No. 632 dated 09.01.2026).

4.16 The tender containing extraneous conditions not covered by the tender notice are liable for rejection and quotations should be strictly in accordance with the tender call notice. Any change in the wording will not be accepted.

4.17 Payment for RA bill shall be made in level section measurement and no string section measurement will be considered.

4.18 **TENDERER'S CERTIFICATE**

The tenderer will furnish his tender with a certificate that he has gone through all documents, including plans, drawings etc. of this tender schedule and clauses of P1/F-2 agreement in vogue and that he has visited the works spot and satisfied himself with the local conditions, sufficiency of availability of labourers and materials. Visited the quarries, assessed the availability of materials, water

etc. camp facilities and quoted his percentage rate for the work as whole considering the finished items in the work, to cover all contractual obligations and contingencies arising thereof.

5. AWARD OF CONTRACT

5.1 The tenderer whose tender is selected for acceptance shall within a period of fifteen days upon written intimation being sent to him by e-mail/ Regd. Post for acceptance of his tender, deposit the amount of initial security deposit @ 2% (two percent) of the accepted tendered amount and enter in to the agreements in the P.W.D. Form **P_1/F_2 (Schedule XLV Form No.61**) for fulfillment of the contract in the office of the **Superintending Engineer, Jambhira Canal Division, Morada.** This initial security deposit together with the E.M.D. and the amount withheld according to the provision of P_1/F_2 agreement shall be retained as security deposit for fulfillment of this contract**). Failure to enter into the agreement** with the aforementioned security deposit within the specified period shall entail forfeiture of the earnest money of the bidder. No tender shall be finally accepted until the required amount of security money is deposited. The written agreement to be executed between the contractor and Government shall be the foundation of the rights of both the parties & the contract shall be deemed incomplete until the agreement has been signed first by the contractor and then by the Superintending Engineer. The department will accept the initial security deposit in the accepted form prescribed in Clause–1.2 above duly pledged in favour of **Superintending Engineer, Jambhira Canal Division, Morada.**

5.2. The work may be distributed among the several contractors on splitting if considered necessary due to exigency of the circumstances and the contractor will not be entitled to any profit/ compensation on such occurrence.

5.3. In case of delay in acquisition of land no compensation will be admissible but extension of time will be granted, if applied by the contractor in prescribed form within due time to keep the contract in force.

5.4. The earnest money will be retained in case of the successful tenderer and will be dealt with as per the terms and condition of O.P.W.D. code. The earnest money of the unsuccessful tenderer except the three lowest tenderers shall be refunded on application after the financial bid is opened and comparative statement prepared. The EMD given by the other two parties except one whose tender is accepted shall also be refunded within 15 days of acceptance of tender and drawl of agreement.

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

The name of such Engineering personnel appointed by the contractor who will supervise the works shall be intimated to the tender receiving authority along with each tender. Each bill of the contractor shall be accompanied by an employment roll of engineering personnel together with certificate of the Graduate Engineer or Diploma holder employed by the contractor to the effect that the work executed as per the bill has been supervised by him.

5.6. No part of the contract shall be sublet without written permission of the Engineer-in-charge or any transfer shall not be made by power of attorney authorizing others to receive payment on behalf of the contractor.

5.7 No tenderer is permitted to furnish their tender in his own manuscript paper. The tender must be furnished in the manuscript used in the Bid documents.

5.8 All intending tenderers are required to submit the information in the forms and Annexure appended in Chapter-III for information and instruction to tenderers (IIT). In this context, they will have to submit the necessary supporting (authentic) documents as per conditions laid down in DTCN and IIT failing which their technical bid shall be considered as "non-responsive" and be liable for rejection.

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

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

6.2 Payment of the compensation under workmen's compensation act VI of 1923 to the workmen awarded by any competent court of law is the responsible of the contractor. If the contractor fails to pay the compensation to the concerned work man violating the order of the competent Court, the same will be recovered from the dues of the contractor and will be paid to the workmen.

6.3 The contractor shall have to be abided by the Labour Laws and Rules in vogue and shall provide at his own cost housing, water supply, sanitation, medical aid and other facilities to the labourers engaged in the work as required under Labour Laws and Regulations. The Contractor shall not employ labourer of minor age group. Any violation to the labour laws in vogue shall not absolve the contractor from penal action.

6.4 The contractor shall have to be abided by the safety code introduced by the Govt. of India, Ministry of works. Housing and supply in their standing order No.44 to 50 dated 25.11.57 violation of which shall drag the contractor to the orbit of penal action.

6.5 Blasting where required shall be taken up only when proper precaution have been taken for the protection of lives and property in accordance with I.S. 4081 – 1967 safety code for blasting and related drilling operations. Only persons having license for the purpose and well conversant with the working methods and precaution measures is to be deployed in using explosives and carrying out the blasting operation. To avoid the danger of injury from flying debris, all personnel in a blasting area shall retreat to an adequate cover. While carrying out excavation, adequate precautions in accordance with I.S. 3764 – 1966, Safety code for excavation works shall be taken for the safety of workers. The contractor shall have to be abided by the rules & regulations on this score.

6.6 In case of any damage to Govt. or public property or to the property owned to any persons, firms or bodies due to negligence or any such action of the contractor

resulting in damage or stoppage of work thereby, the contractor shall be liable to be penalized to the extent of the assessed value of the damage or the out turn lost. The certificate of the Engineer-in- Charge is conclusive and binding on this score.

7. CHANGE OF ADDRESS OF CONTRACTOR:

The Contractor shall inform the Engineer-in- Charge and the Department regarding change of his postal address from time to time which he has given in the tender paper and authorize any person with due intimation to the Engineer-in-charge and the Department to receive instruction or communication from the Department on his behalf if he desires , failing which the said undelivered instructions and communications published in notice board of the Engineer-in-charge shall be treated as intimation to the Contractor which is conclusive and biding on him.

8. ARCHAEOLOGICAL FINDINGS

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

9. CONTEMPORARY CONTRACTORS

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

10. TAXES:

a. The percentage rate quoted by the Contractor shall be deemed to excluding GST and including other taxes, labour cess and royalties, additional royalties, EMF & DMF of all materials that the contractor will have to purchase and borrow earth for performances of this contract.

b. The estimated cost is excluding GST. The rates of item basing on which estimated cost has been derived are excluding GST on different components to arrive at such rates.

c. GST: GST as applicable as per prevailing Govt. Circular time to time on works contract shall be paid over the bill amount at the time of payment of bill.

d. INCOME TAX:

Two percent (2% + 15% Surcharge) of the gross amount of each bill will be recovered from the contractor towards Income Tax (Provisional or as advised by Income Tax Department from time to time)

e. ROYALTY, ADDITIONAL ROYALTY, DMF& EMF OF MATERIALS

As per Gazette No. 419 dated 02.02.2026 the provision of Royalty of mineral materials used for the work is considered as following:-

(i)Metal/Chips/Stone products- Rs.130.00/Cum.With 10% DMF,5% EMF,& Addl.Royality Rs.260.00/Cum

(ii)Sand -Rs.35.00/Cum. With 10% DMF,5% EMF, & Addl.Royality Rs.70.00/Cum

(iii)Moorum –Rs.35.00/Cum. With 10% DMF,5% EMF, & Addl.Royality Rs.70.00/Cum

(iv)Earth –Rs.35.00/Cum. With 10% DMF,5% EMF, & Addl.Royality Rs.70.00/Cum

Any increase of cost of royalty by the Govt. will be applicable for the work and the same will be deducted from the work bill of the contractor. The officers inviting the Bid shall not be responsible for the same.

f. CESS:

1% (One Percent) of gross amount of each running bill will be recovered towards Cess under the Building & Other Construction Workers (Regulation and Employment and Conditions of Service) Act,1996, as enforced vide Government of Odisha, Labour & Employment Department Resolution No. LL-I-(iii)-25/07- 12653, dated. 15.12.2008.

11. INTEREST:

No interest is payable for the dues of the Contractor if any lying unpaid or payable for the work for any reason.

12. PLANS AND DRAWINGS:

The work has to be carried out in accordance with the Odisha Detailed Standard Specification and relevant I.S. Specification pertaining to the tendered items of work and specifications and special conditions appended hereto. Drawings will be supplied to the contractor to execute the work, in general, conformity therewith. These drawings will be supplemented by such additional, general and details drawings or directions as may be considered necessary or desirable as the work progress. No claim will be entertained due to change of drawings. Where details shown on those drawings differ from the requirement of the specifications, the requirement of the specifications shall govern and the contractor shall not work without proper drawings, direction and instructions. He shall check all drawings carefully and bring to the notice of the Engineer-in-charge any error and omissions discovered, where upon the Engineer-in-charge shall prepare revised additional drawings and specifications as may be required. All such additional general and detailed drawings will be binding on the Contractor under the same terms and conditions as provided in clauses of P_1/F_2 agreement. The decision of the Engineer-in-charge with regards to specification is final, for which no compensation or claim will be entertained.

13. CONSTRUCTION PROGRAMME:

A. Construction programme proposed and submitted by the contractor prior to issue of work order may be approved by the Engineer-in-charge. The contractor shall arrange for additional shifts whenever necessary to suit the revised construction programme. No extra payment on this account is admissible.

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

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

D. On signing the agreement, the site will be handed over to the contractor for execution and completion of works in all respect.

E. The contractor has to make adequate lighting arrangements for night works wherever necessary in fulfillment of the construction programme at his own cost and no extra payment on this account is admissible.

14. AVAILABILITY OF LABOUR:

Labourer required for the work may not be available to the full extent in the locality. The contractor may have to import labourer from outside. He shall arrange and regulate the labour strength according to necessity. The Department shall not entertain the claim

for any idle labour. The contractor's percentage rate in the tender is deemed to have adequate coverage because of import and employment of required labourers and providing facilities and amenities to them. No extension of time shall be allowed to the contractor for non-availability of labourer.

15. SUSPENSION OF WORK:

The Engineer-in-charge may from time to time by written orders without in any way deviating the contract, direct the contractor to suspend the work or any part thereof at such time and the contractor shall not after receiving such written order proceed with the work or items thereof ordered to be suspended until he shall have received a written notice from the Engineer-in-charge to proceed with the work again.

Should the work be ordered to be suspended directly in the interest of safety of the work due to acts of God or major war or indirectly as a result of the contractor not complying with any of the provisions of the contract in respect of the quality of the materials, workmanship programmed of execution, he shall not be entitled to claim any compensation for any loss he may be put to directly or indirectly for such suspension of work.

During the period of suspension of the work, the contractor shall properly protect and secure the works as necessary in the opinion of the Engineer-in-charge. No compensation shall be paid to the contractor for suspension of work on any ground and protection of executed work as directed by the Engineer-In-Charge.

16. ITEMS NOT COVERED IN THE BOQ.

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

17. FORCE MAJOR:

The contractor shall take all precautions to protect the work from damages due to any cause except major natural calamity and make good to such damage, if any, at his own cost during the period of execution and till the work is taken over by the Department. No compensation will be paid to the contractor because of idle labourers and machineries due to above reason.

18. TOOLS AND PLANT:

The contractor should arrange necessary tools, plant and machineries for the efficient execution of work at his own cost and the percentage rate quoted should be inclusive of such charges. The department may lend on hire some machinery for use in the work subject to availability on terms and conditions as shall be specified by the Department from time to time and after execution of necessary agreement. But, on the plea of non-supply of machineries by the Department, the works should not be delayed nor any compensation on such account is tenable nor will the contractor be eligible for any time extension on that score. No compensation shall be paid to the contractor for idle charges of machineries deployed in the work as it is the responsibility of the contractor to deploy the machineries and plants at work at his own risk and responsibility as per requirement.

19. HAUL ROADS:

All haul roads to Borrow areas and quarries will be constructed and maintained by the contractor at his own cost. The roads so constructed shall be allowed to be used free of

cost by agencies working in other reaches of the canal including Govt. Department unless otherwise restricted by the Engineer-in-charge.

20. DEPARTMENTAL SUPPLY OF MATERIALS.

In principle, no materials shall be supplied to the contractor as per the current policy of Govt. of Odisha, Vide G.O.No.48443/F dt.11.12.95 come in to force from 01.04.96. The contractor shall be responsible for procurement of all materials at his own cost and shall get it tested and approved as per relevant clauses of contract before use.

21. CONSTRUCTION SHEDS:

21.1 Temporary structures may be erected by the contractor at his expenses for storage sheds, office, residence, labour hutments etc. All preliminary works such as vats, mixing platforms etc are to be done by the contractor at his own cost.

On completion of the work these structures should be dismantled and the site to be cleared. The percentage rate to be quoted should be for the work as a whole considering finished items of works inclusive of such incidental items of works.

21.2. In the event of delay in supply of detailed structural designs for unavoidable reasons, reasonable extension of time will be granted on the request of the contractor. But no claim for monetary compensation will be entertained under any circumstances for this reason.

21.3. Any slip debris and other foreign materials deposited on the working region on account of rains, flood or any other cause prior to and during the course of execution and till the work is completely taken over the department have to be cleared by the contractor at his cost. The percentage rate quoted by the contractor shall be inclusive of all such contingencies. If any excavated portion that could not be filled with concrete by the contractor gets filled up during the monsoon period with earth/ silt, no payment shall be made to the contractor for such removal again. The contractor will have to excavate and remove the same at his own cost.

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

21.5. It shall be the responsibility of the contractor to make such arrangements as may be required from time to time to protect men, machinery and the works against damage due to flood or any other natural calamity and the department shall not be responsible whatsoever for damage or loss on the context.

22. SITE CLEARANCE:

The entire work site or a portion thereof, as may be considered necessary for the purpose of alignment and demarcation, shall be cleared by the contractor at his own cost. The Department shall suitably demarcate the limits of the structure within which work will be carried out within the scope of the contract.

The contractor has to supply necessary labour at his own cost for fixing benchmark pillars/alignment pillars / alignment and pegs and for layout, leveling and profiling and maintaining the same until completion of the work. The contractor at his own cost will supply cement concrete pillars required for layout. The layout and Benchmark pillars already laid out by the Department is to indicate this alignment of Canal in the field. The contractor while taking up excavation works will preserve original pillars.

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

23. OTHER CONTRACTORS:

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

24. ORDER BOOK:

An order book with pages serially numbered issued by the Superintending Engineer shall be maintained by the Sectional Officer systematically till completion of the work and there after surrendered it to the Engineer-in-charge for record. The order book shall be available at the site during working hours for recording instructions relating to the work.

Order regarding the work as and when necessary shall be entered in this book by the Superintending Engineer or his superiors with their dated signature in exercising the statutory power vested with them which shall be duly noted by the contractor or his authorized agent with his dated signature. The authorized field functionaries, in charge of work shall also record their observations as to defective work and such orders / observation entered in the order book, and noted by the contractor or his authorized representative shall be considered to have been duly given to the contractor. Similarly, orders entered by the Superintending Engineer and Chief Engineer shall be deemed to have been duly issued by the Engineer - in - charge of the work.

25. CLAIM BOOK:

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

A certificate should be furnished by the contractor along with claims. He is to certify to the effect that beyond the claims entered in the book, he has no other claims up-to-date. If in any month, there is no claim, a recorded certificate to that effect should be furnished by the contractor in the claim book. Each claim must be definite with the claimed quantity and amount as far as practicable and accurate. The claim book must be submitted regularly by the contractor to the Engineer-in-charge by the 10^{th} day of each month for his orders. Claims not made in this manner are liable to be summarily rejected. The claim book shall be finally surrendered by the contractor to the Engineer-in-charge for record after completion of the work and before settlement of the final claim.

26. RULE TO VERBAL ORDER:

It is the contractor's responsibility to get the verbal order, instructions or directions if any given for the interest of work by the competent authorities of the Department, confirmed in writing within a week without which no cognizance will be taken of such verbal orders, instructions or directions for settlement of any claim arising thereof.

27. STATUTORY OBLIGATIONS OF THE CONTRACTOR:

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

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

27.3. Bailing out water from foundation of structures and construction of cross bund, dewatering wherever necessary during execution of the work shall have to be done by the contractor at his own cost and no extra payment will be made on that account. The term dewatering shall mean the execution or operation of the items due to standing water as well as due to percolated water. The percentage rate of respective items of work is in inclusive of dewatering.

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

27.5 Department shall not pay compensation to the contractor for the damage occurred to the materials and work entrusted to him due to natural calamities the contractual or extended period of the contract. If any damage caused due to natural calamity, the contractor shall make good the loss and damage at his own cost.

28. DEPARTMENT'S RIGHT FOR DEVIATION IN QUANTITIES:

28.1 The Engineer-in- Charge reserves right to make any increase or decrease in quantity of items of work of BOQ or item of work of BOQ mentioned in the schedule of quantities attached to the tender notice as may be considered necessary in his opinion for satisfactory completion of the work and such increase or decrease shall in no way invalidate / vitiate the agreed percentage rate as per the Agreement. The contractor shall not be entitled for any compensation on this account except grant of extension of time where considered necessary. The decision of the Engineer-in- Charge is final and conclusive.

28.2 No claim will be entertained regarding the extra items of work or extra quantity of any item besides estimated amount, unless written order is obtained from the Engineer-in-charge and percentage rate settled before execution of the extra items of work or extra quantity of any item of work.

29. EMERGENCY MEASURE:

The work may be distributed to other contractors on splitting if considered necessary under compelling circumstances due to exigency and the contractor will not be entitled to any compensation to this account.

30. SAFETY OF MACHINERIES:

Unusual flood may occur during the working season. In the event of overtopping or breach in the cofferdam/embankment due to such flood in the working season resulting in flooding of the working area or outside the working area, the contractor shall make his own arrangement to shift the machineries and equipments, materials etc. to a safe place at his own cost. Any damage or loss for such occurrence shall be the responsibility of the contractor and no compensation on this score is permissible.

The work shall be resumed after the floods. Necessary reconstruction of the cofferdam / embankment clearing the working area of debris and silt shall have to be done by the contractor at his own cost. Suitable extension of time may however be

granted in such eventualities at the request of the contractor, but no compensation whatsoever shall be paid in this regard.

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

(a) In the event of the death, insanity, insolvency and imprisonment of the contractor or the contractor being a partnership or firm becomes dissolved or being a corporation goes into the liquidation, the contract may be terminated by notice in writing posted at the site of work and advertised in one issue of the local newspaper and all acceptable works shall be paid for after recovering all the dues payable to Govt. there from at appropriate percentage rate to the person or persons entitled to receive and given dishonor-age for the payment.

(b) If the contractor becomes bankrupt or has a receiving order made against him or compound with his creditor or being a Corporation commence to be would up not being a voluntary winding up for the purpose only an amalgamation or reconstruction or carry on its business under a receiver for the benefit of the creditors of any of them, the Department shall be at liberty.

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

ii) To terminate the contract forthwith by notice in writing to the contractor or to the liquidator or receiver or to any person in whom the contract may become vested and to act in the manner as per prevalent clauses of P_1/F_2 contract.

32. REMOVAL OF CONTRACTOR'S MEN:

The contractor shall on the written direction of the Superintending Engineer immediately removed from the works any person employed thereon, who may, in the opinion of the Engineer-in-charge, be incompetent or has misconduct himself. Such person shall not be employed again on the works without the written permission of the Engineer-in-charge.

33. DETAILS CALL NOTICE BEING PART OF CONTRACT:

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

34. FAIR WAGES CLAUSE:

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

34.2 In case of any complaint by the labourer about the nonpayment of his wages as per latest minimum wages Act., the Superintending Engineer will have the right to investigate and if the contractor is found to be at fault, Superintending Engineer may recover such amount due in any form from the contractor and pay such amount to the labourer directly under intimation to the local labour office of the Govt. The decision of the Superintending Engineer is final and binding on the contractor.

35. LABOUR LICENSE AND REGISTRATION:

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

36. PRICE PREFERENCE:

If the rate quoted by the SC & ST Category Contractor comes to the rate quoted by the L1 bidder (decimal upto two numbers will be taken for all practical purposes) after availing 10% price preference as per Para 2 of Works Department Resolution No.27748 dated 11.10.1977, the tender shall be finalized by the tender accepting authority through a transparent lottery system along with other categories of contractors, vide Office Memorandum No. 632/dated 09.01.2026 of Works Department, Govt. of Odisha.

37. QUALITY CONTROL AND TESTING:

37.1 Within the defined scope of the functions of the officer-in-charge of quality control organization working under the Chief Engineer & Basin Manager, Subarnarekha & Budhabalanga Basin, Laxmiposi shall have the right to inspect the various items of works executed under the contract in respect of the quality and monitoring thereof. Such staff will exercise all necessary field control requirement complying to proper specification and drawing and conduct standard test on construction materials and finished products in accordance with B.I.S. codes and ASTM procedure so as to enable the Engineer-in-charge to ensure the corrective measures from the quality analysis programme and statically control analysis of the test results. Any work executed not confirming exactly, fully and faithfully to the specification and drawings and instruction in writing relating the work signed by the quality control Officer in charge and considered as unacceptable by the Engineer-in-charge shall be removed at the contractor's cost.

The contractor has to bear the cost of all materials required for the tests as and when required including the cost, conveyance from work site to laboratory, if any. The testing charges of all the tests required for work will be borne by the contractor.

37.2 Correction of Defects:

On receipt of notice from the Engineer-in-Charge, the contractor will rectify the defects in stipulated period at his own cost. If the defects are not rectified in the stipulated period, the Engineer-in-charge shall asses the cost, get the defect rectified and recover the cost from the dues of the contractor.

38. TESTING OF THE STRUCTURES:

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

39. RESOLUTION OF DISPUTES:

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

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

d) Non-decision of Civil Suit proceedings shall not disentitle the Government's right to terminate the contract and make alternate arrangement for completion of the work.

40. JURISDICTION OF COURT:

40.1. For the purpose of jurisdiction in the event of dispute, if any contractor should be deemed to have entered into within the State of Odisha.

40.2 If any further necessary information is required, the **Superintending Engineer, Jambhira Canal Division, Morada** will furnish such information on written request, but it must be clearly understood that tenderer must be received in order and according to instruction / specifications appended herewith.

41. ADDITIONAL PERFORMANCE SECURITY:

41.1 **Additional Performance Security (As per Works Department OM No.173 dt.03.01.2026)** shall be obtained from the bidder when the bid amount is less than estimated cost put to the tender. In such an event, only the successful bidder who has quoted less bid price / rates than the estimated cost put to tender shall have to furnish the Additional Performance Security as per the following rate.

Additional performance security shall be taken on an incremental basis from the selected bidder for low bid prices in the project works as under.

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

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

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

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

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

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

The applicable Additional Performance Security (APS) shall have to be furnished by the successful bidder in shape of NSC / Post Office Savings Bank Account / Post Office Time Deposit Account / Kisan Vikas Patra / Bank Guarantee in favour of **Superintending Engineer, Jambhira Canal Division, Morada** from any Nationalised / Schedule Bank in India counter guaranteed by its local Branch at Bhubaneswar / e-Bank Guarantee executed on the National e- Governance Services Limited (NeSL) Digital document execution portal/ Insurance Surety bond issued by an Insurance Company authorized by the Insurance regulatory and Development authority of India (IRDAI) (As per letter no 4909/W dated 12.03.2026) within seven days of issue of Letter of Acceptance (LoA) by the **Superintending Engineer, Jambhira Canal Division, Morada** (by e-mail) to the successful bidder otherwise the bid of the successful bidder shall be cancelled. Further, proceeding for blacklisting shall be initiated against the bidder.

41.2. The security will be refunded after lapse of defect liability period on completion of the work in all respect provided the final bill is passed and the security deposit shall not carry any interest. Any defect noticed during the defect liability period after the actual date of completion of the work shall be rectified by the contractor at his own cost. Failure to comply such rectification, the defective work shall be rectified by the **Superintending Engineer, Jambhira Canal Division, Morada** and cost involved thereof shall be recovered from the contractor from his dues. (Ref. works Deptt order No. 17823/WE dt. 11.10.2006).

42. The EMD/ Bid security will be forfeited in any of the following cases.

(a) If the bidder backs out his offer before acceptance of tender by the competent authority, as concurred by Law and Finance Department in their UOR No.848/L dt.31.05.1997 and UOR No.202/FD dt.06.03.1998 respectively.

(b) In the case of a successful bidder, if the bidder fails within the specified time limit to

(i) Furnish the required performance and additional performance security.

(ii) Enter into the agreement

(iii)If any of the statements, documents, certificates uploaded by the bidder through e-procurement portal, is found to be false / fabricated / bogus;

(c) If any of the statements, documents, certificate uploaded by the bidder through e-procurement portal, is found to be false / fabricated / bogus ,the bidder will be black listed in this case.

43. Incase of discrepancy revealed between P_1/F_2 form and Detailed Tender Call Notice, condition in P_1/F_2 form shall prevail over the Detailed Tender Call Notice.

44. The clause of printed form of P_1/F_2 contract with latest addition/ deletion/ corrections/ substitution etc. shall also prevail

45. No claim for idle labour, machineries etc. will be entertained by the Department whatsoever the reason may be.

46. UNDERTAKING FOR PAYMENT OF MINIMUM WAGES

I/We do hereby undertake that I/We shall pay minimum wages to the labourers engaged by me/us for execution of the work, at the rate as per the Notification of the Government of Odisha in their Department of Labour and Employment, Bhubaneswar. If the minimum wages will be changed by the Government during execution of the work, I/We shall pay to the labourer at the rate, (i) enter into the agreement or in accordance with the notification of Department of labour and employment, Govt. of Odisha, Bhubaneswar.

Signature of the Contractor.

In case the Superintending Engineer is not satisfied that the minimum wages has not been paid to the labourers, he will have the right to deduct such amounts from the bills of the contractor and pay to the labourers.

47. Deleted

48. If more than one bid is quoted (decimal up to two numbers will be taken for all practical purposes) either at the estimated cost put to tender or less than the estimated cost put to tender, the tender accepting authority will finalize the tender through a transparent lottery system, where all bidders / their authorized representatives, the concerned SE/Executive Engineer of concerned Division and DAO will remain present.(As per OM No.632/W dated 09.01.2026.

49. Deleted

50. EXECUTION OF QUANTITY MORE THAN 10%

(i) The quantity 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, prior approval of competent authority is mandatory before making any payment. But, any deviation to the quantities and agreement value shall not vitiate the contract.

(ii) Schedule of quantity accompanies the tender notice: It shall be definitely under stood that the Government do not accept any responsibility for the correctness and completeness of this schedule and this schedule is liable for alternations or omissions, deductions or additions as set forth in the condition of contract and such omissions,

deductions, additions or alternations shall in no way invalidate/ vitiate the contract and no extra monetary compensation will be entertained.

51. SAMPLE OF MATERIALS.

The contractor shall supply sample of all materials fully to be used for the work before procurement for testing and acceptance as may be required by the concerned Superintending Engineer. The transportation and cost of construction materials will be borne by the contractor.

52. PROVISION OF INCENTIVE IN EXECUTION

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

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

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

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

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

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

Before 5% of contract period =1% of contract value".

The amount of bonus, if payable, shall be paid along with final bill after completion of work.

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

Name of work	Minimum Value
1. Building work / P.H. Work	Rs.40.00 Lakhs
2. Road Work	Rs.300.00 Lakhs
3. Irrigation works	Rs.1000.00 Lakhs

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

53. ELECTRICAL WORKS

The contractor will give the undertaking that he will execute the electrical works through a registered electrical license holder contractor. The attested copy of the registered electrical license and willingness of the electrical contractor who will execute the work shall be submitted by the contractor before execution of the agreement.

54. Electricity is to be arranged by the Contractor at his own cost and risk.

55. Steel volume involved in RCC works shall not be deducted from the volume of the concrete.

56. Conditional tender is not acceptable and is liable for rejection.

57. As regards to the extra items of work besides the agreement items and extra quantities of any item of work beyond the schedule of quantities, written order must be obtained from the Engineer-in-Charge before the work is taken up.

58. Dewatering from the foundation of structures when and where necessary during execution will have to be done by the contractor and no extra payment will be made on that account. The contractor's percentage rate should be including the cost of all the dewatering works as and when necessary till the final date of completion.

The term dewatering shall mean the execution or operation of the items due to standing water as well as due to percolation water

59. After the work is finished all surplus materials and debris's should be removed from the site of the work. Preliminary work such as vats, mixing platforms etc. shall be dismantled and all materials shall removed from the site and premises shall be made neat and clean and this is inclusive of the percentage rate quoted by him.

60. (i) The Contractors are required to furnish evidence of ownership of principal Machineries/ equipments asked for in the tender documents.

(ii) In case the contractor executing several works, he is required to furnish a time schedule for movement of equipment/ machinery from one work site to other site when work is to be executed.

(iii) The contractor shall furnish ownership document for those machineries, which he is planning to deploy for the tendered work if these are not engaged or produce certificate from the Superintending Engineer under whom these are deployed at the time of tendering as to the period by which these machineries are likely to be released from the present contract. Certificate from the Superintending Engineer shall not be more than 90 days old on the last date of receipt of tender.

(iv) The Contractor intending to hire/lease equipments/ machineries are required to furnish proof of ownership from the company/ person providing equipments/ machineries on hire/ lease along with contracts / agreements/ lease deed and duration of such contract.

CHAPTER - III

INFORMATION AND INSTRUCTION TO TENDERERS (IIT)

INFORMATION & INSTRUCTIONS TO TENDERER (III)

- Bidder should do the registration in the tender site using the option available.
- Then the Digital Signature registration to be done with the e-token of SIFY/Code/TCS after logging into the site.
- Bidder may go through the tenders published in the site and download the required documents/tender schedules for the tenders he is interested.
- Bidder then login to the site through the secured log in by giving the user id/password chosen during registration & then the password of the e-token.
- Bidder should go through the tender schedules carefully and submit the documents as asked; otherwise, the bid will be rejected.
- If there are any clarifications, this may be obtained through the site, phone, and email. Bidder should take into account of the corrigendum (s) published before submitting the bids online.
- Bidder in advance gets ready the bid documents to be submitted as indicated in the tender schedule and they should be in PDF format.
- Bidder selects the tender which he is interested in thro' search option & then moves it to the my favorites folder.
- From the favourites folder, he selects the tender to view all the details indicated.
- The bidder should read the terms & conditions and accepts the same to proceed further to submit the bids.
- The details of the DD/any other accepted instrument, physically sent, should tally with the details available in the scanned copy and the data entered during bid submission time. Otherwise the bid submitted will not be acceptable.
- The bidder has to enter the password of the e-token and the required bid documents have to be uploaded one by one as indicated.
- The percentage rate offered have to be entered separately in a spread sheet file (xls) in the space allotted and should be updated as BOQ.xls file for each tender after the financial bid.
- The tendering system will give a successful bid updating message & then a bid summary will be shown with the bid no.& the date & time of submission of the bid with all other relevant details.
- The bid summary has to be printed and kept as an acknowledgement as a token of the submission of the bid.
- The bid summary will act as a proof of bid submission for a tender floated and will also act as an entry point to participate in the bid opening date.

- For any clarifications with the TIA, the bid no. can be used as a reference.
- Bidder should log into the site well in advance for bid submission so that he submits the bid in time i.e. on or before the bid submission time. If there is any delay, due to system failure or other problems, bidder is responsible.
- Each document to be uploaded through online for the tenders should be less than 2 MB. If any document is more than 2MB, it can be reduced thro' zip and the same can be uploaded. However of the file size is less than 1 MB the transaction uploading time will be very fast.
- Only one e-token should be used for a bidder and should not be misused by others
- The software application has the provision of payment of cost of tender document through payment gateways of authorized bankers by directly debiting the accounts of the bidder.
- The time settings fixed in the server side & displayed at the top of the tender site, will be valid for all actions of requesting, bid submission, bid opening etc., in the e-tender system. The bidders should follow this time during bid submission

2. Method of submission of Tender Documents

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

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

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

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

2.5 The tenderer has to quote percentage rate up to two place of decimal. The entry beyond this will not be considered.

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

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

3. Opening of Tender Documents.

The Technical Bid Documents **will be opened on dt.07.07.2026 at 11.00 AM** in the office of the **Chief Engineer& Basin Manager, Subarnarekha & Budhabalanga Basin, Laxmiposi** in the presence of the tenderers or their authorized representatives who wish to be present. The bidder can also watch it on online in the address given in tender call notice. Date & time of opening of Financial Bid will be intimated later on to the successful bidders.

4. **Minimum Qualifying Criteria:** The bidder must upload the valid R.C, Valid GST No. and PAN, Affidavit, undertaking regarding No-relationship certificate & E.M.D" which are mandatory as per Lr. No. 01/WR dated 01.01.2019 of Govt. of Odisha, DoWR.

5. **Sample of all material:** The contractor shall supply sample of all materials fully before procurement for the work for testing and acceptance as may be required by the concerned Superintending Engineer.

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

7. From the commencement to the completion of the work, the contractor is responsible to make good all injuries, damages and repairs occasioned or rendered necessary to the same by fire or other causes and he holds the Govt. of Orissa harmless for any claims for injuries to person or structural damage to property happening from any neglect, default, want of proper care or misconduct on the part of the contractor or any one in his employers during the execution of the work. In addition, no claim shall be entertained for loss due to earth quake, flood, cyclone, epidemic, riot or any other calamity whether natural or incidental. Damages so caused will have to be made good by the contractor at his own cost.

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

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

10. **In case of submission of bids through e-procurement portal, the bidder shall upload the scanned copy/ copies of document as required vide clauses of DTCN. The online bidders shall have to produce the original documents in support of scanned copies and statements uploaded in the portal to the Chief Engineer & Basin Manager, Subarnarekha & Budhabalanga Basin, Laxmiposi during the period as specified in tender call notice.**

11.(a)

(i) **Memorandum of Government of Odisha, Works Department, Bhubaneswar issued vide Letter No 7885Dated 23.07.2013 consisting of the procedural requirement of e-procurement which shall be made part of the Detailed Tender Call Notice or Instruction to Bidder for all 'works' tenders hoisted in the portal**.

(ii) The e-Procurement portal of the Government of Odisha is "https://tendersodisha.gov.in".

(iii) Use of valid Digital Signature Certificate of appropriate class (Class–II or Class-III) issued from registered Certifying Authorities (CA) as stipulated by Controller of Certifying Authorities (CCA), Government of India such as n-Code, Sify, TCS, MTNL, e-Mudhra is mandatory for all users.

(iv) The DSC issued to the Department users is valid for the period of two years only. All the Department users are responsible to revalidate their DSC prior to expiry.

(v) For all purpose, the server time displayed in the e-procurement portal shall be the time to be followed by all the users.

(vi) Government after careful consideration has decided to hoist all tenders costing 10 lakhs or above in the e-procurement portal. This will be applicable across all Engineering Departments such as Works Department, Department of Water Resources, Rural Development and Housing & Urban Development Department. Government of Odisha also welcomes hosting of tenders by any other departments, authority, corporations, local bodies etc. of the state with prior approval from Works Department. Works Department is the Nodal department for the implementation of e- procurement in the State.

(vii) The e-procurement shall be operated compliant to relevant provisions of OGFR/OPWD code/Accounts code / Government statues including any amendments brought from time to time to suit to the requirement of the best national practice.

(viii) Registration in the e-procurement portal is without levy of any charges but Government reserves the right to levy any charges for such value added services in future.

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

(x) For the role management "Department " is the Administrative Department, Organization or wing is the Chief Engineer or highest tender accepting authority or equivalent officer, Division is the Superintending Engineer or equivalent Officer and Sub-Division is the Assistant Engineer or equivalent Officer.

(xi) The e-procurement software assigns roles for operation of the module for specific function. The terminologies used in the Portal and their respective functions in the software are as follows.

11(b).Application Administrator (NIC and State Procurement Cell)

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

11(c) Nodal Officer (At organization Level not below the Superintending Engineer or equivalent rank)

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

11(d) Procurement Officer- Publisher (Officer having Tender inviting power at any level)

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

11(e) Procurement Officer- Administrator (Generally Sub-ordinate Officer to Officer inviting Tender)

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

11(f) Procurement Officer- Opener: (Generally Sub- ordinate Officer to Officer inviting Tender)

i. Opening of Bid

11(g) Procurement Officer- Evaluator (Generally Sub-ordinate officer to Officer inviting Tender)

i. Evaluating Bid

11(h) Procurement Officer- Auditor (Procurement Officer, Publisher and / or Accounts Officer/Finance Officer)

i. To take up auditing.

(XII) <u>NOTICE INVITING BID (NIB) OR INVITATION FOR BID(IFB):</u>

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

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

Government of Odisha "e" procurement Notice
Bid Identification

(i) Name of the Work:-
(ii) Estimated Cost:
(iii) Period of completion-
(iv) Date & Time of availability of bid document in the portal-
(v) Last date/ time for receipt of bids in the portal-
(vi) Name and address of the O.I.T.-
Further details can be seen from the e- procurement portal "http://tendersorissa.gov.in"

13. The tender documents published by the Tender inviting Officer (Procurement Officer Publisher) in the website "http://tendersorissa.gov.in" will appear in the "Latest Active Tenders". The Bidders/ Guest users can download the Bid documents only after due date & time of sale. The publication of the tender will be for specific period of time till the last date of submission of bids as mentioned in the 'Notice inviting Bid' after which the same will be removed from the list of "Latest Active tenders".

14. ISSUE OF ADDENDA / CORRIGENDA/ CANCELLATION NOTICE:

14.1 The Procurement / Officer Publisher (Officer inviting tender) shall publish any addendum/ corrigendum/ cancellation of tender in the website "http://tendersorissa.gov.in", notice board and through paper publication and such notice shall form part of the bidding documents

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

15. CREATION AND PUBLISHING OF BID:

15.1 All the volumes/documents shall be uploaded in the portal by the tender creating officer (Procurement Officer Administrator) and published by the officer inviting tender (Procurement Officer Publisher) using their DSCs in appropriate format so that the document is not tampered with.

15.2 The tender document comprise the notice inviting tender, bid document / SBD, drawings in pdf format and the schedule of quantities / BoQ in .xls format to be uploaded by the Officer inviting tender

15.3 Procurement Officer Administrator creates under by filling up the following forms.

i. BASIC DETAILS
ii. COVER CONTENT: The procurement officer Administrator should briefly describe the name and type documents to be uploaded by the bidder in the following format.
   a) For single cover / Packet:

1	1st cover(Technical)	GST/GSTIN, PAN & Contractor RC, Affidavit, Undertaking declaring no relationship with Department Officials & any other documents as per DTCN.

2	2nd cover(Financial)	BOQ, in .xls format,

iii. TENDER DOCUMENT: The Procurement Officer Administrator should upload the NIT in .pdf format.

iv. WORKITEM DETAILS

v. FEE DETAILS: The Procurement Officer Administrator should mention the cost of tender paper and EMD amount as laid down DTCN / SBD.

vi. CRITICAL DATES: The Procurement Officer Administrator should mention the critical dates of tender such as publishing date, document download start date and end date, seek clarification start date and end date (optional), bid submission start date and closing date, bid opening date as per DTCN / SBD.

vii. BID OPENER SELECTION: The Procurement Officer creator can select two / three / four bid openers for a particular bid. If required the bid openers can also be selected within an organization from other procurement units (Circles / Divisions).

viii. WORK ITEM DOCUMENTS: The Procurement Officer Administrator should upload the digitally signed tender document (SBD / DTCN) or any other addition document / drawings in pdf format and Bill of Quantities in xls format.

ix. PUBLISHING OF TENDER: The Procurement Officer Publisher shall publish the tender using his / her DSC after detail scrutiny of the fields created and documents uploaded by the Procurement Officer Administrator. Procurement Officer Publisher can publish tenders for multiple procurement units using multiple DSCs procured for each post separately. After being relieved from the additional charges he has to surrender the additional DSCs to the Nodal Officer of the concerned organization.

16. PARTICIPATION IN BID:

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

16.1.1 Bidders participating through Joint Venture shall declare the authorized signatory through Memorandum of Understanding duly registered and enroll in the portal in the name and style of the Joint Venture Company. It is mandatory that the DSC issued in the name of the authorized signatory is used in the portal.

16.1.2. Any third party / company / person under a service contract for operation of e- Procurement system in the State or his / their subsidiaries or their parent companies shall be ineligible to participate in the procurement process that are undertaken through the e-Procurement system irrespective of who operates the system.

16.2. LOGGING TO THE PORTAL:

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

16.3 DOWNLOADING OF BID:

The bidder can download the tender of his choice and save it in his system, undertake the necessary preparatory work offline and upload the completed tender at his convenience before the closing date and time of submission.

16.4 CLARIFICATION ON BID:

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

16.5PREPARATION OF BID:

16.5.1. The bids may consist of general arrangements drawings or typical or any other drawings relevant to the work for which bid has been invited. Bidder may download these drawings and takeout print for detail study and preparation of his bid. Any other drawings and documents pertaining to the works available with the Officer inviting the bid will be open for inspection by the bidders.

16.5.2. The Bidder shall go through the Bid carefully and list the documents those are asked for submission. He shall prepare all documents including cost of Bid Document, Bid Security, Declaration form, Price bid etc. and store in the system.

16.6. PAYMENT OF EMD / BID SECURITY AND COST OF BID DOCUMENTS;

16.6.1 The Bidder shall furnish, as part of his Bid, a Bid security for the amount mentioned under NIT/Contract Data in online mode. Non submission of bid security within the designated period shall debar the bidder from participating in the online bidding system and his portal registration shall be cancelled. His name shall also be informed to the registering authority for cancellation of his registration.

.16.6.2 **The EMD or Bid Security is payable along with the bid is 1% of the Estimated Contract Value (ECV) or as mentioned in the bid document.**

16.6.3 **The tender accepting authority will verify the originals of all the scanned documents of the successful lowest bidder only within 5 days of opening of the tender. In the eventuality of failure on the part of the lowest successful bidder to produce the original documents, he will be debarred in future from participating in tender for 3 years and will be black listed by the competent authority.**

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

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

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17 SUBMISSION OF BID:

17.1 The bidder shall carefully go through the tender and prepare the required documents. The Bid shall have a 1st cover (technical) & 2nd cover (Financial). The 1st cover (Technical) generally shall consist of cost PAN, GST / GSTIN, Registration Certificate, Affidavits, documents in support of similar major items of work , work in hand, and any other information required by as per DTCN/SBD. The 2nd Cover (Financial)shall consist of the Bill of Quantities (BOQ).

17.2 Bidders are to submit only the original BOQ (in .xls format) uploaded by Procurement Officer Publisher (Officer Inviting Tender) after entering the relevant fields without any alteration / deletion / modification. Multiple BOQ submission by bidder shall lead to cancellation of bid. In case of item rate tender, bidders shall fill in their rates other than zero value in the specified cells without keeping it blank. In the percentage rate tender the bidder quoting zero percentage is valid and will be taken at par with the estimated rate of the work put to tender.

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

17.4. The bidder shall write his name in the space provided in the specified location in the Protected Bill of Quantities (BOQ) published by the Officer Inviting Tender. The bidder shall type rates in figure only in the rate column of respective item (s) without any blank cell in the rate column in case of item rate tender and type percentage excess or less up to two decimal place only in case of percentage rate tender.

17.5 The bidder shall log on to the portal with his / her DSC and move to the desired tender for uploading the documents in appropriate place one by one simultaneously checking the documents.

17.5.1 Bids cannot be submitted after due date and time. The bids once submitted cannot be viewed, retrieved or corrected. The Bidder should ensure correctness of the bid prior to uploading and take printout of the system generated summary of submission to confirm successful uploading of bid. The bids cannot be opened even by the OIT or the Procurement Officer-Publisher / Opener before the due date and time of opening.

17.5.2 Each process in the e-procurement is time stamped and the system can detect the time of log in of each user including the Bidder.16.5.3 The Bidder should ensure clarity / legibility of the document uploaded by him to the portal.

17.5.4 The system shall require all the mandatory forms and fields filled up by the contractor during the process of submission of the bid / tender.

17.5.5 The Bidder should check the system generated confirmation statement on the status of the submission.

17.5.6 The Bidder should upload sufficiently ahead of the bid closure time to avoid traffic rush and failure in the network.

17.5.7 The Tender Inviting Officer is not responsible for any failure, malfunction or breakdown of the electronic system used during the e-procurement process.

17.5.8 The bidder is required to upload documents related to his eligibility criteria and qualification information and Bill of Quantity duly filled in. It is not necessary for the part of the Bidder to up-load the drawings and other Bid documents (after signing) while uploading his bid. It is assumed that the bidder has referred all the drawings and documents uploaded by the Officer inviting the Bid.

17.5.9 The bidder will not be able to submit his bid after expiry of the date and time of submission of Bid (server time). The date and time of bid submission shall remain unaltered even if the specified date for the submission of bids declared as a holiday for the Officer inviting the Bid.

17.6SIGNING OF BID:

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

18.<u>SECURITY OF BID SUBMISSION:</u>

18.1 All bid uploaded by the Bidder to the portal will be encrypted.

18.2 The encrypted Bid can only be decrypted / opened by the authorized openers on or after the due date and time.

19.<u>RESUBMISSION AND WITHDRAWAL OF BIDS:</u>

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

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

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

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

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

20.OPENING OF BID:

20.1 Bid opening date and time is specified during tender creation or can be extended through corrigendum Bids cannot be opened before the specified date & time.

20.2 All bid openers have to log-on to the portal to decrypt the bid submitted by the bidders.

20.3. The bidders & guest users can view the summary of opening of bids from any system. Contractors are not required to be present during the bid opening at the opening location if they so desire.

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

20.5 Combined bid security for more than one work is not acceptable.

20.6 The electronically submitted bids maybe permitted to be opened by the predefined Bid opening officer from their new location if they are transferred after the issue of Notice inviting Bid and before bid opening. Further, action on bid documents shall be taken by the new incumbent of the post.

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

21. EVALUATION OF BIDS:

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

21.2 The bidder may be asked in writing / online (in their registered e-mail ids) to clarify on the uploaded documents provided in the Technical Bid, if necessary, with respect to any doubts or eligible documents. The Officer inviting Tender may ask for any other document of historical nature during Technical Evaluation of the tender. Provided in all such cases, furnishing of any documents in no way alters the Bidder's price bid. Non-submission of legible documents may render the bid non-responsive. The authority inviting bid may reserve the right to accept any additional document.

21.3 The bidders will respond within 7(seven) days of issue of the clarification letter, failing which the bid of the bidder will be evaluated on its own merit.

21.4 Technical evaluation of all bids shall be carried out as per information furnished by Bidders.

21.5 The Procurement Officer-Evaluators will evaluate bid and responsive bidders shall be finalized by the competent authority..

21.6 The financial bids of the technically responsive bidders shall be opened on the due date of opening. The Procurement Officer-Openers shall log on to the system in sequence and open the financial bids.

21.6.1 The Financial Bid will be opened on the notified date and time in the presence of

bidders or their authorized representative who wish to be present.

21.6.2 At the time of opening of "Financial Bid", bidders whose technical bids were found responsive will be opened.

21.6.3 The responsive bidders name, bid prices, item wise rates, Total amount of each Item in case of item rate tender and percentage above or less in case of Percentage rate tenders will be announced.

21.6.4 The Procurement Officer-openers shall sign on each page of the downloaded BoQ and the comparative statement and furnish a certificate to that respect.

21.6.5 The Bidder can witness the principal activities and view the documents / Summary reports for that particular work by logging on to the portal with his DSC from anywhere.

21.6.6 System provides an option to Procurement Officer - publisher for reconsidering The rejected bid with the approval of concerned Chief Engineer / Head of Department.

22. NEGOTIATION OF BIDS:

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

23. NOTIFICATION OF AWARD AND SIGNING OF AGREEMENT:

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

23.2 The contractor after furnishing the required acceptable Performance Security and Additional Performance Security, "Letter to proceed" or "Work Order" shall be issued by the Engineer-in-Charge with copy thereof to the Procurement Officer - Publisher. The Procurement Officer-Publisher shall up load the summary and declare the process as complete.

23.3 If the L-1 bidder does not turn up for agreement after finalization of the tender, he shall be debarred from participation in bidding in the Government tenders for three years and action will be taken to blacklist him. Besides the consortium / JV / firm where such an agency / firm already happens to be or is going to be a partner / member/ proprietor, he / they shall neither be allowed for participation in bidding for three years nor his / their application will be considered for registration and action will be initiated to blacklist him / them. In case of the failure of the L-1 bidder to enter into the agreement, the L-2 bidder, if fulfils other required criteria, would be called for entering into the agreement for execution of work subject to condition that the L-2 bidder negotiates at par with the rate quoted by the L-1 bidder, otherwise, the tender will be cancelled.

24.BLOCKING OF PORTAL REGISTRATION:

24.1 If the Registration Certificate of the Contractor is cancelled / suspended by the Registering authority / blacklisted by the competent authority his portal registration shall be blocked automatically on receipt of information to that effect.

24.2 The portal registration blocked in the ground mentioned in the above para - 23.1 shall be unblocked automatically in receipt of revocation order of cancellation / suspension / blacklisting from the concerned authority.

24.3 The officer inviting Tender shall make due inquiry and issue show cause notice to the concerned contractor who in turn shall furnish his reply, if any, within a fortnight from the date of issue of show cause notice. Thereafter, the officer inviting Tender is required to issue an intimation to the defaulting bidder about his unsatisfactory reply and recommend to the Chief Manager (Technical) for blocking of portal registration within 10 days of intimation to the defaulting bidder regarding his unsatisfactory reply with intimation to the Registering Authority and concerned Chief Engineer / Heads of Office, if any, of the following provisions are violated.

24:3:1 Fails to furnish original technical / financial (Tender Paper Cost, EMD / BID Security) instruments before the designated officer within the stipulated date and time.

24:3:2 Backs out from the bid on any day after the last date of receipt of tender till expiry of the bid validity period.

24.3.3 Fails to execute the agreement within the stipulated date.

24.3.4 If any of the information furnished by the bidder is found to be false / fabricated / bogus.

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

25. <u>GUIDE LINES FOR UNBLOCKING OF PORTAL REGISTRATION</u>:

25.1. UNBLOCKING **OF PORTAL REGISTRATION**:

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

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

25.2. The Chief Manager (Technical), State Procurement Cell will be the convener and he will maintain all records for this purpose. The committee shall meet not less than once in a month if required and shall consider the recommendation of the officer inviting tender for unblocking of portal registration. The quorum of the meetings will be four.

25.3 The minimum period of blocking of Portal Registration shall in no case be less than 90 days. After blocking of Portal Registration, the contractor whose Portal Registration has been blocked may apply to the concerned officer inviting tender showing sufficient ground for unblocking of his portal registration along with a Treasury Challan showing deposit of Rs.10000.00 (Rupees ten thousand) only (Non refundable) under the head of accounts '0059 – Public Works' as processing fees. The officer inviting tender shall forward the application filed by the contractor to the Chief Manager (Technical), State Procurement Cell.

25.4 On receipt of recommendation from the concerned Chief Engineer along with the copy of challan as mentioned above, the Chief Manager (Technical) being the member convener of the Committee shall place the case before the Committee for examination and taking a decision in this regard. After examination the Committee may recommended for unblocking of the portal registration of said contractor if the Committee is satisfied that the fault committed by the contractor is either unintentional or done for the first time.

25.5 After Scrutiny by the State Procurement Cell it is found that the portal registration of a contractor has been blocked for the 2nd time the Chief Manager (Technical), SPC may not consider his case to be placed before the Committee and may advise the concerned officer inviting tender to issue show cause notice to the contractor asking him to explain as to why his portal registration shall not remain blocked. On receipt of show cause reply from the contractor the officer inviting tender shall examine the same and if considered proper he may report to the Chief Manager (Technical), SPC along with his views furnishing the copy of the show cause reply for placement of the same before the Committee for taking a decision in respect of blocking / unblocking. If the Committee found that the contractor is in habit of committee such fault again and again intentionally the committee may advise the concerned officer inviting tender to initiate proceeding for blacklisting as per the existing rule.

Procedure for Electronic Receipt, Accounting and Reporting of Cost of Tender Paper and Earnest Money deposit on submission of bids.

1) The State Government have been working on formulation of rules and procedures' for Electronic receipt accounting and reporting of the receipt of Cost of Tender Paper and Earnest Money Deposit on Submission of bids through the e-procurement portal of Government of Odisha i.e. https://tendersodisha.gov.in for some time past.

2) Electronic receipt of cost of tender paper has been successfully tested through SBI payment gateway. Now it has been decided to introduce electronic receipt of **Cost of Tender Paper and Earnest Money Deposit on submission of bids** through payment gateway of designated banks such as SBI/ICICI Bank/HDFC Bank for all Government Departments, State PSUs, statutory Corporations. Autonomous Bodies and Local Bodies etc. in phases (ANNEXURE-I) the process outline as well as accounting and reporting structure are indicated below.

A) It will be carried out through a single banking transaction by the bidder for multiple payments like **Cost of Tender Paper and Earnest Money Deposit on submission of bids**.

B) Various payment modes like internet banking/NEFT/RTGS of Designated Banks and their Aggregator Banks as well can be accessed by the intending bidders.

C) Reporting and Accounting of the e-receipts will be made from a single source.

D) Credit of receipts in to the Government accounts and to the designated Bank account of the participating entities indicated in Para-2 above would be faster.

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

4. **Banking arrangement.**

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

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

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

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

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

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

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

Ii) A Bidder having account in other Banks can make payment using NEFT/RTGS facility of designated Banks.

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

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

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

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

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

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

C) Similarly, in case of State PSUs, Statutory Corporations. Autonomous Bodies and Local Bodies etc. **Cost of Tender Paper,** the e-Procurement portal shall generate a MIS for the State Procurement cell (SPC). The MIS will contain an abstract of the cost of tender paper collected with reference to **Bid Identification Number**. The cost of tende5r papers will be credited to the registered Bank account of the concerned State PSUs, Statutory Corporations, Autonomous Bodies and Local Bodies etc.

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

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

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

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

8. **Forfeiture of E.M.D.**

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

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

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

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

9. **Role of the Banks:**

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

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

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

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

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

10. **Role of State Procurement Cell:**

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

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

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

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

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

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

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

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

11. **Role of National informatics Centre:**

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

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

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

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

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

12. **Role of Cyber Treasury:**

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

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

13. **Redressal of Public Grievances:**

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

14. **Applicability and modification of existing rules/orders**.

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

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

ANNEXURE: I

CONTRACTOR(AGENCY) SUPERINTENDING ENGINEER

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

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

FORM – A
STRUCTURE AND ORGANISATION

CONTRACTOR(AGENCY) SUPERINTENDING ENGINEER

Name of Tenderer. ……

Nationality of Tenderer. ……

Office Address. ……

Telegraphic Address ……

Telephone No : ……

Mobile No : ……

Telex Number ……

Location of establishment ……

The tenderer is

1. An individual

2. A proprietary firm.

3. A limited company or limited corporation

4. A member of a group of companies (If yes, give names, address and present description of other companies.)

5. A subsidiary of large organization

(If yes, give names, address of the present organization)

6. if the company is subsidiary, state what involvement if any, will the parent company have in the project.

   Attach the organization chart showing the structure of the organization including the names of the Directors position of officer.

7. Number of year of experience

   I. As a prime contractor

   II. In own country

   III. Other country (specify country)

b. In a Joint venture

   I.In own country

   II. Other country (specify country)

CONTRACTOR(AGENCY) SUPERINTENDING ENGINEER

8. Name of the address of any associates the tenderer has in India who are knowledgeable in the procedure of customs, immigration takes and other information necessary to do work.

9. How many years has your organization been in business under your present name? Add what were your fields were and when you established your organization. When did you add new field (if any)?

10. Were you ever required for suspending construction for a period of more than six months continuously after you started? If so, give the names of project and reason of failure.

11. Have you ever not completed any work awarded to you? If so give name of project and reasons for not completing the work.

12 In how many projects were imposed penalties for delay? Please give details.

13. In which fields of Civil Engineering construction do you claim specialization and Interest.

14. Give details of your experience in modern concreting / Earth work and quality control.

15 Give details of your material testing laboratory.

Signature of tenderer

CONTRACTOR(AGENCY) SUPERINTENDING ENGINEER

ANNEXURE – C

AFFIDAVIT

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

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

ii) I am submitting tenders before the **Chief Engineer & Basin Manager, Subarnarekha & Budhabalanga Basin, Laxmiposi** for execution of following works in response to Invitation For Bid (IFB) Identification No ……

1. …… * * *

2. ……

Etc.

iii) I am the authorized signatory on behalf of contractor for the tender for the work / works mentioned above.

iv) I am swearing this affidavit that all tender documents and accompanying papers those being submitted by me before the **Chief Engineer & Basin Manager, Subarnarekha & Budhabalanga Basin, Laxmiposi** are all authentic and bonafied documents in the eyes of the law of the land.

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

Signature of Contractor /
Authorized Signatory

Note:

*Mention the license issuing authority.

* *Mention the date up to which the license is valid

* * *Mention name of works for which tender is being submitted.

ANNEXURE – D

INFORMATION REGARDING CURRENT LITIGATION DEBARRING EXPELLING OF TENDERED OR ABANDONMENT OF WORK BY THE TENDERER

1.	a)	Is the tenderer at current involved in any litigation relating to the works	Yes/No
	b)	If yes : give details :	Yes/No
2.	a)	Has the tenderer or any of its Constituent partners been debarred/ Expelled by any agency in India During the last three years.	Yes./No
3.	a)	Has the tenderer or any of its Constituent partners failed to Perform on any contract work in India during the last three years.	Yes/No
	b)	If yes, give details:	

Note

If any information in this schedule is found to be incorrect or concealed, qualification application will be summarily being rejected.

Signature

CONTRACTOR(AGENCY) SUPERINTENDING ENGINEER

ANNEXURE-E

No Relationship Certificate

I/We hereby certify that I/We am / are not related to any officer of the Water Resources Department in the rank of Asst. Engineer and above and any officer of the rank of Asst. Secretary and above.

Signature of Contractor

Address _____

_____

Date: _____

List of Relatives of the tenderer serving in Water Resources Department.

Sl No	Name of the Relatives	Rank	Place of present posting with Office / Division of the Department.
1	2	3	4
1. 2. 3. 4.			

Contractor

(Vide Para - 7 of Appendix P - 33 of P.W.D. Code Vol. II)

BANK GUARANTEE FOR BID SECURITY / EARNEST MONEY DEPOSIT (EMD)

WHEREAS_____ (name and address of Contractor) (hereinafter called "the Contractor") has to participate in the tender for Percentage rate Contract in respect of work _____ (Name of Work) invited by the Chief Engineer and Basin Manager, Subarnarekha and Budhabalanga Basin, Laxmiposi and submitted to the **Superintending Engineer, Jambhira Canal Division, Morada** vide e procurement Notice No._____ Tender Id. _____

AND WHEREAS it has been stipulated by you in the said Tender that the Bidder willl furnish you with a Bank Guarantee from a Scheduled Bank having its Branch in Odisha in favour of **Superintending Engineer, Jambhira Canal Division, Morada** for the sum specified therein as Bid Security / Earnest Money Deposit (EMD), for participation in the said Tender.

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee; NOW THEREFORE we hereby affirm that we are the Guarantors and responsible to you, on behalf of the Contractor, up to a total of Rs _____ [amount of guarantee] Rupees _____ [in words], such sum being payable and we undertake to pay you, upon your first written demand declaring the supplier to be in default under the contract and without cavil or argument, any sum or sums within the limits of Rs_____ [amount of guarantee] as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

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

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

This guarantee shall be valid up to _____ day of _____ 20 _____ i.e., upto 3 (three) months beyond the Valid Period of the bid for the work.

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

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

Signature of the authorized officer of the Bank)
Name and designation of the officer
Seal, name & address of the Bank and address of the Branch

Account Details for Bank Guarantee

Account Name		EE, Jambhira Canal Division, Morada
Beneficiary Bank Account No.		11043401773
IFSC Code		SBIN0000027
MICR Code		757002002
Branch Address		At- College Road, Baripada, Po-Baripada, Dist.:-Mayurbhanj, PIN:-757001
Bank Mail Id.		sbi.00027@sbi.co.in
Bank Help Desk No.		06792-254485

CHAPTER-IV

PERCENTAGE RATE TENDER

AND

CONTRACT FOR WORKS

ORISSA PUBLIC WORKS DEPARTMENT

(FORM P_1/F_2)

Percentage Rate Tender and Contract for works

General Rules and Directions for the Guidance of Contractor.

1. The work proposed for execution by contract will be notified in a form of invitation to tender posted through the Govt. web-site "http://tendersodisha.gov.in."

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

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

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

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

5. The amount of earnest money and security money to be deposited shall confirm to the following.

(a) All the contractors for the purpose of participation in tender have to deposit 1% of the bid amount as EMD (Earnest Money Deposit) as specified in DTCN at the time of submission of tender and another 1% of the Bid amount at the time of drawal of agreement as initial security deposit.

(b) Besides and initial security deposit, contractors of Super, Special, A & B class will be required to furnish security deposit by way of deduction from their bills at the rate of 5% of the gross amount of each bill where as in case of C & D class contractors such deductions will be made at the rate of 3% of the gross amount of each bill. Thus the total security deposit from the contractors will be 7% for Super, Special, A & B class and 5% for C & D class contractors.

6. As per letter no 4909/W dated 12.03.2026 Security Deposit for fulfillment of a contract should invariably be taken. The security may be taken in shape of N.S.C/ Post office Savings Bank Account/ Post office Time deposit Account/ Kisan Vikas Patra / Bank Guarantee in favour of Divisional Officer (Superintending Engineer, Jambhira Canal Division, Morada) from any Nationalized Scheduled Bank in India counter guaranteed by its local branch at Bhubaneswar/ e-bank Gurantee executed on the National e-Governance Services Limited (NeSL) Digital Document Execution Portal/ Insurance Surety Bond issued by an Insurance Company authorized by the insurance Regulatory and Development Authority of India (IRDAI). Such instruments shall be accepted towards Earnest Money Deposit (EMD), Initial Security Deposit/ any other security deposit from the contractor or supplier."

7. Any person who submits a tender shall fill up the usual printed form/ tender document downloaded from the website through e-procurement portal stating at what percentage rate he is willing to undertake the work. Incomplete tender and tenders which propose any alternation in the work specified in the said form of invitation to tender, or which contain any other conditions of any sort, or omit to note the time within which the work can be furnished or which are not accompanied by the required earnest money will be liable to rejection. No single tender shall include more than one work. But contractors who wish to tender for two or more works shall submit a separate tender for each. Tender shall bear the name of the work to which they refer written outside the envelope.

8. The Engineer or his duly authorized assistant will open the tenders in the presence of any intending contractors who may be present at the time and will enter the amounts of the several tenders in a comparative statement in a suitable form. In the event of a tender being rejected, the earnest money forwarded therewith shall there

upon be returned to the tenderer with a refund order for the amount of the earnest money.

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

10. In the event of a tender being selected for acceptance the Engineer who opened the tenders will, if he is competent to accept the tender, inform the tenderer of the selected tender who shall there upon sign copies of the specification and other document mentioned in rules 1 and 4 for the purpose of identification and for his acceptance with tender. The tenderer of the selected tender shall also deposit the required amount of the security money within the prescribed time. If the tenderer fails to deposit the required amount of the security money within the prescribed time, the Engineer may reject the tender.

If the Engineer is not competent to accept the tender himself, he will forward the tender with the specification and other documents signed by the tenderer for acceptance to the Engineer competent to accept the same. In case he rejects the tender the security money deposited shall be refunded to tenderer.

11. When a tender is selected for acceptance the tenderer shall deposit the required amount of the security deposit As per letter no 4909/W dated 12.03.2026 in shape of N.S.C/ Post office Savings Bank Account/ Post office Time deposit Account/ Kisan Vikas Patra / Bank Guarantee in favour of Divisional Officer (Superintending Engineer, Jambhira Canal Division, Morada) from any Nationalized Scheduled Bank in India counter guaranteed by its local branch at Bhubaneswar/ e-bank Gurantee executed on the National e-Governance Services Limited (NeSL) Digital Document Execution Portal/ Insurance Surety Bond issued by an Insurance Company authorized by the insurance Regulatory and Development Authority of India (IRDAI). Such instruments shall be accepted towards Earnest Money Deposit (EMD), Initial Security Deposit/ any other security deposit from the contractor or supplier."

12. The amount of security money to be deposited by the tenderer whose tender is selected for acceptance shall be **2** percent of the bid value of the work and towards this amount, the earnest money already deposited by him shall be credited, failing which tender shall be liable for rejection.

13. When tender has been selected for acceptance and the required amount of the security money has been deposited the Engineer shall

scrutinize all pages of the form of item, rate, tender and contract for works to see that the form has been properly filled up and signed by the contractor and the signature witnessed. He shall then, if he is competent to accept the tender, sign the acceptance of the tender or if he is not so competent, shall send the form for signature of the acceptance to the officer competent to accept it.

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

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

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

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

17. The Cess will be deducted @ 1% under the Building & Other Construction Workers (Regulation and Employment and Conditions of Service) Act,1996, as enforced vide Govt of Odisha, Labour & Employment Department Resolution No. LL-I-(iii)-25/07- 12653, dt.15.12.2008.

18. The contractor has to mention percentage excess or less over the estimated (in figures as well as words) in prescribed format of the Bill of Quantity (BOQ) appended to the tender document.

19. Only percentage quoted shall be considered. Percentage quoted by the Contractor should be accurately filled-in figures and words, so that there is no discrepancy.

(a) If any discrepancy is found in the percentage quoted in words and figures, then the percentage quoted by the contractor in words shall be taken as correct.

(b) The contractor will write percentage excess / less up to two decimal point only. If he writes the percentage excess / less up to two or more decimal points, the first two decimal point shall only be considered without rounding off.

(c) The tender shall be written legibly and free from erasures, over writings or corrections of figures. Corrections, over writings and interpolations, where unavoidable, shall be made by making out, initiating, dating and rewriting.

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

TENDER FOR WORKS

I/We hereby tender for the execution for the Governor of Orissa of the work specified in the underwritten memorandum at the percentage rate specified therein within a period of **12 (Tweleve) calendar months** from the date of written order to commence and complete in all respect with the specifications, designs, drawings and other documents referred to in rule-1 thereof and subject to the annexed conditions of contract and with such material as are provided for by and in all other respects in accordance with such conditions so far as applicable.

MEMORANDUM

a) If several sub works are included they should be detailed in a separate list.	a)	Name of work :	"Improvement of Black Topping Service Road from RD 25.00KM to RD 37.50KM of Jambhira Left Main Canal."
	b)	Name of the Contractor :	
	c)i	Amount put to tender :	Rs. 628.71 Lakh
	ii.	Agreement Amount :	
	d)	Earnest money deposit :	Rs. 6,28,800/-
e) The deposit will be 2% of the bid value of the work	e)	Initial Security deposit (including earnest money) to be deposited before the commencement of the work:	
	i)	Additional Performance Security :	
f) This percentage deduction from bills will be credited to the contractor's security deposit	f)	Percentage to be deducted from bills :	5% (Five percent)
	g)	Time required for the work from date of written order to commence :	**12(Tweleve)calendar Months**
	h)	Date of written order to	
	i	commence :	
	ii.	Stipulated date of completion:	

i) Total number of items of work tendered for : **13 (Thirteen)** Items

CONTRACTOR(AGENCY) SUPERINTENDING ENGINEER

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

Dated the ……..day of ……2026

Signature of the Contractor

Signature of the Contractor before submission of tender

Witness:

Signature of one witness to Tenderer's signature

Address:

Occupation:

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

Dated the ……day of …….2026

Signature of the Officer by whom Accepted

CONTRACTOR(AGENCY) SUPERINTENDING ENGINEER

CONDITIONS OF CONTRACT.

Compensation for delay.

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

Clause 2 (a) The time allowed for carrying out the work as entered in the tender shall be strictly observed by the contractor and shall be reckoned from the date of which the written order to commence work is given to the contractor. The work shall throughout the stipulated period of the contract be carried on with all due diligence (time being deemed to be of the essence of the contract on the part of the contractor) and the contractor shall pay as compensation an amount ½ percent on the amount of the estimated cost if the whole work as shown by the tender for every day that the work remains un-commenced, or unfinished after the proper dates and further, to ensure good progress during the execution of the work the contractor shall be bound, in all cases in which the time allowed for any work exceeds one month, to complete one-fourth of the whole of the work before one fourth of the whole time allowed under the contract has elapsed one-half of the work, before one-half of such time has elapsed, and three-fourth of the work, before three-fourth of such time has elapsed, in the events of the contractor failing to comply with the conditions he shall be liable to pay as compensation, an amount equal to one third percent of the said estimated cost of the whole work for every day that the due quantity of work remains incomplete. Provided always that the entire amount of compensation to be paid under the provisions of this clause shall not exceed 10 percent on the estimated cost of the work as shown in the tender.

Action when whole security deposit is forfeited.

Clause 2 (b) If there are possibilities of exceeding this compensation amount as mentioned in clause (A) 10 percent of the estimated cost or in any case in which under any clause or clauses of this contract the contractor shall have rendered

himself liable to pay compensation amounting to the whole of his security deposit in the hands of Govt. (whether paid in one sum or deducted by installments) the Superintending Engineer on behalf of the Governor of Orissa shall have power to adopt any of the following courses, as he may deemed best suited to the interest of Govt.

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

ii) To employ labour paid by the Public works department and to supply materials to carry out the work, or any part of the work, debiting the contractor with the cost of the labour and the price of the materials (of the amount of which cost & price certificate of the Superintending Engineer shall be final and conclusive against the contractor) and crediting him with the value of the work done, in all respects in the same manner and at the same percentage rate as if it had been carried out by the contractor under the terms of his contract the certificate of the Superintending Engineer as to the value of the work done shall be final and conclusive against the contractor.

iv) To measure up the work of the contractor, and to take such part of the work of the contract as shall be unexecuted out of his hands and to give it to another contractor to complete, in which case any expenses which may be incurred in excess of the sum which would have been paid to the original contractor if the whole work had been executed by him (of the amount of which excess the certificate in writing of the Superintending Engineer shall .be final and conclusive) shall be borne and paid by the original contractor and may be deducted from any money due to him by Govt. under the contract or otherwise, or from his security deposit or the proceeds of sale thereof, or a sufficient part thereof.

In the event of any of the above courses being adopted by the Superintending Engineer, the contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchase or procured any materials or entered into any engagements or made any advance an account of or with a view to the execution of the work or the performance of the contract and in case the contract shall be rescind under the provision aforesaid the contractor shall not be entitled to recover or be paid any sum for any work there to force actually preformed under this contractor unless and until the

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

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

Contractor remains liable to pay compensation if action not taken under Clause - 6

Clause 3. In any case in which any of the powers, conferred upon the Superintending Engineer by clause 2 hereof shall have become exercisable and the same shall not be exercised the non exercise thereof shall not constitute a waiver of any of the conditions hereof and such powers shall not withstanding be exercisable in the event of any future case default by the contractor of which by any clause or clauses hereof he is declared liable to pay compensation amounting to the whole of his security deposit and the liability of the contractor for past and future compensation shall remain unaffected in the event of the Superintending Engineer putting in force the powers vested in him under the preceding clause he may if he so desire, take possession of all or any tools, plants materials and stores, in or upon the works or the site thereof or belonging to the contractor or procured by him and intended to be used for the execution of the work or any part thereof paying or allowing for the same in the account as the contract percentage rate, or in case of these not being applicable at current market percentage rate to be certified by the Superintending Engineer whose certificate thereof shall be final otherwise the Superintending Engineer may be notice in writing to the contractor or his clerk of the works, foreman or other authorized agents require him to remove such tools plants, materials or stores from the premises (within a time to be specified in such notice) and in the event of the contractor failing to comply with the such requisition the Superintending Engineer may remove them at the Contractor's expenses or sell them by auction or private sale on account of the contractor and at his risk in all respect, and the certificate of the Superintending Engineer as to the expenses of any such removal and the amount of proceeds and expenses of any such sale shall be final and conclusive against the contractor.

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

Extension of time

Clause 4. If the contractor shall desire an extension of the time for completion of the work, on the ground of his having been unavoidably hindered in its execution or any other ground, he shall apply in writing to the Superintending Engineer within 30 days of the date of the hindrance on account of

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

Final Certificate.

Clause 5. On completion of the work the contractor shall be furnished with a certificate by the Superintending Engineer (herein after called the Engineer-in-charge) of such completion but no such certificate be given nor shall the work be considered to be complete until the contractor shall have removed from the area of the premises (to be distinctly marked by the Superintending Engineer in the site plan) on which the work shall be executed, all scaffolding, surplus materials, and rubbish and cleared off the dirt from all wood works doors windows, walls, floors or other parts or any building in, upon or about which the work is to be executed or of which he may have had possession for the purpose of the execution thereof, nor until the work shall have been measured by the officer of the Public Works department in accordance with the rules of the department whose measurements shall be binding and conclusive against the contractor. If the contractor shall fail to comply with the requirements of this clause as to removal of scaffolding surplus materials and rubbish and cleaning off dirt on or before the date fixed for the work the Engineer-in-charge may at the expenses of the contractor remove such scaffoldings, materials and rubbish and dispose of the same as he thinks fit and clean of such dirt as aforesaid and the contractor shall forthwith pay the amount of all expenses incurred and shall have no claim in respect of any such scaffolding of surplus materials as aforesaid except for any sum actually realized by the sale thereof.

Sub-Clause 5. If in the opinion of the Engineer-In-Charge, which shall be final & binding on the contractor, occupation or utilization of a portion of the work completed no way interferes with progress of the work the same may be occupied or utilized by on behalf of the Government under the written order of the Engineer-In-Charge and get the defects, if any rectified by the contractor at his own cost within twelve months from the date of completion of the whole work provided that the Contractor will not be allowed any concession either in the shape of extension of stipulated period or any other monetary compensation on account of such occupation or use.

Payment on intermediate to be regarded as advances and bill to be submitted monthly.

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

Provided that, if any balance of 3% security is outstanding from each such payment shall be deducted so much, not exceeding 3% as may be necessary to make up the balance of the security. All such intermediate payments to the contractor shall be regarded as payments by way of advance against the final payment only and not as payments for work actually done and completed and shall not preclude the requiring of bad, unsound the imperfect or unskillful work to be removed and taken away and reconstructed or re-erected or to be considered as an admission of due performance of the contract or any part thereof in any respect or the accrual of any claim nor shall it conclude determine or effect in any way the powers of the Engineer-in-charge under these conditions or any of them as to the final settlement or adjustment of the accounts or otherwise or in any other way very or affect the contract.

Clause 7. The final bill shall be prepared by the officers of the Public Works Department in accordance with the rules of the department in the presence of the contractor within one month of the date fixed for completion of the work.

Stores supplied by the Government

Clause 8. If the specification or estimate of the work provides for the use of any special description of materials to be supplied from the Engineer-in-charge's store, or if it is required that the contractor shall use certain stores to be provided by the Engineer-in-charge under the conditions of this contract (such materials and stores, and the price to be charged therefore as hereinafter mentioned being so far practicable for the convenience of the contractor but not so as in many way to control the meaning or effect of this contractor are specified on the schedule or memorandum hereto annexed), the contractor shall be supplied with such materials and stores noted in the annexed schedule as are

required from time to time to be used by him for the purpose of the contract only and the value of the full quantity of materials and stores so supplied at the percentage rate specified in the said schedule may be set off or deducted from any sums then due or thereafter to become due to the contractor under the contractor or otherwise or against or from the security deposit or the proceeds of sale thereof if the same is held in securities, the same or a sufficient portion thereof being in this case sold for the purpose. All materials supplied to the contractor shall remain the absolute property of Govt. and shall not on any account be removed from the site of the work and shall all time be open to inspection by the Engineer-in- charge any such materials unused and in perfectly good condition at the time of the completion or determination of the contract shall be returned to the Engineer-in-charge's store at the prevailing market rate or at the issue whichever is less if by a notice in writing under his hand he shall so require but the contractor shall not be entitled to return any such materials unless with such consent and shall have not claim for compensation on account of any such materials so supplied to him as aforesaid being unused by him or for any wastage in or damage to any such materials.

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

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

Work to be executed in accordance with specification, drawing and order

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

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

Alternation in specification and designs

Clause 10. The Engineer-in-charge shall have power to make any alternation in or additions to the original specification, drawings, designs, and instructions that may appear to him necessary and advisable during the progress of work and the contractor shall be bound to carry out the work in accordance with any instructions which may be given to him in writing singed by the Engineer-in-charge and such alternation shall not invalidate the contract and any additional work which the contractor may be directed to do in the manner above specified as part of the work shall be carried out by the contractor on the same conditions in all respect on which he agreed to do the main work and at the same rate as are specified in the tender for the main work. The time for the completion of the work shall be extended in the production that the additional work differs to the original contract work and the certificate of the Engineer-in-charge shall be conclusive as to such proportion. And if the additional work includes any class work for which no rate is specified in this contract then such class of work shall be carried out at the rate entered in the sanctioned schedule of rate of the locality during the period when the work is being carried on and if such last mentioned class of work is not entered on the schedule of rate of the district then the contractor shall within seven days of date of his receipt of the order to carry out the work

Do not invalidate contracts

Extension of time in consequence of alternations.

inform the Engineer-in-charge of the rate which it is his intention to charge for such class of work and if the Engineer-in-charge does not agree to this rate he shall by notice in writing be at liberty to cancel his order to carry out such class of work and arrange to carry it out in such manner as he may consider advisable.

No deviations from the specification stipulated in the contractor additional items of work shall ordinarily be carried out by the contractor nor shall any altered additional or substituted work be carried out by him unless the rate of the substituted altered or additional items have been approved and fixed in writing by the Engineer-in-charge. The contractor shall be bound to submit his claim for any additional work done during the month on or before the 15th day of the following month accompanied by a copy of the order in writing of the Engineer-in-charge for the additional work and that the contractor shall not be entitled to any payment in respect of such additional work if he fails to submit his claim within the aforesaid period.

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

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

Clause 11. If at any time after the commencement of the work the Govt. or Orissa shall for any reason whatsoever nor require the whole thereof as specified in the tender to be carried out the Engineer-in-charge shall give notice in writing of the fact to the contractor. Who shall have no claim to any payment or compensation whatsoever on account of any profit or advantage, which he might have derived from the execution of the work in full but which he did not derive in consequence of the full amount of the work not having been carried out neither shall he have any claim for compensation by reason of any alteration having made in the original specifications, drawings, designs and instruction which shall involve any curtailment of the work as originally contemplated.

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

Action and compensation payable in case of bad work

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

Work to be open for inspection.

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

Contractor or responsible Agents to be present.

Notice to be given before work is covered up.

Clause 14. The contractor shall give not less five days notice in writing to the Engineer-in-charge or his subordinate in charge of the work before covering up or otherwise placing beyond the reach of measurement any work in order that the same may be measured and correct dimensions thereof be taken before the same is so covered up or placed beyond the reach of measurement any work without the consent in writing of the Engineer-in-charge or his subordinate in charge of the

work and if any work shall be covered up or placed beyond the reach of measurement without such notice having been given or consent obtained the same shall be uncovered at the contractor's expense or in default thereof no payment or allowance shall be made for such work or the materials with which the same was executed.

Contractor liable for damage done and for 6 months from date of final certificate of its completion.

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

Contractor to supply plants, ladders, scaffolding etc.

Clause 16. The contractor shall supply at his own cost all materials (except such special materials if any as may in accordance with the contract be supplied from the Engineer-in-charge's stores) plant, tools, appliances, implements ladders, cordage, tackle scaffolding and temporary works requisite or proper for the proper execution of the work, whether original altered or substituted and whether included in the specification or other documents forming part of the contractor or referred to in the conditions or not or which may be necessary for the purpose of satisfying or complying with the requirement of the Engineer-in-charge as any matter as to which under this conditions entitled to be satisfied, which he is entitled to require together with carriage therefore to & from the work. The contractor shall also supply without charge the requisite no of persons with the means & materials necessary for the purpose of setting out works and counting, weighing and assisting in the measurement or examination at any time and form time to time of the work or materials. Failing his so doing the same may be provided by the Engineer-In-Charge at the expense of the contractor also

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

provide all necessary fencing and light required to protect the public from accident and shall be bound to under the contract, or from his security deposit or the proceeds of sale thereof or of a sufficient portion thereof. The contractor shall bear the expenses of defense every suit action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any such suit action proceedings to any such person or which may with the consent of the contractor be paid to compromise any claim by any such person.

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

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

The Superintending Engineer shall have the right to enquire into and decide any complaints alleging that the wages paid by the contractor to any labourer for the work done by such labourer is less than the wages paid for similar work in the neighborhood.The officer in charge of the work shall have the right to decide whether labourer employed by the contractor is below the age of twelve years and to refuse to allow any labourer whom he decides to be below the age of twelve years to be employed by the contractor.

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

Employment of Graduate Engineers & Diploma Holders

Clause – 17 (b) Super/Special class Contractor shall employ under him one Graduate Engineer and Two Diploma Holders belonging to the State of Orissa. Likewise 'A' class contractor shall employ under him one Graduate Engineer or Two Diploma holders under the contractor shall be full time & continuous and they should not be superannuated, retired, dismissed or removed personnel from any State Govt. or Central Govt. service/public Sector undertakings, private companies and firms or be ineligible for appointment to Government service. The contractor shall pay them monthly emoluments which shall not be less than the emoluments of the personnel of equivalent qualification employed under the State Government of Orissa. The Chief Engineer, Roads Orissa may however, assist the contractor with names of such unemployed Graduate Engineer and Diploma holders if such help is sought for by the contractor. The names of such Engineering personnel appointed by the contractor should be intimated to the tender receiving authority along with the tender. Each bill of the **"A" Class** contractor shall be accompanied by an employment Roll of the Engineering personnel together with a certificate of the Graduate Engineer or Diploma holder is employed by the contractor to the effect that the work executed as per the bill has been supervised by him.

Work not to be sublet without written permission from Engineer-in-Charge.

Clause 18. The contractor shall not be assigned or sublet without the written approval of the Superintending Engineer. And if the contractors shall assign or sublet his contract or attempt so to do or become insolvent or commence any insolvency proceedings, or make any composition with his creditor or attempt so to do or if any bribe gratuity, gift, loan perquisite reward or advantage, pecuniary or otherwise, shall either directly or indirectly be given promised or offered by the contractor or any of his servants or agents to any public officer or person in the employ of Govt. in any way relating to his office employment or if any such officer on person shall become in any way directly or indirectly interested in the contract, the Superintending Engineer may thereupon by notice in writing to rescind the contract and the security deposit of the contractor shall thereupon stand forfeited and be absolutely at the disposal of Government and the same consequences shall ensure as if the contract has been rescind under clause 3 thereof and in addition the contractor shall not be entitled to recover or be paid for any work there to for actually performed under the contract.

Contract may be rescinded and any security deposit forfeited for subletting bribing or if contractor becomes in solvent

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

The sum payable by way of compensation to be considered as reasonable without reference to actual loss.

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

Change in constitution of firm

In case of failure to notify the change in the constitution within fifteen day the Engineer-in-charge may by notice in writing rescind the contracts and the security deposit of the contractor shall thereupon stand forfeited and be absolutely at the disposal of Govt. and the same consequences shall ensure as if the contract had been rescinded under clause 3 thereof and in addition the contractor shall not be entitled to recover or be paid for any works therefore actually performed under the contract.

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

Clause 22. Deleted

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

Lump sums in the estimate.

Clause 24. In the case of any class of work for which there is no such specification as is mentioned in rule. I, such work shall be carried out in accordance with the circle specification

and in the event of the there being no circle specification then in such case the work shall be carried out in all respects in accordance with the instruction and requirements of the Engineer-in-charge.

Action where no specification.

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

Definition of works

Clause 26. Government shall be entitled to recover in full from the contractor any amount that the Govt. may be liable to pay under Workmen's Compensation Act VIII of 1923 to any workmen employed in course of execution of any part of the work covered by these contract.

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

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

Clause 29. The contractor at his own cost for his labour camp will make sanitary arrangements.

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

CONTRACTOR(AGENCY) SUPERINTENDING ENGINEER

Works Department O.M. No.15847/W Dated 19.11.2019And O.M. No. 8189/W Dated 07.06.21

Sub: - Revised Price adjustment in works contract.

Clause 31:- Price Adjustment

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

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

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

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

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

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

The formulas (e) for adjustment of prices are:

31 (a) (i) : Adjustment of other Materials Component

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

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

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

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

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

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

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

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

$V_c = 0.85 \times Pc / 100 \times R \times (C_1 - C_0) / C_0$

V_c = Increase or decrease in the cost of work during the month under consideration due

to changes in rates for cement.

C_0 = The all India wholesale price index for ordinary Portland cement (OPC) on 28 days Preceding the date of opening of Bids as published by the Ministry of Commence and Industry, Government of India, New Delhi.

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

Pc = Percentage of Cement component of the work.

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

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

$V_s = 0.85 \times Ps / 100 \times R \times (S_1-S_0) / S_0$

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

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

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

Ps = Percentage of steel component of the work.

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

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

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

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

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

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

B_1 =The official retail price of bulk bitumen at IOC / BPCL depot at nearest center for the 15^{th} day of the month under consideration.

P_b = Percentage of bitumen component of the work.

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

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

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

P_{pi} = Differential cost of pipe i.e. amount of Increase or decrease in rupees to be paid or

recovered during the month under consideration.
P_{pi} = Percentage of pipe component of the work.
P_{i1}= All India whole sale price index of pipe for the period under consideration as published by the Ministry of Commerce and industry, Government of India, New Delhi.
P_{i0} =All India whole sale price index of pipe on 28 days preceding the date of opening of Bids as published by the Ministry of Commerce and industry, Government of India, New Delhi.

31 (b): Adjustment of Labour Component.

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

$V_L = 0.85 \times P_1 / 100 \times R \times (L_1 - L_0) / L_0$

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

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

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

P_L = Percentage of labour component of the work.

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

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

$V_f = 0.85 \times P_f / 100 \times R \times (F_1 - F_0) / B_0$

V_f= Increase or decrease in the cost of work during the month under consideration due to changes in the rates for fuel and lubricants.
F_0=The official retail price of High Speed Diesel (HSD) at the existing consumer pumps of IOC / BPCL / HPCL at nearest center on the day 28 days prior to the date of opening of Bids.
F_1 =The official retail price of HSD at the existing consumer pumps of IOC / BPCL / HPCL at nearest center for the 15^{th} day of the month under consideration.
P_1 =Percentage of fuel and lubricants component of the work.

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

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

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

V_p^-=0.85 x P_p / 100 x R x (P_1-P_0) / P_0

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

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

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

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

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

Regarding wholesale price index (WPI) for appropriate commodity for payment of price adjustment, due to change of base year of WPI from i993-94 to 2004 - 05 & 2011 - 12, it is observed that, the commodity **'Bars and Rod'**, **'Cement'**, Heavy machinery and parts' included in the list of WPI 1993 - 94 series are not mentioned as such in the WPI 2004 - 05 & 2011 - 12 series. Therefore, the following items in the WPI 2004 - 05 & 2011 - 12 series shall be considered corresponding to items in WPI 1993 - 94 series.

SL. No.	**Item in WPI 1993 - 94 Series**	**Item in WPI 2004 - 05 Series**	**Item in WPI 2011 - 11 Series**
1	Cement	Grey Cement	Ordinary Portland
2	Bars & rods	Rebars	Mild steel long products
3	Heavy Machinery & parts	Construction Machinery	Manufacture of Machinery for mining, quarry & construction.

31(e): APPLICATION OF ESCALATION CLAUSE:

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

Percentage Table

SL No.	Category of works		% Component (cost wise)		
			Labour (P_1)	POl (P_1)	Steel (P_s) + Cement (P_c) + Bitumen (P_b) + Pipes (P_{pi}) + Plant & Machinery Spare & Component (P_p) + Other Materials*
1	R & B Works (% of component)	Road Works	5	5	90
		Bridge Works	5	5	90
		Building Works	5	5	90
2	Irrigation Works (% of component)	Structural work	5	5	90
		Earth, Canal & Embankment work	5	5	90
3	P.H. Work	Structural Work	5	5	90
		Pipeline Work	5	5	Pipe – 70% Machinery = Other material – 20%
		Sewer Line	5	5	Pipe – 70% *Machinery + Other material – 20%

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

Appendix to Bid
Schedule of Adjustment Data

[For all works, adjustment factor for Labour and POL shall be considered @ 5% each, Steel, Cement, Pipes, other Materials and Machinery shall contribute to 90% of Price Adjustment and shall be calculated for each work separately during preparation of estimate, shall be approved by the authority during technical sanction as a "Schedule of Adjustment Data" and shall form part of the Bid Document]

Cl. No. 31 of F2/P1 Contracts SL. No.	**Index description**	**Source of index**	**Base value***	**Base Date***	**Weightage of item****
31(a) (i)	Others Materials	All India Whole sale price index (all commodities) as published by the Economic Advisor to the Govt. of India,			44.37%

		Ministry of Commerce and Industry.			
31(a) (ii)	Cement	Whole sale price index for Cement (Ordinary Portland Cement) as published by the office the Economic Advisor to the Govt. of India, Ministry of Commerce and Industry.			0.00%
31(a) (iii)	Steel	Whole sale price index for Steel (Mild Steel-Long Products) as published by the office the Economic Advisor to the Govt. of India, Ministry of Commerce and Industry.			0.00%
31(a) (iv)	Bitumen (VG - 30)	Official retail price of bulk bitumen at the nearest IOC/HPCL depot.			36.62%
31(a) (v)	Pipes	Whole sale price index for the type of Pipe under consideration, as published by the office the Economic Advisor to the Govt. of India, Ministry of Commerce and Industry.			0.00%
31(b)	Labour	Minimum Wage notified by the Labour and Employee's State Insurance Department of Government of			5.00%

		Odisha, India.			
31(c)	POL	Official retail price of HSD at nearest IOCL/HPCL/BPCL Consumer pump depot.			5.00%
31(d)	Plant and Machinery	Whole sale price index for Manufacture of Machinery for Mining, Quarrying and Construction as published by the office the Cement (Ordinary Portland Cent) as published by the office the Economic Advisor to the Govt. of India, Ministry of Commerce and Industry.			9.01%
Total					100%

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

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

Works Department O.M. No.1739 Dated 03.02.2023

Sub: - Codal /Contractual provisions regarding Price Adjustment in Works Contract

Codal / Contractual provisions regarding Price Adjustment in Works Contract was under active consideration of Government for some time past. After careful consideration, Government was pleased to make the codal/contractual provisions regarding Price Adjustment clause due to increase or decrease in rate and price of Labour, Materials, Fuels and Lubricants and Plant and Machineries, Spares Components vide Works Department O.M No.1584/W Dtd 19.11.2019.

Now, in continuation of Works Department O.M No. 15847/W dtd. 19.11.2019 Government have been pleased to make the following provisions in place of existing provision relating to "Schedule of Adjustment Data under Appendix to Bid."

[For all works, adjustment factor for Labour and POL shall be considered at the rate of 5% each, Steel. Cement, Pipes, other Materials and Machinery shall contribute to 90% of Price Adjustment and shall be calculated for each work separately during preparation of estimate shall be approved by the authority during technical sanction as a "Schedule of Adjustment Data" and shall form part of the Bid Document. The cases where

the original technically sanctioned estimate gets revised, the technical sanction to the revised estimate will be obtained from the competent authority as provided under Para 3.11.2(b) of OPWD Code, Volume-I. Based on the revised technically sanctioned estimate, the Labour & the POL component shall be given the weightage of 90% on steel, cement, bitumen, pipes, other materials and plant and machinery spare component shall be given as per the technically sanctioned revised estimate excluding the extra items. The revised weightage of "Schedule of Adjustment Data" based on revised technically sanctioned estimate shall be included as an Addendum to the agreement. The technical sanctioning authority shall be the competent authority for this purpose.]

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

FAIR WAGE CLAUSE

Clause 33. (a). The contractor shall not employ for the purpose of this contract any person who is below the age of twelve years and shall pay to each labour for work done by such laborers fair wages.

Explanation : 'Fair Wage' means wages, whether for time of piece work prescribed by the State Public Works Department provided that where higher percentage rate have been prescribed under the minimum wages Act 1948 wages at such higher percentage rate should constitute fair wages.

The Superintending Engineer shall have the right to enquire into and decide any complain alleging that the wages paid by the contractor to any laborer for the work done by such labor is less than the wages as per sub-paragraph (1) above.

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

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

(d) The Superintending Engineer or Sub-Divisional Officer concerned shall have the right to deduct, from the money due to the contractor, any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason of non fulfillment of the conditions of the contract for the benefit of the workers nonpayment of wages or of adductions made from his or their wages which are not justified by their terms of the contract or non

observance of the regulations. Money so deducted should be transferred to the workers concerned.

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

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

Orissa P.W.D. / Electricity Department
Contractor's Labour Regulations

1. Short title -These regulations may be called "The Orissa Public Works Department / Electricity Department Contractor's Regulation."

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

1) **"Labour,"** mean workers employed by a contractor of the Orissa Public Works Department/Electricity Department directly or indirectly through a sub-contractor or other persons or by an agent on his behalf.

2) **"Fair Wages"** means wages whether for time or piece work prescribed by the State Public Works Department provided that where higher percentage rate have been prescribed under the minimum wages Act, 1948 wages at such higher percentage rate should constitute fair wages.

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

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

3. Display of notice regarding wages etc.

The contractor shall –

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

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

4. Payment of Wages:

1. Wages due to every worker shall be paid to him direct.
2. All wages shall be paid in current coin or currency or in both.

5. Fixation of wage period:

i. The contractor shall fix the wage period in respect of which the wages be payable.
ii. No wage period shall exceed one month.
iii. Wages of every 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.
iv. When the employment of any worker is terminated by or on behalf of the contractor the wages earned by him shall be paid before the expiry of the day succeeding the one of which his employment is terminated.
v. All payments of wages shall be made on working days.

6. Wage book and wage cards, etc:

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

a) Rate of daily or monthly wages.
b) Nature of work on which employed.
c) Total number of days worked during each wage period.
d) Total amount payable for the work during each wage period.
e) All deductions made from the wages with an indication in each case of the ground for which the deduction is made.
f) Wage actually paid for each wage period.

2) The contractor shall also maintain a wage card for each worker employed on the work.
3) The Superintending Engineer may grant an extension from the maintenance of wage bond, wage cards to a contractor, who in his opinion may not directly or indirectly employ more than 100 persons on the work.

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

1) The wages of a worker shall be paid to him without any deduction of any kind except the following –
a) Fines:
b) Deductions for absence from duty, i.e. from the place or places where by the terms of his employment he is required to work. The amount of deductions shall be in proportion to the period for which he was absent.

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

d) Any other deductions, which the Orissa Government may allow from time to time

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

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

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

8. Register of fines etc:

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

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

9. Preservation of register:

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

10. Power of Labour Welfare Officers to make investigation or enquiry:

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

11. Report of Labour Welfare Officers:

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

12. Appeal against the decision of Labour Welfare Officer:

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

13. Inspection of registers:

The contractor shall allow inspection of the wage book and wage cards to any of his workers or to his agent at a convenient time and place after due notice is received or to the Labour Commission or any other person authorized by the Govt. of Orissa on his behalf.

14. Submission of return:

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

15. Amendments:

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

Clause 34. The term and condition of the agreements have been read/ explained to me and certified that I have clearly understand them.

WITNESS **CONTRACTOR**

ADDENDUM TO CONDITION OF CONTRACT

2. TIME CONTROL.

2.1 Progress of work and re-scheduling programme.

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

2.1.2 Within 15 days of issue of the letter of acceptance, the contractor shall submit to the Engineer-in-charge for approval and programme commensurate to clause no 2 showing the general methods, arrangements, and timing for all the activities in the works along with monthly cash flow forecast.

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

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

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

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

2.2. Extension of the Completion date.

2.2.1 The time allowed for execution of the work as specified in contract data shall be the essence of the contract. The execution of the works shall commence from the 15th day or such time period as mentioned in letter of award after the date on which the Engineer-in-charge issue written orders to commence the work or from the date of handing over of the site whichever is later. If the contractor

commits default in commencing the execution of the work as aforesaid, Government shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the earnest money and performance guarantee/security deposit absolutely.

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

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

i. Force major, or

ii. Abnormally bad weather or –

iii) Serous loss or damage by fire, or

iv) Civil commotion, local commotion of workmen, strike or lockout, officers any of the heads employed on the work or

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

vi) In case of variation is issued which makes it impossible for completion to be achieved by the intended completion date without the contractor taking steps to accelerate the remaining work and which would cause the contractor to incur additional cost or

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

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

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

for giving a fair and reasonable extension by the Engineer-in-charge and this shall be binding on the contractor.

2.3 Compensation for delay.

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

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

Provided always that the total amount of compensation for delay to be paid under this condition shall not exceed 10% of the tendered value of work or to the tendered value of the item or group of item of work for which a separate period of completion is originally given.

The amount of compensation may be adjusted or set off against any sum payable to the contractor under this or any other contract with the Government. in case the contractor does not achieve a particulars milestone mentioned in contract date, or the rescheduled milestone(s) in terms of clause 2.5 the amount shown against that milestone shall be withheld, to be adjusted against the compensation levied at the final grant of extension of time. Withholding of this amount on failure to achieve a milestone, shall be automatic without any notice to the contract. However, if the contractor catches up with the progress of work on the subsequent milestone(s) the withheld amount shall be released. In case the contractor fails to make up for the delay in subsequent milestone(s) amount mentioned against such milestone missed subsequently also shall be withheld. However no interest whatsoever, shall be payable on such withheld amount.

2.4 Bonus / Incentive for early completion.

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

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

Before 30% of contract period = 5% of contract value
Before 20 to 30% of contract period = 4% of contract value
Before 10 to 20% of contract period = 3% of contract value
Before 5 to 10% of contract period =2% of contract value
Before 5% of contract period =1% of contract value".

The amount of bonus, if payable, shall be paid along with final bill after completion of work.

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

	Name of work	**Minimum Value**
1.	Building work / P.H. Work	Rs. 40.00 Lakhs
2.	Road Work	Rs. 300.00 Lakhs
3.	Irrigation works	Rs. 1000.00 Lakhs

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

2.5 Management of Meetings.

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

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

NOTE: The Existing relevant provisions in this contract shall stand modified accordingly.

General Instruction to Contractors

1) Any agency or contractor executing a work should be aware about the local festivals like Makar sankranti, Raja Sankranti, ChaitiParba, DandaNata or any such festivals which may affect the work schedule. Therefore the contractor should engage more work forces during working period available at his disposal to complete the work as per schedule.
2) In the pick summer season, working hour is curtailed by the labour department to avoid exposure to personnel to the scorching sun and heat. It is the duty of the agency to increase the number of work force and to employ the existing work force during morning and afternoon hours as per Govt. order.
3) Rainfall is a normal occurrence during monsoon in Odisha, so unless there is unusually heavy rainfall resulting in a declared calamity, the contractor is not eligible for any extension of time. The contractor should plan the deployment of workforce and machinery, so as to complete the work as per schedule considering vagaries of the nature. The same applies for borrow areas ponding also the contractor foresee possible ponding of borrow area in monsoon and likewise lift more quantity of soil/other materials during dry period, so as to complete the work as per schedule.
4) The contractor should take up the work with due diligence in the acquired without waiting for acquisition of the entire land. This should be completed in proportionally less period depending on the quantum of available work front.
5) The agency should plan his work programme and mobilize men and machineries considering the canal closure programme of a particular system or area. Khariff/Rabi closure cannot be imposed arbitrarily on the farmers as per convenience of the agency. Closure of canal for the interest of work will be solely at the discretion of the Engineer-in-charge and cannot be claimed as matter of right.
6) There will always be standing crop before harvesting season as per crop schedule and this fact has to be clearly understood by the agencies. Extension of time on this ground may be considered by Divisional Officers.
7) Only the day (s) of election to the local bodies/assembly/Parliament will be treated as a non working day (s).

CONTRACTOR (AGENCY) SUPERINTENDING ENGINEER

SPECIAL CONDITIONS

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. It must be definitely understood that the Government do not accept any responsibility for the correctness and completeness of the trial borings shown in the cross sections.
3. 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.
4. No claim whatsoever on account of interest will be entertained under any circumstances.
5. The Contractor will remain responsible to arrange all mechanical means whenever required to complete the work in time at his own cost.
6. Unutilized Metal, Chips, Sand and stones outside the specific alignment will not be taken into consideration for measurement.
7. 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.
8. The quantities provided in the tender schedule are tentative which is likely to vary during execution as directed by the Engineer-in- charge. Before starting the work, the initial levels will be taken for his acceptance.
9. Borrowing earth for the Embankment is the responsibility of the Contractor. The type of soil to be used in the embankment is to be got approved by the Engineer-in-Charge before use.
10. If use of explosives is necessary for the purpose of blasting of rock required at any stage of the execution, the contractor is to obtain necessary area license from the appropriate authorities and procure the explosives and store them at his own responsibility and arrange in the work sites. The procurement and storage of the explosives is the sole responsibility of the contractor he shall abide by all the laws of explosive act.
11. The approach road to work site will be maintained by the contractor.
12. 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 made his own arrangement to land at his own cost.
13. The tenderer should obtain equipment for the work. However, some equipment if available in the department will be given on hire and condition to be fixed by the Engineer-in-charge. Time for charging of cost of hire will be reckoned from the date on which equipment will be handed over to the contractor to the date of its return to the department after the work is completed or the contract is rescinded, or when the contractor is not required the same finally. The daily hire charges of the machineries will be realized from the contractor's bill on the basis of each day the machines will be under his custody. The contractor will return the equipment in perfect running condition as it was at the time of issue. While the departmental

machineries given on hire are with the contractor, compensation towards any loss or damage of the same shall be paid by the contractor to make good the loss or damage. The amount of compensation will be decided by the Engineer-in – charge. The contractor shall not remove the equipment from the site while the same is in his custody. If any equipment or any part thereof is required to be sent out from the site for repair or otherwise, written permission from the Engineer-in-charge shall be taken. The contractor should maintain repair, overhaul and the equipment with due diligence and care. Proper grades of fuel, oil and lubricants should be used. Only good and genuine parts should be used. The equipment shall be made available for inspection by the Engineer-in-charge or other competent authority. If the equipments are not maintained, repaired or used properly, the contractor is liable to pay compensation to the department towards the damage caused to the equipment for improper use. The Amount of compensation shall be assessed by the Engineer-in-charge which will be final. The equipment shall be handed over initially as they are.

14. 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.
15. The period of completion is fixed and cannot be altered except in case of exceptional circumstances with due approval of next higher authority.
16. Royalty, Additional Charges of Royalty, DMF& EMF for stone products, sand and Borrow earth are to be recovered from the contractor's bill as follows:-
    i) Stone products @ Rs 130.00+Rs.260.00+Rs.13.00+Rs.6.50 per cum.
    ii) Sand @ Rs.35.00 +Rs.70.00+Rs.3.50+Rs.1.75 Per cum
    iii) Borrow area earth @ Rs.35.00 +Rs.70.00+Rs.3.50+Rs.1.75 Per cum
    iv) Moorum @ Rs.35.00 +Rs.70.00+Rs.3.50+Rs.1.75 Per cum

    Statutory increase in the rate of royalty, if any, shall be reimbursed. On the other hand, the same shall be recovered if there is any decrease in rate.
17. The rates of cement and steel have been adopted as follows in preparation of the estimate. The rates of the other materials have been adopted as per current schedule of rate for preparing the estimate under this bid. The minimum prevailing labour rates of the state has been adopted in framing the estimate.

    The contractor has to utilize the available good quality stones from the canal excavation first in the work. Then only he may procure additional quantity if required. The cost of stone is to be recovered as per current Govt. scheduled rate

18. The Joint venture is not allowed for this contract.
19. **The Contractors would be responsible for procurement of materials from authorized sources and voluntarily disclose the source of procurement for the purpose**

of billing. Besides, the bidder would be required to submit the details of quarry for procurement while submitting the bids.

20. Refund of Security Deposits made by way of Deduction / withholding payment from work bills through works expenditure Module of iOTMS (As per Finance Department Order No.FIN-WM-LC-0034/2011-68(5) Dated 01.01.2013).

i) The Security Deposits to be recovered on or after 1.01.2013 should be entered in the iOTMS incorporating the details.

ii) Before allowing refund the Divisional Officers / FA & CAOs are to obtain approval of the Head of the Department concerned.

iii) After obtaining approval of the Head of the Department, the Divisional Officers/ FA & CAOs are to issue cheque against the amount approved for repayment from the balance available in the Deposit Register and enter the particular of the cheque and the Deposit appearing in Deposit Register in iOTMS.

21. Testing of reinforcement bar and concrete works.

(i)If, in the opinion of the Engineer-in-Charge of the work (Superintending Engineer, Jambhira Canal Division, Morada) or any other authorities, such as Additional Chief Engineer, Subarnarekha Irrigation Circle, Laxmiposi or Chief Engineer & Basin Manager, Subarnarekha & Budhabalanga Basin, Laxmiposi, 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 Superintending Engineer, Jambhira Canal Division, Morada at the cost of the contractor. The contractor shall bear all the cost towards supply of required samples, transportation and testing. The decision of the Superintending Engineer, Jambhira Canal Division, Morada 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 Superintending Engineer, Jambhira Canal Division, Morada or his authorized field functionaries and in case of any dispute arises on this aspect, the decision of the Superintending Engineer, Jambhira Canal Division, Morada 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 Executive Engineer, Quality Control Division, Laxmiposi shall be final and binding on the contractor. If, in the opinion of the Superintending Engineer, Jambhira Canal Division, Morada, 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 Superintending Engineer, Jambhira Canal Division, Morada and cement testing work shall be carried out in the Field Laboratory under the direct supervision of the Field functionaries of

the Quality Control Division, Laxmiposi under guidance of the Executive Engineer, Quality Control Division, Laxmiposi.

CONTRACTOR (AGENCY) SUPERINTENDING ENGINEER

CHAPTER –V

TECHNICAL SPECIFICATION

SECTION –1

GENERAL SPECIFICATION

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

LIST OF INDIAN STANDARDS

Sl. No.	Short Title	B.I.S Number
(I)	**CEMENT**	
1.	Specification to ordinary and Low heat Portland cement (Reaffirmed 1998)	269-1989
2.	Specification for Portland Pozzolana Cement	489-1991
3.	Portland Slag Cement(Third revision) (Reaffirmed 1995)	455-1981
4.	Method for physical tests for hydraulic cement (Reaffirmed 1980)	4031-1996
5.	Method of Chemical analysis for hydraulic cement (First revision)(Reaffirmed 1990)	4032-1985
6.	Rapid hardening Portland cement	8041-1990
7.	Hydrophobic Portland cement (Reaffirmed 2000)	8043-1991
8.	High Strength ordinary Portland cement	112-1989
(II)	**AGGREGATES**	
1.	Specification for coarse and fine Aggregates from natural source for concrete (Reaffirmed 1997)	383-1970
2.	Specification for sand for masonry mortars(Reaffirmed 1998)	2116-1980
3.	Method of Tests for aggregates for concrete	2385-1969 (Part I to Part VIV)
4.	Standard sand for testing of cement (First revision) with amendment 1 and 2 (Reaffirmed 1999)	50-1991
5.	Methods for sampling of aggregates for concrete(Reaffirmed 1995)	2430 -1986
6.	Method of test for determining aggregates impact value of soft coarse aggregates	5640-1970
(III)	**STEEL**	
1.	Code of practice for bending and fixing of bars (Reaffirmed 1990)	2502-1963

2. Specification for cold worked steel deformed bars for concrete reinforcement (Reaffirmed 1990) 1786-1985

3. Code of practice for welding of MS Bars used for reinforced concrete construction. 2751-1966

4. Code for practice for use of Metal are welding for general construction of mild steel 818-1989

5. Recommendations for detailing of reinforcement in reinforced concreted works (Reaffirmed 1990) 5525-1969

6. Specification for Mild Steel and medium tensile steel Bars for Concrete reinforcement (Reaffirmed 1995) 432-1982 (Part I)

7. Code for practice for safety and health requirement in Electric and Gas welding and cutting operations 818-1968

8. Code for practice for fire precautions in welding and cutting operation 3016-1965

9. Measurement of building and Civil Engineering works, method steel work and iron work 1200-1974 (part VIII)

10. Code of procedure for manual or metal ARC and welding of Mild steel 823-1964

11. Specification for filler rods and wires for gas welding 1278-1972

12. Recommendations for welding cold worked steel bars for reinforced concrete construction 9417-1979

13. Hard drawn steel wire fabrics for concrete reinforcement 1566-1982

(IV) <u>CONCRETE</u>

1. Method of Measurement of building and Civil Engineer works cement concrete works1200-1968 (Part-II)

2. Code of practice for plain and reinforced concrete 456-2000

3. Specification for pre cast concrete coping blocks(Reaffirmed 1997) 5751-1984

4. Methods of tests for strength of concrete (Reaffirmed 1999) 516-1959

5. Code of practice for laying in situ cement concrete lining on canals 3873-1993

6. Specification for Admixtures for concrete(Reaffirmed 1992) 9103-1978

7. Method of Test for Autoclaved cellular concrete products (Reaffirmed 1997) 6441-1972-73

(Part-I to IX)

8. Method of Sampling and Analysis of concrete (Reaffirmed 1991) 1199-1959

9. Specification of Batch type concrete mixtures 1791-1963

10. General requirements for Concrete Vibrators immersion type (Reaffirmed 1999) 2505-1992

11. Specification for concrete vibrating tables 2514-1963

12. Method of test for permeability of cement mortar & concrete (Reaffirmed 1997) 3085-1965

13. Specification for fly ash for use as pozzolana as admixture for Concrete (Reaffirmed 1992) 3812-1981 (Part-II)

14. Specification for Portable swing weigh batch for concrete (single and double bucket type) 2722-1964

15. Code of practice for installation of joints in concrete pavements6509-1972

16. Code of practice for general construction of plain and reinforced concrete for dams and other massive structures (Reaffirmed 1991) 457-1957

17. General requirement for concrete vibrator screed board type (Reaffirmed 1990) 2506-1985 (First revision)

18. Code of practice for concrete structures for shortage of liquids (Reaffirmed 1999) 3370-1965 (Part-1 to 4)

19. Code of practice for use of immersion vibrator for consolidating concrete (Reaffirmed 1999) 3558-1983

20. Method for testing performance of batch type concrete mixer 4634-1991

21. From vibrators for concrete 4656-1968

22. Concrete batching and mixing plant 4925-1968

23. Ready mixed concrete (First revision) 4926-2003

24. Code of practice for sealing joints in concrete lining on canals (Reaffirmed 1998) 5256-1992

25. Vibrating plate compactor 5889-1970

26. Concrete transit mixer and agitator 5892-1970

27. Concrete pavers 7245-1974

28. Concrete slump test apparatus 7320-1974

29. Method of making curing and determining compressive strength of accelerated cured concrete test specimen(Reaffirmed 1999) 9013-1978

(V) EARTH WORK

1. Method of Measurement of building and Civil Engineering Works Part I, Earthwork (Reaffirmed 1997)(Part-I) 1200-1992

2. Safety code for piling and other deep foundations (Reaffirmed 1990) 5121-1969

3. Code of practice for Design installation, observation and Maintenance of uplift pressure pipes for Hydraulic structures on permeable foundation. 6532-1972

4. Safety code for excavation works (Reaffirmed 1996) 3764-1992

5. Code of practice for protection of slope for Reservoir embankment 8237-1985

6. Code of practice for earth work on canals 4701-1982

7. Guidelines for lining of canals in expansive soils(Reaffirmed 1999) 9451-1994

8. Method of test for soils Part-II Determination of water concrete (Reaffirmed 1997) 2720-1973 (Part-II)

9. Method of test for soils Determination of water content dry density relation using light compaction (Reaffirmed 1997) 2720-1980 (Part-VII)

10. Method of test for soils determination of dry density of soils in place by the sand replacement method (Reaffirmed 1995) 2720-1974 (Part-XXVIII)

11. Method of test for soils determination of dry density of soils in place by the core cutter method (Reaffirmed 1995) 2720-1975 (Part-XXIX)

12. Classification and identification of soils for general (Reaffirmed 1997) 1498-1970

13. Safety code for blasting and related drilling operation with Amendment No. I (Reaffirmed 1978) 4081-1986

14. Portable Pneumatic drilling machine (First revision) 5441-1986

15. General requirement for black hold drilling rigs 7209-1974

16. Safety code for working with construction machinery (Reaffirmed 1996) 7293-1974

17. Code of practice for stability analysis of earth dams 7894-1975

18. Guidelines for design of under seepage control measures for earth and rock fill dams 8414-1977

19. Filtration media sand and gravel 8419-1977

(Part-I)

20. Guidelines for design of large earth and rock fill dams 8826-1978
21. Under drainage arrangements of lined canals. 4558-1995
22. Pre-cast cement concrete stables for canal lining 3868-1966
23. Methods of tests of soils 2720
(Part-1 to X)
24. Ammonium nitrate for explosive 4668-1967
25. Method of test for commercial blasting explosives and accessories. 6609
(Part-1 to V)
26. Detonators 7632-1975
27. Method of load test on soils (Second revision)(Reaffirmed 1997) 1888-1982
28. Method for standard penetration test for soil (First revision)(Reaffirmed 1997) 2131-1981
29. Glossing of terms and symbolic relating to soil engineering(Reaffirmed 1995) 2809-1972
30. Method of sampling and preparation of stabilized soils for testing 4332
(Part-I of 1967)
31. Test in over burden 5529
(Part-1 of 1969)

(VI) <u>OTHER SUBJECTS</u>

1. Safety code for scaffolds and ladders part I scaffolds(Reaffirmed 1996) 3696-1987
(Part-I)
2. Safety code for scaffolds and ladders Part 2 ladders (Reaffirmed 1996) 3696-1987
(Part-II)
3. Recommendations on stacking and storage of construction materials at site 4082-1996
4. Plywood for general purposes (Second revision amendment 1 to 3) 303-1975
5. Test Sieves 460-1985
6. Code practice for under drainage of lined canals (2nd revision) 4558-1995
7. Code of for practice for in situ permeability test 5529 (Part-1 & 2)
8. Structural steel (Standard quality) (with amendment No.1 to 3) IS: 226-1975
9. Hard drawn steel wires (Third revision) (Reaffirmed 1995) IS: 432-1982

(Part-II)

10. Concrete pipes (with and without reinforcement) (2nd revision) IS: 458-1971
11. Code of practice for lying of concrete pipes IS: 783-1959
12. Specification for mild steel tubes, tubular and other wrought Steel fittings Part-I mild steel tubes IS:1239-1979 (fourth revision) (With Amendments No. 1 to 5)
13. Hard drawn steel wire fabric for concrete reinforcement IS: 1566-1982 (Second revision)
14. Asbestos cement pressure pipe (Second revision) IS: 1592-1980
15. Preformed filler for expansion test in concrete payment and structures (non extruding and resilient type) IS: 1838-1961
16. Cast iron detachable joints for use with asbestos cement pressure pipes. IS:8794-1978
17. Structural steel (Fusion welding quality) (Second revision) IS: 2062-1980
18. Code of practice for laying of cast iron pipe (With amendment No. I) IS: 3114-1994
19. Methods of testing for concrete pipes IS 3597-1966
20. Rubber sealing rings for gas mains water mains and sewers IS: 5382-1969
21. Centrifugally cast (spun) iron low pressure pipes for water gas and sewage (First revision) IS: 6163-1978
22. Code of practice for laying of asbestos cement pressure pipes IS: 6530-1972
23. Cast iron detachable joints for use with asbestos cement pressure pipes. IS: 8794-1978
24. Other Publications:
    Ministry of shipping and transport
    Specification for Road and Bridge works No. 7900

(VII) <u>STONE PITCHING AND LAUNCHING APRON</u>

1. Methods of test for determination of strength properties of natural building stone.(Reaffirmed 1998) IS: 1121-1975 (Part-1 to 4)
2. Method of test determination of true specific gravity of natural building stone (First revision)(Reaffirmed 1998) IS: 1122-1974
3. Method of identification of natural building stone(Reaffirmed 1998) IS: 1123-1975
4. Method of test for determination of water absorption apparent specific gravity and porosity of natural building stone IS: 1124-1974 (1st Revision)
5. Method of test for determination of weathering of natural building stones (First revision) IS: 1125-1974

6. Method of test for determination of durability of natural building stone (First revision) IS: 1126-1974
7. Recommendations for dimensions and workmanship of natural building stones for masonry work (First revision) IS: 1127-1970
8. Recommendation of dressing of natural building stone IS:1129-1972 (1st Revision)
9. Sand for plaster (First revision) IS:1542-197710. Code of practice for construction of stone masonry(Reaffirmed 1996) IS: 1597-1992 (Part-I)
11. Rubble stone masonry (Reaffirmed 1996) IS: 1597-1992 (Part II)
12. Method for determination of resistance to wear by abrasion of natural building stones (1st Revision) IS: 1706-1972
13. Sand for masonry mortars (1st Revision)(Reaffirmed 1998) IS: 2116-1980
14. Code of practice for preparation and use of masonry mortars (1st Revision) IS: 2250-1981
15. Stone facing (Reaffirmed 1995) IS: 4101-1967 (Part-I)
16. Method of test for determination of water transmission rate by capillary action through natural building stones IS: 4121-1967
17. Method of test for surface softening of natural building stones by exposure to acidic atmospheres IS: 4120-1967
18. Methods of test for determination of permeability of natural building stones (1st Revision) IS: 4348-1973
19. Method of test for toughness of natural building stones IS: 5218-1969
20. Gujarat State, Section 2, Engineering properties of building stones IS: 7779-1975 (Part1/Sec.2)
21. Recommendation practice for quarrying stones for construction purpose. IS: 8881-1977

(VII) <u>Road Works</u>

1. Specification of Semi dense bitumen Macadam IRC: 95-1987
2. Guide line for Wet Mix Macadam IRC: 109-1997
3. Specification for Dense Bitumen Macadam IRC: 94-1986
4. Methods of tests of road materials IS: 2386, IS: 5640, IS: 6241

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

SECTION-2

2.0 General Specification.

2.1 The enclosed drawing in the bid document gives board dimensions and outline of the works to be executed through this contract. These drawings may however be revised /modified from time to time and supplementary additional drawing(s) may also be issued as per necessity. During the course of execution there may be changes in dimensions, specifications and shapes of components. The changes in the drawings can be done without any way deviating the terms of the contract and the contractor is to execute the work as per revised drawings and specifications at the same rate as agreed upon for the work awarded under the original contract. The contractor shall do no work without proper drawings. He shall check all drawings and specifications carefully and advise the Engineer-in-charge if any error and omission are discovered where upon the Superintending Engineer will prepare revised additional drawings and specifications as may be required to suit the stage of the work.

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

2.3 The percentage rate shall be for finished items of works as per description in schedule of quantities and according to drawings specification and conditions of contract. The percentage rate quoted shall be for execution of finished items of work & the specifications of which confirm to the details furnished in the Agreement and provisions in Bureau of Indian Standards and shall include all general and incidental charges which will not be paid separately. Such general and incidental charges are listed in succeeding Para for the convenience of the tenders but are not exhaustive. Omission of any such items here in but required for delivering finished items of work, shall not be plea, that such items are not covered by the percentage rate quoted.

2.3.1 Formation and maintenance of haul roads including river and drainage crossings within the work site is to be made by the Contractor at his own cost. The existing approaches and haul roads, if any under the control of the

Department may be used but improvement, if required, shall be done by the contractor at his own cost.

2.3.2 Labour and materials required for construction of reference points, benchmark pillars etc. for setting out work shall be at contractor's cost.

2.3.3 Scaffolding and gang-ways as and when required for the work will be done by the contractors at his own cost. No additional payment on this score, will be entertained.

2.3.4 The rate includes all leads, lifts & de-lifts.

2.3.5 Form work complete includes cost of materials, labour, maintenance, erection and removal.

2.3.6 Construction of coffer dam and dewatering required if any during execution of work is the responsibility of the contractor.

2.3.7 Protection of components of work during the rainy season shall be the responsibility of the contractor. The responsibility for the safety of the structure rests, entirely on the contractor and any damages that may occur has to be made good by the contractor at his own cost.

2.4 The sequence of construction adopted by the Contractor shall have to be approved by the Engineer-in-Charge.

2.5 The contractor has to make his own design for coffer dam or any type of cross bund required during course of execution. All materials for the coffer dam or cross bund shall be arranged by the Contractor at his own cost. The contractor shall maintain the coffer dam till completion of the work.

2.6 QUALITY CONTROL.

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

2.6.2 All such testing charges shall be borne by contractor. The contractor will provide necessary assistance if required for collection of samples & sending to outside laboratory for testing if required.

2.6.3 On the basis of satisfactory test results confirming to technical specification collection of materials shall be started in the field. The testing of materials shall be checked in the field Laboratory by the Department as well as staff of Quality Control Organization. If the field test result is found unsatisfactory, the materials shall be rejected and action taken to remove the same from work site by the contractor at his own cost. In no case the defective materials shall be used in the work.

2.6.4 On receipt of notice from the Engineer-in-Charge and on observation of Quality Control Division, in charge of the project, the contractor will rectify the defect in stipulated period at his own cost. If the defects are not rectified in the stipulated period. The Engineer-in-charge shall assess the cost, get the defect rectified and recover the cost for the same from the dues of the contractor.

2.7 A quarry chart indicating possible source of materials may be seen in the office of the Superintending Engineer, Jambhira Canal Division , Morada. The contractor must however satisfy himself that the materials as will be made due to non-availability materials as per required specification and quality in the quarries shown in the departmental quarry chart. The quarry chart is only an indication of source of material and the department does not accept the responsibility if the materials are not available in full quantity and quality.

2.8 No claim for carriage of water whatsoever will be entertained.

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

2.10 The item marked "N/A" Not Applicable "do not apply in this contract.

SECTION 2.1 DISCHARGE RECORDS
RECORDS 2.1.1. DISCHARGE

The Hydrological data, pertaining to the canal and the streams crossing the canal furnished in the relevant report and drawings, are for information of bidders and contractors. It should be noted that the data used in preparing these particulars were recorded at locations different from the work site. The Government (that is Govt. of Odisha) does not guarantee the reliability or accuracy of any of the data, shall assume no responsibilities for any conclusions or

interpretations that may be made from them. The contractor shall undertake at his expense such studies as are necessary to assess the reliabilities and accuracy of the information presented in the Data.

SECTION- 2.2. SETTING OUT OF WORK

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

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

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

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

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

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

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

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

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

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

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

SECTION 2.3 CLEARING AND GRUBBING:

A. CLEARING AND LEVELING SITE.

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

B. GRUBBING.

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

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

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

PREPARATION OF BED:

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

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

C. DISPOSAL OF CLEARED AND GRUBBED MATERIAL.

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

The materials to be disposed off shall be buried.

D. PAYMENT

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

SECTION 2.4.1: USE OF WATER:

2.4.1 WATER FOR DUST ABETMENT.

A. GENERAL

The contractor shall procure and apply water for dust abatement.

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

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

2.4.2 PREWETTING OF CANAL PREMISES AND ADJACENT AREAS:

A. GENERAL

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

Water applied for pre-wetting areas as detailed above will not be eligible for payment. The cost of procuring and applying water including all expenses for all means of conveying the water to the point of use, their collection, usage and all incidental charges shall be included by the contractor in the concerned unit price

bid in the bill of quantities for that item of work where the water shall be used and no separate payment for the same will be made.

SECTION 2.5 SITE DRAINAGE:

2.5.1 CROSS DRAINAGE:

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

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

2.5.2 DRAINS, BERM DRAINS AND DOWEL BANKS:

A. DRAINS:

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

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

B. BERM DRAINAGE AND DOWEL BANKS:

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

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

Payment will be made for construing Dowel banks and sloping berms and cost there of shall be included in the unit price per cubic meter bid in the bill of quantities for construction for canal embankment including reconstructing and remodeling.

2.6 MONSOON DAMAGES:

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

2.7 REMOVAL OF SILT AND WATER:

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

2.8 PROCEDURES FOR MEASUREMENT:

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

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

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

If the work is awarded to any agency the level shall be recorded in the presence of the contractor or his authorized agent. The contractor or his authorized agent shall sign each page of the level book/field book in token of acceptance. Without acceptance of the level by both the parties , the work shall not commence. Dispute if any arises, the decision of the Engineer-in- Charge shall be conclusive and binding. These cross sections shall form the basis of all future measurements and payments. Each dimension shall be measured to the nearest 0.01m, areas shall be computed to nearest 0.01sqm. Volume shall be computed to nearest 0.01 cubic meter.

SECTION- 3

EARTH WORK

SECTION 3.1. EARTH WORK – GENERAL

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

Drawing showing the typical section of the canal annexed to these specifications provides such details as would enable the contractor to execute the work in general conformity there-with under these specifications which have been prepared as definitely and in as much detail as possible with regard to design data presently available. These drawings will be supplemented by such additional, general and details drawings or directions as may be considered necessary or desirable as the work progresses. For all changes in approved drawing/design the recommendation of Chief Construction Engineer, Superintending Engineer and approval of Chief Engineer will be essential. Where details shown on these drawings differ from the requirements of these specifications. The requirement of specifications shall govern. The contractor shall do no work without proper drawings. He shall check all drawings and specifications carefully and advise the Engineer-in-charge if any errors and commissions are discovered where upon the Superintending Engineer will prepare and lodge such revised additional drawings and specifications as may be required to suit the stage of the work. All such additional general and detailed drawings whether original or revised lodged in the office of the Engineer-in-charge and signed by him for purpose of identification shall be open for inspection by the contractor under the same terms and conditions as provided in agreement.

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

SECTION 3.2. EXCAVATION OF CANAL:

3.2.1. CLASSIFICATION OF EXCAVATION.

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

3.2.2. EXCAVATIONFORCANAL

a) The excavation may be carried out manually or mechanically and as per specification drawing and direction of Engineer-in-charge.

b) The excavation for canal in all kinds of soil and D.I. Rock shall be done according to the dimensions and grades shown on the drawing, Proud equivalent to thickness of the lining on sides and in bed on the underside of the lining shall be left unexcavated temporarily and the removal of this proud shall be done just before trimming and placing concrete for lining.

c) Blasting shall be done in such a manner as not to cause over break which in the opinion of the Engineer-in-charge is excessive. Special care shall be taken to prevent over break or loosening of material on bottom and side slopes against which concrete lining is to be placed. The method of drilling and blasting to be resorted to for rock excavation/rock breaker shall be got approved from the Engineer-in-charge.

d) Except for the area of rock, all areas to be excavated for canal sections shall be pre-wetted so that at the time of excavation moisture content shall be about optimum. However, in case the excavated material from canal is not to be used for embankment, such pre-wetting is not necessary.

e) The excavation shall be allowed to progress from the valley ends of the reach towards the ridge in conformity with the layout given. All useful earth from excavation shall be used in for filling the banking section, with varying leads and with all lifts either manually or mechanically. Excavated materials which is not useful for banking or which is in excess after meeting the banking requirement of the reach shall be disposed as specified at Para 8.1 of I.S. Code 4701-1982 either by head lead or by mechanical means or by

both in spoil bank or at any specified place with all lifts and with varying leads.

f) The re-gradation for tail channel and approach channel for structures and diversion of drains, nallah shall be done according to the dimension and grade as shown on the drawings or as instructed by the Engineer-in-charge.

g) The contractor shall not be entitled to any additional rate above the percentage rate quoted in the schedule on account of the requirement for allowing additional time for drying, stock piling and re-handling the excavated materials which have been deposited temporarily and stock piled.

h) When cutting on cross sloping ground the contractor shall cut a catch water drain on the higher side to prevent water from flowing down the cutting slope.

3.2.2.1 EXCAVATION OF SOIL AND DISINTEGRATED (DI.) ROCK.

a. Excavation of soil shall comprise of all kinds of soil such as vegetable or organic soil, turf, sand, silt, loam, clay mud, peat, black cotton soil, loose or compact moorum, soft stiff/heavy/hard shale, stony earth mixed with gravel and boulder up to 0.5 cum size. Excavation of D.I. shall comprise of soling of roads/paths, hard core, macadam surface, soft conglomerate, and other types of D. I. rock, which does not require blasting and can be quarried or split with pick axe and crow bars. If however the contractor resorts to blasting in such strata and D.I. rocks for his convenience, no extra payment shall be made and the materials shall not be classified in higher grade.

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

b. The laterite sheet rock, which cannot be removed by pick axe / crow bar and normal excavator used for excavation of AKS and DI, when encountered, the Engineer-in-Charge will apprise the fact to the concerned Superintending Engineer. The Superintending Engineer will inspect the site and certify the initial level of laterite sheet rock and excavation by rock breaker will proceed. Further, the final level of laterite sheet rock will be certified by the Superintending Engineer.

3.2.2.2. EXCAVATION OF HARD ROCK.

This shall include all solid rock in place of such hardness and textures that it can not be removed by pick axe and crowbars and only to be removed by means of appropriate blasting/rock breakers. All boulders or detached pieces of solid rocks having volume greater than 0.50 cum, can be classified as Hard Rock.

The excavated rock and debris so obtained shall be carried and dumped / stacked separately with varying lead at places indicated by the Engineer.

The excavated materials shall be the property of the Department.

Payment for Hard Rock having continuous sheet shall be made as per level section (pre & finished). A closer interval for leveling may be adopted if considered necessary as per opinion of the Engineer-in-charge. Boulders having volume more than 0.5 cum shall be pre- measured and will be paid as hard rock.

3.2.2.2 OVER EXCAVATION.

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

3.2.2.3 DEWATERING TRENCHES AND WET EXCAVATION.

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

3.2.2.5 MEASUREMRENT AND PAYMENT

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

The initial and final level of laterite sheet rock requiring removal by rock breaker will be certified by the Superintending Engineer and quantity so derived as per level section will be paid.

In case of canal excavation in Hard Rock, cross sections, shall be taken at 30 m. interval longitudinally with transverse levels at 5 m. or closer intervals, as decided by the Engineer-in-charge for initial and final sections, isolated boulders having volume more than 0.50cum and not covered in section measurement shall be pre-measured.

3.2.2.6 EXCAVATION FOR STRUCTUTRES.

A. GENERAL

Excavation for the foundation of structures shall be to the elevation shown on the drawings or as directed by the Engineer-in- charge. In so far as practicable

the useful materials removed in excavation for structures shall be used for back fill and embankment.

B. FOUNDATION FOR STRUCTURES.

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

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

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

When unsuitable materials are encountered in the foundation for structure the Engineer-in-charge will direct additional excavation to remove the unsuitable materials. The additional excavation shall be refilled as follows. The excavation of soil, the over excavation shall be filled in by selected bedding materials and compacted. In excavation of rock it shall be filled by cement concrete M-7.5. Payment will be made as per unit rate as provided in the bill of quantities. Should remains of old building be met with, the materials shall be removed with wedges and levers. Blasting shall not be allowed, without the permission in writing of the Engineer-in-charge, If bad ground of loose soil is met with the contractor shall responsible for reporting the fact to the Engineer-in-charge who shall issue such orders as may be necessary. For extra excavation, concrete and masonry arising from bad ground, the contractors shall be paid treating this as additional quantity as per the contract rate of contract documents. All excavated earth which is unfit

or surplus to the requirements for filling in canal embankments etc. shall be spared, as instructed by the Engineer-in-charge at the contractor's expenses.

C. OVER EXCAVATION.

If at any point in common excavation the foundation materials is excavated beyond the lines required to receive the structure, or if at any point in common excavation the natural foundation materials is disturbed or loosened during the excavation process, it shall be compacted in place or where directed, it shall be filled by cement concrete M-7.5. and all excess excavation or over excavation performed by the contractor for any purpose or reason except as directed by the Engineer-in-charge shall be at the expense of the contractor. Filling for such excess excavation of over excavation shall also be at the expense of the contractor.

D. DISPOSAL OF MATERIALS:

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

E. MEASUREMENT FOR PAYMENT:

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

F. PAYMENT:

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

SECTION 3.2.2.7BACK FILL.

3.2.2.7.1 BACK FILL AROUND STRUCTURES.

A. GENERAL

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

B. MATERIALS

The type of materials used for backfill, the amount thereof and the manner of depositing the materials shall be subject to approval of Engineer-in-charge. In so far as practicable back fill material shall be obtained from material removed from excavation for structures. But when sufficient suitable material is not available from this source or from adjacent canal excavation, additional material shall be obtained from approved borrow areas. The borrow pit excavation shall be accordance with clause 9.1 to 8.3 of BIS 4701-1982.

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

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

Except as otherwise provided below, backfill materials to be compacted shall contain no stones larger than 80 millimeters in diameter and if not be compacted shall contain no stones larger than130 millimeters in diameter. If the excavation for the foundations of the structure is in swelling soils, a layer of cohesive non-swelling soil conforming to BIS 9451-1985 should be interposed between the swelling soil and the structure.

C. PLACING BACKFILL:

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

The surface to receive the filling shall be first prepare free from all roots, vegetation or spoil and wetted.

All backfill shall be placed carefully and spread in uniform layers so that all spaces around rocks and clods will be filed. Backfill shall be brought up as uniformly as practicable on both sides of walls and all sides of structure to prevent unequal loading. Backfill shall be placed to about the same elevation on both sides of the pipe positions of the structures and sufficient earth cover over the top of pipe to prevent damage from construction equipment loads. If a haul road is built over a pipe all backfill about and over the pipe shall be placed to a uniform surface and no humps or depressions will be permitted at the pipe crossing.

D. STRUCTURES OF FILL:

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

E. MEASUREMENT AND PAYMENT.

Payment for backfill about structure will be made as provided in the unit price bid therefore in the bill of quantities.

SECTION 3.4. DRILLING AND BLASTING:

3.4.1. GENERAL

Blasting where required shall be permitted only when proper precaution have been taken for the protection of persons and property in accordance with I.S. 4081 – 1967 (Indian Standard Specification for safety Code for blasting and related drilling operations). While carrying out excavation, adequate precautions in accordance with I.S. 3761-1966 (Indian Standard Specifications for safety Code for excavation work) shall be taken.

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

3.4.2. PERSONNEL:

Excavation by blasting shall be permitted only under the personal supervision of competent and licensed persons and trained workmen employed by the contractor at his cost. All supervisors and workmen in charge of work of handling, storage and blasting shall be adequately insured by the contractor.

The storage of explosives shall be in charge of a very reliable person of the contractor men. The contractor shall make sure that his supervisor workmen are fully conversant with all the rules to be observed in storing, handling and use of explosives. It shall be assured that the supervisor in-charge is thoroughly acquainted with the details of the handling and the blasting operations.

3.4.3 STORAGE OF EXPLOSIVES

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

The explosives, detonators and fuse coils shall each be separately stored. A careful and day to day account of the use of explosives shall be kept by the contractor in register in a manner prescribed by the Engineer-in-charge.

3.4.4 TRANSPORT AND STRORAGE OF EXPLOSIVES:

For the transport of the explosives and detonators between the store and site, closed and strong containers made of soft materials such as timber, zinc, copper, leather shall be used. Explosives and detonators shall be carried in separate boxes. For the conveyance of primer special containers shall be used.

The boxes and containers used shall be kept closed. Explosives shall be stored and used chronologically to ensure the ones received earlier being use first. A make up house shall provided at each working place in which cartridge will be made up by component and licensed man as required for the work. The make up house shall be separated from other buildings. Only electric storage battery lamps will be used in this house.

No smoking shall be allowed in the make up house or generally while dealing explosive.

No child under 16 years of age & person who is in a state of introduction shall be employed on the loading & unloading or transport of explosive or be employed in or allowed to enter in premises where explosives are handled and / or stored.

3.4.5 DIPOSAL OF DETERIORATED EXPLOSIVES:

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

3.4.6 PREPARATION OF PRIMERS:

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

3.4.7 CHARGING OF HOLES:

The work of charging of holes shall not commence before all the drilling work at the site is completed and the contractor's. Supervisor be satisfied himself to the effect by actual inspection. While charging open laps shall be kept away. For charging with powdered explosives, a naked flame shall not be allowed. The tamping rods shall have cylindrical ends. Bore hole must be of such size that the cartridges can easily pass down & they shall not however be too big.

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

3.4.8. BLASTING:

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

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

All the roads and foot paths leading to the blasting area shall be watched. Road closing barriers should be provided to close the traffic on these roads at least 400 meters away when the firing is to take place.

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

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

3.4.9. ELECTRICAL FIRING:

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

The detonators shall be checked before use. For blast in series only detonators of the same manufacture of the same group of electrical resistance shall be used.

Such of electrical lines as could constitute danger for the work of charging shall be removed from the site.

The firing cables shall have a proper, insulating cover so as to avoid short circuiting due to contract with water, metallic parts of rock.

The use of the earth as a return line shall not be permitted.

The firing cables shall be connected to source of current only when no body is in the area of blasting. Before, firing, the circuit shall be checked by a suitable apparatus. After firing whether with or without an actual blast the contact between the firing cables and the source of current shall be cutoff before any one is allow to leave the shelter.

During storms charging with electrical detonators shall be suspended. The charges already placed in the holes shall be blasted as quickly as possible but taking all the safety precautions and giving necessary warning signals. If this is not possible the sites shall be abandoned till the storm has passed.

3.4.10 PREACAUTIONS AFTER BLASTING:

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

3.4.11 MISFIRES:

If it is suspected that part of the blast has failed to fire and delayed, sufficient time shall be allowed to elapse before entering the danger zone. When fuse and blasting caps are used a safe time should allow and then the contractor's supervisor alone shall leave the shelter to see the misfire.

None of the drillers are to work nearer this hole under one of the two following operations have been carried out by the supervisor.

Either (i) the supervisor should very carefully (when the tamping is of camp clay) extract the tamping with a wooden scraper or jet of water or compressed air (using pipe of soft materials and withdraw the fuse with the primer and detonator attached after which a fresh primer and detonator with fuse should be placed in this hole and fired out or (ii) the hole may be cleared of 300mm of capping and the direction then be ascertained by placing a stick in the hole. Another hole may be drilled at least 225mm away and parallel to it. This hole should then be charged and fired. The balance of the cartridge and detonator found shall be removed.

Before leaving the work, the contractor's supervisor should inform the supervisor of the relieving shift of any case of misfires and should point out the position with Red Cross denoting the same, also stating what action if any, he has taken in the matter. A register of misfires and their location and how they were dealt with shall be maintained by the contractor.

The contractor's supervisor should also at once report at the contractor's office all cases of misfires, the cause of the same and what steps were taken in connection there with.

The name of the day and night shift supervisors of the contractor must be noted daily in the contractor's office. If misfire has been found to be due to a defective detonator, or dynamite, the whole quantity of box from which the defective article was taken must be returned to the contractor's office for inspection, and shall be disposed off.

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

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

SECTION 3.5 EMBANKMENTS

3.5.1. PREPARATION OF SURFACES FOR EMBANKMENTS

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

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

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

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

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

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

Where the ground surface under any embankment is not suitable as determined by the Engineer for a foundation for the embankment, the contractor shall strip the area under the embankment of such unsuitable material to such depth as may be directed. The material so removed shall be disposed off as provided in paragraph 3.3.4. Measurement for payment of stripping unsuitable materials under embankments shall be made only to the lines and to such depth as may be directed and payment therefore will be made at the unit prices per cubic meter bid in the bill of quantities for excavation for canal/construction of embankment.

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

The depth of which top soil is removed shall be adequate to remove all perishable material and any soil which may become unstable on saturation or may interfere with development of proper bond between foundation and embankment. It is not necessary to remove all the soil containing fine hair like roots but only the rather heavy mat. The underline table may offer as a guide for lines for finding depth of stripping.

Type of vegetable cover in the soil	**Depth of stripping.**
1. Soil containing light grass cover 2. Agricultural Lands	10 cm to 15 centimeters To bottom of ploughed zone 20.0 to 30.0 centimeters

The ground surface under all canal embankments excepting rock surface where it is below the full supply level in the canal shall be scarified making open furrows not less than 20 centimeters deep below natural ground surface at

intervals of not more than 1.0 (One) meter. However, where the ground surface is low, the bed level of the canal the entire surface of the foundation of embankments shall be stripped to a depth of not less than 20 (twenty) centimeters or as directed by Engineer-in-Charge.

Immediately after preparation of the embankment foundation, the contractor shall excavate cut off trenches. Following this operation as soon as feasible and as approved by the Engineer the contractor shall place and compact embankment in the cut off trenches and place one meter of embankment over the entire embankment foundation and compact where required. This procedure will seal the foundation against loss of moisture and provide some consolidation of the foundation.

The cost of scarifying the foundation surfaces under the canal embankments and other embankments shall be paid, if provided in the bill of quantities for excavation of canal.

Payment for excavation for cut off trenches shall be made at the unit price per cubic meter provided in the schedule of quantities for excavation for canal.

Payment for compacting embankment in the cut off trenches shall be included in the unit price per cubic meter in the bill of quantities for watering and compaction of embankments.

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

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

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

3.5.2 CONSTRUCTION OF EMBANKMENTS:

A. GENERAL

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

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

All materials shall be deposited in embankments so that cobbles, gravel and boulders are well distributed through other materials and not nested in any position within or under the embankment as enunciated in clause 6.4. of IS 4701 – 1982.

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

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

B. ROADS AND RAMPS:

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

The width of road shall be provided as shown in the drawing and where the width of road is not shown on the drawings, it shall have a width of not less than 4.2 meters. The work required for construction, operation and maintenance of road

and for earth ramps that obtainable with a motor grader provided for safe travel with a two wheel drive automobile in high gear to moderate speed. Special rolling or compact will not be normally required Provided that if compaction is directed, the embankments shall be compacted in accordance with section 3.6.

C. EMBANKMENTS NOT TO BE COMPACTED:

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

DEPOSITING

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

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

D. EMBANKMENT TO BE COMPACTED:

The requirements for compacted embankments shall be as specified in Section 3.6 All materials in compacting embankments shall be placed moisture and compacted as provided in Section 3.6.

The materials used for compacted embankments shall be suitable materials as determined by the Engineer-in-charge and shall be obtained from required excavation. The materials shall conform to clause 6.4 of IS 47-01-1982.

Before the materials for the 1st layer of embankment is placed, the foundation of the embankment shall be prepared as provided in paragraph 3.5.1 and shall be moistened and Compacted in the manner specified therein. The embankments shall be compacted to the elevation and to the top widths and side slopes shown on the drawings or prescribed by the Engineer-in-charge.

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

Where the original ground surface is below the bottom of the canal and where compacted fill below the bottom of the canal is prescribed such fill shall be placed as compacted embankment. Where the original ground surface is below the base of structures for where slopping concrete walls or slabs extend above the original ground surface and it is practicable as determined by the Engineer-in-charge to embankments shall be constructed to lines and grades as directed to form suitable foundation for the structure of for the sloping or slabs.

3.5.3. BORROW AREA.

3.5.3.1. GENERAL.

a. All materials required for the construction of embankment and backfill for cut-off trench and around the structures which are not available from canal excavation, excavation for structure or from excavation of other ancillary works shall be obtained from the designated borrow area after stripping and approved by the Engineer-in-charge in consultation with field laboratory. The depth of cut in all borrow areas shall be designated by the Engineer-in-charge and the cuts shall be made up to such designated depths only. Shallow cut will be permitted in the borrow areas if uncertified materials with uniform moisture contents are encountered. Each designated borrow area shall be fully exploited before switching over to the next designated borrow area. Half hazard exploitation of borrow pits shall not be permitted. The type of equipment used and the operations in the excavation of materials in borrow area shall be such as to produce the required uniformity of the mixture of materials for the embankment. The contractor has to arrange borrow earth at his own cost and responsibility. No compensation whatsoever for change in limits and locations of the borrow areas

and depth of cut for getting suitable earth shall be paid to the contractor. The borrow area shall not be designated within a distance of five times the height of embankment from the other toe.

b. Borrow pits shall be operated so as not to impair the usefulness or mar the appearance of any part of the work of any other property. The surfaces of wasted materials shall be left in a reasonably level and even condition.

3.5.3.2. PREPARATION OF BORROW AREAS:

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

Particulars care shall be taken to exclude all organic matter from the materials to be placed in the embankment. All cleared organic materials shall be burnt to ashes or disposed of as directed. The cleared areas shall be maintained free of vegetable growth during the progress of the work.

3.5.3.3. STRIPPING OF BORROW AREAS:

Borrow area shall be stripped of top soil, sod and any other objectionable materials to the required depth as directed by Engineer-in-charge.

The work may be done manually or with suitable machine. Stripping operations shall be limited only to designated borrow areas. Materials from stripping shall be disposed of in exhausted borrow areas or in the approved adjacent areas as directed. The payment shall be made as per the item rate of the BOQ.

3.5.3.4. BORROW AREA WATERING/DEWATERING:

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

b. The initial moisture content of the materials in the borrow areas shall be estimated with the help of field laboratory tests. The optimum moisture content required for the materials in any particular borrow areas shall be obtained from the field laboratory. The additional moisture requirements as determined by the laboratory test shall be introduced into the borrow areas by watering well in advance of the excavation to ensure uniformity of moisture content. All care shall be taken to reduce excessive moisture in any of the locations of a borrow area

before or during excavation to secure the materials with moisture content close to the optimum. To avoid formation of pools in the borrow areas during excavation operation, drainage ditches from borrow areas to suitable outlets shall be excavated, wherever necessary. Upon exhausting of all materials or abandoning the borrow areas, the pits shall be fully drained to ensure no ponding of water.

3.5.3.5. HAUL ROADS:

Construction and maintenance of haulage roads will be the responsibility of the contractor. The department will have full right to way to those roads for inspection purposes. Proper roads sign as directed have to be provided for safety. For haulage of earth, the contractor shall construct ramps and haul roads of sufficient width along the shortest but most practicable route and shall maintain and illuminate them to a satisfactory manner. Watering of the haul road shall be done by the contractor as often as necessary to prevent raising of dust, formation of cuts and consequent deterioration of the surface. Whenever service roads meant for public through fare traverse through or run close to the borrow area, the contractor shall direct the excavation and haulage operation in such a manner as to ensure uninterrupted use of the service road and safety to the public. At the haul road and service road crossing, the contractor shall install necessary check gates and road signs.

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

3.5.4. EARTH FILL MATREIALS.

3.5.4.1. HOMOGENEOUS EARTHFILL:

Canal embankment shall be constructed to the top width and side slopes as shown on the drawings. Suitable excavated materials available from the canal cutting, proud cutting, removal of ramps and excavation for structures shall be used for construction of banks. If suitable and adequate materials for constructing embankment is not available for excavations, the desired materials shall be obtained from borrow area designated for the purpose as per the instruction of the Engineer-in-charge.

The planning for execution should be such that all the useful excavated materials are utilized in embankment prior to utilization of borrow earth from outside. The embankment earth shall be borrowed only after getting written instruction of the Engineer-in-charge.

Only suitable materials as per specification shall be excavated, loaded and conveyed to the point of placement in the embankment. Unsuitable materials if

conveyed shall be removed and disposed clear of the work site as directed by the Engineer-in-charge at the cost of the contractor. The maximum dimensions of stones, pebbles and rock fragments etc. placed in the outside zone of the embankment shall not be more than 15 cm. and the quantity of such stone shall not exceed 5% of total quantity.

3.5.4.2. ZONED EARTHFILL:

i) When a embankment section is designed zoned section, the embankment shall be divided into zones within which fill materials obtained from canal excavations having different characteristics are to be placed. Placement of fill within these zones as shown on the drawings shall be performed in orderly sequences and in an efficient and workman like manner. The selected materials shall be filled above the key of lining.

ii.) Chemical and physical tests of the soil in the embankment shall be carried out to ensure that the soil does not contain soluble lime salt content or cohesion less fines, and quantities harmful to the embankments. The useful materials available from canal excavation, excavation of proud and excavation of structures shall be transported over the required leads, as indicated in the respective items of schedule of quantities and placed in then specified layers for embankment.

iii) In areas, where suitable and adequate materials for constructing the inner zones of the embankment is not available from the canal excavation and excavation of structures, the materials shall be obtained from the borrow areas fixed for the purpose. The borrow areas shall be excavated to the dimensions and depths actually required and as per the instructions of the Engineer-in-charge.

iv) The rest of compacted zone in the drawings shall be constructed of materials having required percentage of clay so that it can be compacted at optimum moisture content by suitable compacting equipment, to their maximum dry density. The materials shall be compacted to a density as specified on the drawings and as per standard proctor density. Water tightness of materials shall be checked by carrying out in situ permeability tests. Permeability of impervious materials shall not be greater than 10 cm /sec. The impervious material of inner zone should preferably by free from large size particles. If this is not possible the maximum size of gravels i.e. coarse particles to be permitted shall be 40 mm and in that case gravel corrected density shall be considered for compaction standards. In no case the quantity of gravel shall exceed 10% of total quantity.

iii) The rest of compacted zone may consist of any suitable material which provides support to impervious core under various conditions of saturation

and draw down. If silty or sandy materials are used, compaction shall be done by using proper machinery utilizing the principle of vibro-compaction. The distribution of materials shall be such that the compacted material shall be homogeneous free from cracks, pockets or other imperfections. The maximum dimensions of stone placed in the embankment shall not be more than 15 cm. and the quantity of such stone shall not exceed 5% The excavating and placing operations shall be such that the materials when compacted shall be blended sufficiently to secure the best practicable degree of compaction, impermeability and stability. The materials shall be compacted to a density as specified on the drawings or as directed by the Engineer-in-charge.

3.5.5.PLACING EARTHFILL:

A. The embankment shall be constructed with earth fill of required materials as per drawing and specification. The fill shall before from lenses pockets, streaks or layer of materials differing substantially in texture or gradation from the surrounding materials. Then useful excavated materials shall be classified as impervious and semi pervious by the Engineer-in-charge. Care shall be taken to utilize the impervious materials towards the waterside of the embankment and semi pervious materials towards outer zone of the embankment as per drawing.

B. Construction of embankment shall begin at the toe of the fill and in no case shall embankment be widened by materials dumped from the top. The materials shall be placed in the earth fill in the continuous horizontal layers not more than 15 cm. In thickness after being rolled as herein specified.

The thickness of the layer shall be adjusted by the Engineer-in-charge, if the contractor satisfies the Department that the particular type of compactors used by him give the required density by carrying out trial compaction and requisite tests. The thickness of horizontal layers after compaction shall not be more than 10 cm. if compaction is performed by mechanical tampers, not more than 15 cm. if by sheep foot roller and not more than 30 cm. if compaction is performed by vibratory or pneumatic rollers or similar equipment. Initially the earth in the embankment fill shall be laid in a greater width than the designed section. Adequate extra width of about 0.6 m on either side of the embankment shall be provides so that the earth fill, up to lines of the finished slopes shall have the required compaction as per the drawing and specification. Such extra width shall be removed and utilized in the upper layers of embankment along with slopes dressing, for which no additional payment shall be made as it is deemed to have been included in bid price of earth work in embankment in the bill of quantities.

The inside proud section shall not be removed if the lining work is not included under the same contract such proud section made out of borrow earth

from outside only shall be paid as per bid price of the item in the bill of quantities. No payment shall be made for compaction for such proud section left.

C. No fresh layer shall be laid until the previous layer is properly watered and compacted as per the requirement. The surface of the prepared foundation or the rolled surface of any layer of earth fill is too dry or smooth to bound properly with the layer of materials to be placed thereon, it shall be moistened or worked with harrow scarified or other suitable equipment in an approved
manner to a sufficient depth to provide a satisfactory bonding surface before the next succeeding layer of earth fill materials is placed. If the rolled surface of any earth fill is found to be too wet for proper compaction of the layer of earth fill materials to be placed thereon. It shall be raked up and allowed to dry or be worked with harrow. Scarified or any other suitable equipment to reduce the moisture content to the required amount and then it shall be compacted before the next succeeding layer of earth fill materials is placed.

D The materials shall be deposited in rows parallel to the axis and spread in the uniform layers and shall be broken clods maximum up to 5 cm. in thickness or such thickness as directed by Engineer. The work of spreading and compaction shall be so adjusted as not to interfere with each other and in such a way that neither of the operations is held up because of non completion of rolling and watering. The excavation and placing operation shall be such that the materials when compacted shall be blended sufficiently to secure the best practicable degree of compaction, impermeability and stability. If the work is held up due to failure of machinery no claim whatsoever shall be entertained even in case the machinery is supplied by Department. The surface of banking shall at all time of construction be maintained true to required cross section.

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

F. When compacting the soil against the rock abutment or walls of masonry or concrete structures, the construction surface of the embankment shall be sloped away from the rock or masonry or concrete structure leaving a minimum distance of 0.6 m and at an inclination of 3:1. If the foundation surface is too irregular to allow the use of large roller directly against the structure or rock out crop, the roller shall be used to compact the soil, as close to the structure or the out crop as possible and the portion of the embankment directly against the rock or the structure shall be compacted with pneumatic hand tampers in thin layers. The moisture content of the earth fill placed against the rock or the structure shall be slightly above the optimum to allow it to be compacted into all irregularities of the

rock and this shall be determined by the field laboratory. In placing the earth fill under rock foundation the foundation shall first be prepared as detailed earlier.

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

3.5.6. WEATHER CONDITIONS:

a. Embankment materials shall be placed only when the weather conditions are satisfactory to permit accurate control of the moisture content in the embankment materials. Before closing work on embankment, in any continuous reach prior to setting of monsoon, the top surface shall be graded and rolled with a smooth wheeled roller to facilitate run off. Prior to resuming work, the top surface shall be scarified and moistened or allowed to dry as necessary and approved by the Engineer for resumption.

b. The contractor shall provide suitable protection works to protect the slope from corrosion due to rain water. No payment whatsoever shall be made for providing such protection work and rectifying the monsoon damages.

3.5.7 MOISTURE CONTROL:

The water content of the earth fill materials prior to and during compaction shall be distributed uniformly throughout each layer of materials and it shall be between 2% to +2% of the optimum moisture content. Moisture determination of soil as well as needle moisture determination of soil shall be carried out as per I.S. 2720-1983

Laboratory investigations may impose some restriction on the lower limits of the practicable moisture contents on the basis of studies on consolidation characteristics of soil in embankment. Here in after the terms range of optimum practicable moisture content shall refer to the value as described above. As far as practicable, the materials shall be brought to the proper moisture content in the borrow area before excavation. If additional moisture is required it shall be added preferably at the borrow area and only in limited cases/extent. If required, on the embankment by sprinkling water before rolling of a layer. If more moisture is present than required, the material shall be spread and allowed to dry before starting rolling. Moisture control shall be strictly adhering to. The moisture

content shall be relatively uniform throughout the layer of material, if necessary, ploughing, disc harrowing or blending with other materials may have to be resorted to obtain uniform moisture distribution. If the moisture content is more or less than the range of optimum practicable moisture content or if it is not uniformly distributed throughout the layer, rolling and adding of further layer shall be stopped. Further work shall be started again only when the above conditions are satisfied.

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

SECTION 3.6.COMPACTING EARTH MATEIALS.

3.6.1. GENERAL.

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

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

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

A. Earth fills height.

Canal reaches having earth fill shall always be compacted by any approved method of compaction.

B. Moisture control.

The water content of the earth fill material prior to and during compaction shall be distributed uniformly throughout each layer of materials and it shall be between -5% to +2% of the optimum moisture content. As far as possible and practicable the moisture content of the materials should be brought to required level by watering of borrow area before excavation. If additional moisture is required the same should be sprinkled while laying the earth fill in layers, if the moisture content is greater than required the material shall be allowed to dry and if necessary ploughing, disc-harrowing or blending with other materials may have to be resorted to obtain uniform moisture distribution . In order to have proper

control of moisture in earth fill, no embankment shall be constructed during rainy days.

3.6.2 COMPACTING CLAY AND SILTY MATERIALS.

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

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

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

When the materials has been conditioned as herein before specified, it shall be compacted by rollers or by hand or power tampers. Where hand or power tampers are used to compact soils in confined areas such as under pipes and at the

joints of bank connections with the structures, they shall been equipped with suitably shaped heads to obtain the required density.

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

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

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

The optimum moisture content is the moisture content that corresponds of the laboratory maximum dry density determined in accordance with I.S. 2720 (Part – VII) 1973.

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

3.6.3 COMPACTING COHESIONLESS MATERIALS

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

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

equipment the thickness of the layer before compaction shall not be more than 4 cm. if compaction is performed by internal vibrators the thickness of the layer shall not be more than the penetrating depth of the vibrator.

As envisaged in clause 6.6.3.1 of I.S. 4701-1982 the relative density of the compacted materials shall not be less than 70% when tested in accordance with I.S. 2720(Part-XIV) k1983 Indian Code of Practice for determination of density Index (relative density) of cohesion less soils.

3.6.4 COMPACTION COHESIONLESS MATERIALS CONTAININGS SOME CLAY AND SILT:

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

i) Dry density determined using procedure enunciated in I.S. 2720 (Part-VII) 1965 (Indian Code of Practice for termination of moisture content dry density relation using light compaction). Prior to and during compaction operation the materials shall posses optimum moisture content as determined in accordance with clause 6.6.4.1 of I;.S. 4701-1982 and the moisture content shall be uniform throughout each layer. Provided that the moisture content is ensured as required in clause 6.6.4 of I.S. 4701-1982 the dry density of take soil portion in the compacted materials shall not be less than 95% of the laboratory maximum soil dry density compacted. The field dry density shall be determined in accordance with I.S. 2720(Part-XXVIII) 1974 or IS 2720 (Part XXIX) k1975.

ii) Dry density using the relative density test as described in I.S. 2720 (Part XIV)1983 Indian Code of Practice for determination of density index (relative density) of cohesion less soils. The relative density of the compacted materials obtained shall be not less than 70% determined in accordance with clause 6.6.3.1 of I.S. 4701 – 1982 the moisture content shall be maintained as per clause 6.6.4 of I.S. 4701 – 1982.

iii)

3.6.4 ROLLERS AND OTHER COMPACTING EQUIPMENT:

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

Major Division	Sub-group	Suitable type of compacting equipments.

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

The compacting equipment shall confirm to relevant India specification below.

1. Smooth wheeled roller should conform to IS 5502-1969
2. Sheep Foot roller should conform to IS 4661-1968
3. Pneumatic tyred roller should conform to IS 5501-1969

4. Vibratory plate compactor should conform to IS 5889-1970
5. Vibratory roller should conform to IS 500-1970

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

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

Tampering rollers used for compaction of earth fill shall conform to the following requirement.

A. Roller drums:

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

B. Roller Weight.

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

C. Rolling.

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

3.6.6. TAMPING.

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

i. Porticos of the earth fill in embankment adjacent to masonry structures and embankment foundation designated on the drawing as specially compacted earth fill.

ii Earth fill embankment adjacent to steep abutments.

iii Earth fill at specially designated location.

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

3.6.7 TESTING:

Density tests shall be carried out after rolling to ascertain the state of compaction which should be measured in terms of dry density. Standard proctor density tests shall be carried out at regular intervals to account for variations in the borrow area material. Not less than three tests shall be conducted to indicate variation in the standard Procter density attained in the laboratory.

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

The density to be attained after compaction should be at least 95% of proctor density predetermined by Laboratory tests.

3.6.8. SETTLEMENT ALLOWANCE:

In the mechanically compacted earth fill, settlement allowance of 2% should be provided. In case of earth fill of canal which has not been mechanically compacted, settlement allowance at 16% of height should be provided and necessary adjustment should be made to take care of natural settlement due to rains. Accordingly, extra height should be provided. Settlement allowance at 10% shall be calculated after embankments are subjected to natural compaction of one full monsoon rains. Settlement allowance of 2% shall be calculated after

embankments are subjected to natural compaction for 2 or more monsoon rains.The base width of the embankment shall not be increase to maintain the design slopes indicated in the drawings for additional height as settlement allowance, but the following procedure shall be adopted.

Settlement allowance shall be calculated at various levels and the elevation including settlement allowance shall be derived keeping the embankment width at the designated levels unchanged. The edges of the embankment at the increased elevations (including settlement) when joined with the point where the slope has changed earlier below, shall give the slope to be adopted for construction.

3.6.9. SLOPE DRESSING.

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

3.6.10. MEASUREMENT AND PAYMENT

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

SECTION – 4

CONCRETE WORKS

SECTION 4. 1 CONCRETE STRUCUTRES.

4.1.1. CONCRETE IN STRUCTURES.

Concrete in structures shall conform to the requirements of paragraphs 4.2.1.

4.1.2. CONSTRUCTION OF STRUCTURES:

The item of the schedules for concrete in the structures including all cast in place concrete in the structure.

Cast-in-place concrete for the structures includes all cast-in-place concrete in the structure.

Cast-in-place concrete for the structures shall conform to the requirement of section 3.2 pipe and fitting miscellaneous metal work, mechanical and electrical equipment and other items forming a part of the structures are provided for elsewhere in these specification.

The structures will be located at various points along the canal as shown on the drawings or as otherwise designated.

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

Where necessary as determined by the Engineer-in-charge the contractor shall furnish additional details drawings of the structures to be constructed.

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

SECTION 4.2. GENERAL CONCRETE REQUIREMENTS:

4.2.1. COMPOSITION:

A. GENERAL:

Concrete shall be composed of cement, sand, coarse aggregate, water admixtures (if any) as specified and all well mixed in batching plant by weight or by concrete mixture by volume and brought to the proper consistency. Batching plant shall conform to IS Code No. 4925-1968.For works in which water tightness is required the specification in IS 3370-1965 para 1 to 10 shall be adopted.

MIXING:

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

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

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

B. NOMINAL MAXIMUM SIZE OF AGGREGATES:

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

C. MIX PROPROTIONS:

The proportions of various ingredients to be used in the concrete for different items of the work are given in the bill of quantities. In proportioning concrete, the quantity of both cement and aggregate should be determined by weight / volume. Water shall be either measured by volume in calibrate tanks or weighed. Batching plant shall conform IS 4925-1968 (Indian Standard Specification for batching and mixing plant). All measuring equipments shall be maintained in a clean serviceable condition and their accuracy periodically checked. Adjustment shall be made as directed to obtain concrete having suitable workability, impermeability, density, strength and durability without the use of excessive cement. The acceptance or rejection of concrete shall be as per the acceptance criteria laid down in clause 15 of IS 456-2000.

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

D. CONSISTENCIES:

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

Sl. No.	Place condition	Degree of workability	Value of workability.
1.	Concreting of light reinforced sections without vibration or heavily reinforced section with brat ions.	Medium	25mm to 75mm slump for 20 aggregate.

II. For plain concrete work, slump requirements mentioned in item 1 above are applicable.

III. Lining with slip form machine 60 to 70 mm slump for concrete paver finish.

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

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

4.2.2 CONCRETE QUALITY CONTROL MEASURES AND CONCRETE QUALITY ASSURANCE TEST PROGRAMME.

CONCRETE QUALITY CONTROL MEASURES

a. The contractor shall be responsible for providing quality concrete to ensure compliance of the contract requirements.

b. Making and cutting concrete test specimens in the field will conform to IS 516-1959

c. Capping cylindrical concrete specimens will conform to IS 516-1959

d. Compressive strength of concrete specimens will confirm to IS 516-1959.

SAMPLING PROCEDURE AND FREQUENCY:

A. A random sampling procedure shall be adopted to ensure that each concrete batch has a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and should cover all mixing units.

B. FREQUENCY:

The minimum frequency of sampling of concrete of each grade shall be in accordance with the following-

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

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

TEST FACILITIES:

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

CONTRACTOR TO FURNISH DRAWINGS AND DATA:

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

4.2.3 CEMENT

A. GENERAL

Cement shall confirm to clause 4 of IS 456-2000 for the purpose of specifications cement used shall be any of the following with the prior approval of the Engineer-in-charge.

a. Ordinary or low heat Portland cement conforming to IS 269-1976
b. Rapid hardening Portland cement conforming to IS 8041-1978

c. Portland slag cement conforming to IS 455-1976
d. Portland puzzolana cement conforming to Is 1489-1976
e. High strength ordinary Portland cement conforming to IS 8112-1976
f. Hydrophobic cement conforming to IS 8043-1978

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

The contractor shall make his own arrangements for the procurement of cement to required specifications required for the work. Transportation from the place of supply to the batching plant shall be in weather tight rail cars, trucks, conveyors and other means which will protect the cement completely from exposure to moisture. Immediately upon receipt at the jobsite, bulk cement shall store in dry, weather tight, properly ventilated bins until the cement is batched. The bins shall be emptied and cleaned by the contractor when so directed by the Engineer-in-charge. However the intervals between required cleaning will normally be not less than 6 month. Each other shipment of bagged cement shall be stored separately so that it may readily be distinguished from other shipment and shall be stored in a dry enclosed area protected from moisture. Storage of materials shall be as described in IS 4082-1977 (IS recommendation on staking and storage of construction materials at site) to prevent under aging of bagged cement after delivery. The contractor shall use bags of cement in the chronological order in which they were delivered to the job site. All storage facilities shall be subject to approval of the Engineer-in-charge.

B. ACCEPTANCE OF CEMENT.

Portland cement shall be supplied by the contractor according to clause 10.1 of IS 269-1976.

C. ACCEPTANCE OF POZZOLANA:

Pozzolana added to the concrete as an admixture shall be sampled and tested as per IS9103-1979

D. RECOVERY OF COST OF CEMENT IN WASTED CONCRETE ETC:

The cost of cement used in wasted concrete in replacement of damaged or defective concrete and extra concrete required as a result of over excavation intentionally performed by the contractor's shall be borne by the contractor

himself. No extra payment shall be made to the contractors for such additional quantity.

4.2.4 ADMIXTURES:

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

4.2.5. WATER.

The water used in making and curing of concrete mortar and grout shall be free from objectionably quantities of silt, organic matter, injurious amounts of oils, acids, salts and other impurities etc. as per IS specification No.456-2000.

The Engineer-in-charge will determine whether or not such quantities of impurities are objectionable.

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

PERMISSIBLE LIMITS FOR SOLIDS IN WATER.

1. Organic Maximum permissible limit 200 mg. /ltr.
2. Inorganic 300 mg. /ltr.
3. Sulphate (as 504) 500 mg. /ltr.
4. Chlorides (as CL) 2000 mg. /ltr for plain concrete work and 1000 mg/ltr for RCC work.
5. Suspended matter 2000 mg. /ltr.

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

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

4.2.6. SAND (FINE AGGREGATES):

A. GENERAL

The term sand is used to designate aggregate most of which passes 4.75 millimeter IS . Sieve and contains only so much coarser material as permitted in clause 4.3of IS 383-1970. Sand shall be predominantly natural sand which may be

supplemented with crushed sand to make up deficiencies in the natural sand grading.

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

B. QUALITY:

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

ORGANIC IMPURITIES IN SAND:

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

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

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

SPECIFIC GRAVITY:

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

DELETERIOUS SUBSTANCE:

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

C. GRADING.

The sand as batched shall be well graded and when tested by means of standard sieves shall confirm to the limits given in table 4 of IS 383-1970 and shall be described as fine aggregates. Grading zones.I, II, III and IV. Sand complying with the requirements of any of the four grading zones is suitable for concrete. But sand confirming to the requirements of grading zone IV shall not be used for reinforced cement concrete work.

4.2.7. COARSE AGGREGATES:

A. GENERAL:

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

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

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

B. QUALITY:

The coarse aggregate shall consist of naturally occurring (crushed or uncrushed) stones, and shall be hard, strong durable, clear and free from veins and adherent coating, and free from injurious amounts of disintegrated pieces, alkali, vegetable matter and other deleterious materials. Coarse aggregate will be rejected if it fails to meet any of the following requirements.

1. LOS ANGLES ABRASION TEST.

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

2. AGGREGATE CRUSHING STRENGTH TEST.

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

3. SOUNDNESS TEST.

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

4. SPECIFIC GRAVITY:

The coarse aggregates shall have specific gravity of 2.60 minimum.

5. DELETERIOUS MATERIALS.

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

C. SEPARATION.

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

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

Coarse aggregates for concrete shall be separated into various nominal maximum sizes specified in the relevant paragraph. Separation of the coarse aggregate into the specified sizes after finish screening shall conform to the

grading requirements specified in Table 2 of IS 383 – 1970 when tested in accordance with IS 2386 (Part II) 1963 (Method of test for aggregates for concrete part I) particles size and shape.

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

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

4.2.8. PRODUCTION OF SAND AND COARSE AGGREGATE:

A. GENERAL.

Sand and coarse aggregate for concrete and sand for mortar and grout shall be obtained by the contractor from the approved sources shown in the contract documents. The approval of deposits by the Engineer-in-charge shall not be constructed as consisting the approval of all or any specified materials taken from the deposits and the contractor will be responsible for the specified quality for all such materials used in the work.

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

No separate payment will be made for such tests. If sand and coarse aggregate are to be obtained from a deposit not previously tested andappr9oved by the Engineer-in-charge the contractor shall submit representative samples for pre construction test and approval not less than 60 days before the sand and coarse aggregates are required for use. Each sample shall approximately consist of 100 Kg. of material. In addition to pre construction tests the approval of deposits the Engineer-in-charge may test the aggregates for their suitability during their processing. The contractor shall provide such facilities as may be necessary for procuring representative samples free of cost at the aggregate processing plant and at the batch plant or mixing platform.

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

B. DEVELOPING AGGREGATE DEPOSITS:

If the deposits is owned by the State Govt. and controlled by the department of Mines and Geology, the portion of the deposit used shall be located and operated so as not to detract

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

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

C. PROCESSING RAW MATERIALS.

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

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

D. COST.

This shall be included in the applicable price bid in the schedule for concrete filter and other works in which the aggregates are used .

4.2.9. BATCHING.

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

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

The grading of aggregates shall be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions the different sizes being stacked in separate stock piles, the materials shall be stock piled a day before use. The grading of coarse and fine aggregates will be checked as frequently as directed by the Engineer in charge. Water shall be added by weight or measured by volume in calibrated tanks. The amount of added water shall be adjusted to compensate for any observed variations in the moisture contents. Determinations of moisture content in the aggregate shall be in accordance with I.S. 2386 (Part
III) 1963 (Indian Standard Method of test for aggregate of concrete Part III). The amount of surface water carried by aggregates will be determined in accordance with Table 4 of I.S. 456-2000.

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

4.2.10. MIXING.

A. GENERAL.

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

The concrete as discharged from the mixer shall be uniform in composition and consistency from batch to batch. Workability shall be checked at frequent

intervals as IS 1199-1959. Mixer shall be examined regularly by the Engineer-in-charge or his authorized Engineer for changes in conditions due to accumulation of hardened concrete or mortar or to wear of blades. The mixing shall be continued until there is a uniform in colour and consistency and to the satisfaction of the Engineer. If there is aggregation after unloading the concrete should be remixed.

After mixer that at any time produces unsatisfactory mix, shall not be used until repaired. If repair attempts are unsuccessful a defective mixer shall be replaced. Batch capacity shall be at least 10% of but not in excess of the rate capacity of the mixer unless otherwise authorized by the Engineer-in-charge.

B. CENTRAL MIXERS.

Water shall be admitted prior to and during charging of the mixer with all other concrete ingredients. After all materials are in the mixer, each batch shall be mixed for not less than the time specified by the Engineer-in-charge. The minimum mixing time shall be 2 minutes. The minimum mixing time specified is based on average mixer performance. The Engineer-in-charge will adjust the minimum mixing time as required by the observations of the mix delivered from mixer. Excessive over mixing which require addition of water to maintain the required concrete consistency shall not be permitted.

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

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

4. TRUCK MIXERS:

Each truck mixer shall be equipped with accurate water meter located between the supply tank and mixers and having a dial or digital indicator and a reliable revolution counter, located near the water meter which can be readily rest to Zero for indicating the total number of revolutions of the drum from each batch. Each mixer shall have affixed there to a metal plate on which the drum are plainly marked.

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

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

4.2.11. TEMPERATURE OF CONCRETE:

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

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

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

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

4.2.12 FORMS:

a. GENERAL

From shall be used wherever necessary to confine the concrete and shaping it to the required lines. If a type of form does into consistently perform in an acceptable manner as determined by the Engineer-in-charge the type of form shall be changed and method of erection shall be modified by the contractor subject to approval of the Engineer-in-charge.

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

Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete and shall be maintained rigidly in

position. Where form vibrators are to be used forms shall be sufficiently rigid to effectively transit energy from the form vibrators to the concrete while not damaging or altering the positions of forms. Forms shall be sufficiently tight to prevent of loss of mortar from the concrete. Chamfer strips shall be placed to produce beveled edges on permanently exposed concrete surfaces. Interior angle of inter setting concrete surfaces and edges of construction joints shall not be beveled except where indicated on the drawings.

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

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

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

d. Suitable inserts for block outs for electrical and other service fixtures where necessary shall be provided in the required locations as specified.

e. Cleaning and oiling of forms:- At the time the concrete is placed in forms, the surfaces of the forms shall be free from encrustations of mortar grout or other foreign material. Before concrete is placed the surface of the forms shall be oiled with commercial forms of oil.

f. Removal of forms

The steeping of form work shall conform to clause 10.3 of IS 456-2000. The contractor shall be liable for damage and injury caused by removing forms before the concrete has gained sufficient strength. Forms on upper sloping faces of concrete such as forms on the water sides of wrapped transitions shall be removed as soon as the concrete ha attained sufficient stiffness prevent sagging. Any needed repairs or treatment required on such slopping surfaces shall be performed at once and be followed immediately by permitted curing.

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

g. Cost.

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

4.2.13 TOLERANCES FOR CONCRETE CONSTRUCTION.

A. GENERAL.

Tolerances are defined as allowable variations from specified lines, grades, and dimensions and as the allowable magnitude of the surface irregularities. Allowable variations from specified lines, grades and dimensions are listed as given under sub paragraph (B) below.

The intent of this paragraph is to establish tolerances that are consistent with modern construction practice that is governed by the effect that permissible variations may have upon a structure. The Govt. reserves the right to diminish the tolerances set forth therein if such tolerances impair the structural action operational function or architectural appearance of a structure or position thereof.

Concrete shall be within all stated tolerances even though more than one tolerance may be specified for a particular concrete structure. Provided that the specified variation for one element of the structure shall not apply when it will permit another element of the structure to exceed its alterable variation where tolerance are not specified for particular structure tolerances shall be those specified for a similar work. As an exception to clause 2 of the general provisions, specific tolerance shown here in connection with any dimension shall govern. The contractor shall be responsible for finishing the concrete forms with in the limit necessary to insure that the completed work will be within the tolerance limit specified. The defective work where the tolerance limit is exceeded shall be remedied in accordance with the sub paragraph b and c.

B.VARIATION FROM SPECIFIED LINES, GRADES AND DIMENSIONS:

Hardened concrete structure shall be checked by the contractor and will be subject to such inspection and measurement as needed to determine that the structures are with in the tolerance specified in the table below.

Variation is defined as the distance between the actual position of the structure or any element of the structure and the specified position in plan for the structure or the particular element. Plus or minus variations shown as indicated or permitted from actual position up or down and in or out from the specified position in plan. Variations not designated as plus or minus indicate the minimum deviation permitted between designated successive points on the completed element of construction.

Specified position in plan is defined as the lines, grade and dimensions described in those specifications or shown on the drawings or as otherwise prescribed by the Engineer-in-charge.

TABLE

Variation from specified lines, grades and dimensions

B. TOLERANCE FOR CANAL STRUCTURES.

1. Deviations from specified dimensions of cross section of columns, beams, piers and slabs [(-6 mm to (+) 12mm]

Deviations from dimensions of footing.

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

b. Eccentricity = (±) 0.02 times width of footing in the direction of deviation but not more than 50mm

c. Thickness (±) 0.05 times the specified thickness.]

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

C. CONCRETE SURFACE IRREGULARITIES.

a. GENERAL

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

b. ABRUPT SURFACE IRREGULARITIES:

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

c. GRADUAL SURACE IRREGULARITIES:

Gradual surface irregularities are defined herein as bulges and depressions resulting in gradual changes on the concrete surface. Gradual surface irregularities

are measured using a suitable template conforming to the design profile of the concrete surface being examined. The magnitude of the gradual surface irregularities is defined herein as measures of the rate of change in slopes of the concrete surface.

The surface irregularities shall not exceed 6 mm for bottom slab and 12 mm for side slopes when tested with a straight edge of 1.5 meter in length.

The magnitude of gradual surface irregularities on concrete shall be checked by the contractor to ensure that the surfaces are within the specified tolerance. The Engineer-in-charge will also make such checks of hardened concrete surfaces as determined and ensure necessary compliance with such specifications.

d. REPAIR OF HARDENED CONCRETE NOT WITHIN SPECIFIED TOLERANCES:

Hardened concrete which is not within specified tolerances shall be repaired to bring it within those tolerances. Such repair shall be in accordance with paragraph 6.2.21 and shall be accomplished in a manner approved by the Engineer-in-charge. Concrete repair to bring concrete with the tolerance shall be done only after consultation with a representative of Engineer-in-charge regarding the method of repair. The Engineer-in-charge shall notify as to the time when repair will be performed.

Concrete shall be finished in a manner which will result in concrete surface with a uniform appearance. The fins and any rough projections can then be rubbed down and the whole surface brought to an even finish by rubbing with a wooden float using a mortar of one part cement by two parts of coarse sand as an abrasive, the mortar at the same time filling the voids. A neat cement works shall than be applied to give a smooth surface. If the concrete has set hard, the fins and rough projections, if any shall be removed by using carborandum brick or a paved grinding machine by chipping, before finishing off with the smoothing wash. If the work of chipping is not done with care or if the surface exposed after removal of the forms cannot be satisfactorily dealt with in this manner due to bad work or for other reasons, a coat of cement plaster of 1:2 of thickness as ordered by engineer shall be applied. No extra payment will be given for finishing concrete surface as instructed above in this clause.

e. PREVENTION OF REPEATED FAILURE TO MEET TOLERANCES:

When concrete placements result in hardened concrete that does not meet the specified tolerance the contractor shall submit to the Engineer-in-charge an outline of all prevention actions such as modification to form, modified procedure for setting screeds and different finishing techniques to be implemented by the contractor to avoid repeated failure.

The Engineer-in-charge reserves the right to delay concrete placement until the contractor implements such preventive actions which are approved by the Engineer-in-charge.

4.2.14 REINFORCING BARS:

The contractor shall make his own arrangement for procurement of steel of required specification of reputed factory such as **SAIL/TATA/JINDAL STEEL/SHYAM STEEL/ANY OTHER BRAND OF STEEL APPROVED BY THE DEPARTMENT** etc. for the work. Transportation from the place of supply to work site and all incidental charges will be borne by the contractor.

Reinforcing bars shall be placed in the concrete as shown in the drawings or as directed. For concrete canal lining the reinforcement rods as provided for in the drawing shall be placed.

For anchoring the concrete canal lining to the hard rock provision of anchor road is made in the drawing and contractor shall place these anchor rods to the spacing and depth shown in the drawings.

B. MATERIALS:

Unless shown otherwise on the drawings the reinforcement to be used shall be High Yield strength deformed bars of grade FE 415 & FE 500 conforming to IS 1786-1985 specification for high yield strength deformed steel bars and wire for concrete reinforcement.

C. PLACING:

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

Subject to the written approval the Engineer-in-charge, the contractor may for his convenience, splice bars at additional locations other than those shown on the drawings. In order to meet design and space limitation on placing some bent bars may exceed usual clearance cutting and bending of such bars from stock lengths may be required at the site.

Unless otherwise prescribed, placement dimensions shall be to the center line of the bars. Reinforcement will be inspected for compliance with requirement as to size, shape, length, splicing.

Before reinforcement is embedded in concrete the surface of the bars shall be cleaned of heavy flaky Rusk, loose scale, dirt grease or other foreign substances which in the opinion of the Engineer-in-charge are objectionable. Heavy

flaky rust that can be removed by firm rubbing with bar lap or equivalent treatment in considered objectionable.

As specified in clause 11.3 of IS 456-2000 unless otherwise specified by the Engineer-in-charge reinforcement shall be placed with the following tolerances.

a. For effective depth 200 mm or less ± 10 mm
b. For effective depth more than 200 mm ± 15 mm

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

Reinforcement shall be securely held in position so that it will not be displaced during the placing of the concrete and special care shall be exercised to prevent any disturbances of the reinforcement in concrete that has already been placed. Welding of bars shall be done as directed by the Engineer-in-charge and in conformity with the requirements of clause 11.4 of IS 456-2000. Concrete cover shall be as shown on the drawings.

D. REINFORCEMENT DRAWINGS:

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

E. MEASUREMENT AND PAYMENT:

Measurement for payment of reinforcement bars will be based on the weight of the bars placed in the concrete in accordance with the drawings supplied by the Engineer-in-charge when conformance with these specifications drawings has been determined at the time of embedment. Except as otherwise provided below payment for furnishing and placing reinforcing bars will be made at the unit price bid in the bill of quantities for furnishing and placing reinforcement bars which unit price shall include the cost of reinforcing bars attaching wire, cutting, bending, cleaning securing and maintaining in position reinforcing bars as shown in the drawings.

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

4.2.15 CURING:

A. GENERAL.

The contractor shall furnish all materials and perform all work required for curing concrete.

All concrete including bed and sides of canal lining shall be cured by water curing.

The precast slab for canal lining shall be cured by keeping them immersed in water for seven days and by sprinkling water for another 21 days with straw canvass, hessian or similar materials cover over slab.

The uniformed top surfaces of bridges decks shall be cured for 28 days with a damp sand cover or curing mat cover. The sand or curing mats shall not be kept so wet as to allow water to drain from them which may stain other concrete. The sand or curing mats shall be removed after expire of the curing period.

All concrete surfaces shall be treated as specified to prevent loss of moisture from the concrete until the required curing period elapsed or until immediately prior to placement of other concrete or back fill against those surfaces. Only sufficient time to prepare construction joint surfaces and to bring them to a surface dry condition shall be allowed between discontinuance of curing and placement of adjacent concrete.

Forms shall be removed within 24 hours after the concrete has hardened sufficiently conforming to IS 456-2000 to prevent structural collapse or other damage by careful form removal. Where required repair of all minor surface imperfection shall be made immediately after form removal and prior to curing, minor surface repair shall be completed within 2 hours after form removal and shall be immediately followed by the initiation of curing by the applicable method specified herein. Concrete surfaces shall be kept continuously moist after form removal until initiation of curing.

B. MATERIALS:

Concrete cured with water shall be kept wet at least for 28 days from the time the concrete has attained sufficient set to prevent detrimental efforts to the concrete surfaces. The concrete surfaces to be cured shall be kept wet covering them with water saturated materials by using a system of perforated pipes, mechanical sprinklers or porous hose or by other methods which will keep all surface continuously wet. All curing methods are subject to approval of Engineer-in-charge.

C. COST:

The cost of furnishing all materials and performing all work for curing concrete shall be included in the price bid in the bill of quantities for the concrete on the particular curing methods are required.

4.2.16. MEASUREMENT OF CONCRETE:

Measurement for payment of concrete required to be placed directly upon or against surfaces of excavation will be made to the lines for which payment for excavation is made.

The unit measurement will be cubic meter. In measuring concrete for payment the volume of all opening, fixtures embedded pipes and metal work each of which is larger than 0.1 square meter in cross section will be deducted.

4.2.17. PAYMENT FOR CONCRETE:

Payment for concrete shall be made at the applicable unit price in therefore in the bill of quantities, which unit price shall include the cost of furnishing all materials and performing all works required for the concrete construction except

that payment for furnishing and placing reinforcement bars and form work which shall be made at the respective unit price's bid thereof in the schedule.

SUPPLY OF PIPES:

Providing and fixing R.C.C. $NP_2/NP_3/NP_4$class pipes as per drawings.

Pipes shall be specified diameter non pressure type conforming to IS 458-1971. Maximum length of the pipe shall not be less than 2.5m. or otherwise directed by the Engineer-in-charge. The contractor shall order the pipes required for the work on the basis of the construction drawings supplied to him by the Engineer-in-charge. Pipe marked with the following information on each type shall only be accepted for the work.

i. Class Pipe
ii. Date of Manufacture
iii. Name of Manufacturers or his trade mark or both
iv. IS Specification mark.

HANDLING AND LAYING OF PIPES.

Work shall be done as per IS 783-1956 or its latest edition. Reasonable care shall be exercised in loading, transporting and unloading of concrete pipes. Handling shall be such as to avoid impact. All pipes shall be inspected thoroughly before being laid. Broken or defective pipes shall not be used. Trench shall be of sufficient width to provide for free working space in minimum 30cm on either side of the pipe. Pipes shall be lowered into the trenches by use of standard appliance. Pipe shall be laid true to line and as specified on the construction drawings. Lying of pipes shall be along proposed grade of the slopes. The socket ends of pipe shall face upstream. The connections of the pipes shall be joined together in such a manner that these shall produce perfect even surface along the inside of the pipe. In no case pipes shall be laid directly on rock or other hard materials.

JOINING PIPES:

Semi flexible type spigot and joint as per IS 783-1959 and as shown in the construction drawing shall be provided.

BACK FILLING TRENCHES:

A. Trenches shall be kept free from water until the materials in the jointshas hardened. Walking or working on the completed pipe shall not be permitted until the trench has been back filled to a height of at least 45cm. over the pipe except as may necessary for back filling and compaction.

B. Trenches shall be back filled after pipe has been laid subject to the condition that jointing has hardened only selected materials shall be used for backfilling. Filling of the trench shall be carried out simultaneously on both sides of pipe in such manner that unequal pressure does not occur.

MEASUREMENT AND PAYMENT:

Measurement for payment shall be on running meter basis on the pipe line laid. The rate in bill of quantities shall include the cost of pipes including loading, unloading, handling, storing, laying in position, taxes, curing & all other operations to complete the work as per the specification.

SECTION –5

STONE PACKING

5.0 R. R. STONE PACKING

5.1. GENERAL

The packing shall consist of boulders and blasted rock and it shall be hand placed. The thickness of the packing shall be measured normal to the slope of the embankment.

5.2. QUALITY OF PACKING STONE

i) Packing stone shall be controlled in quarry for quality, gradation and size.

ii) Stone and spalls obtained from rock excavation shall be checked for quality, gradation and size before lifting.

iii) The stone for packing should be dense, resistant to abrasion and is free from cracks, seams, shale partings, conglomerate bonds and other defects that would tend to increase their susceptibility to destruction by the action of water and weather.

iv) The stone shall be closely packed and the interstices shall be filled with moorum. The finished surface of packing should be reasonably uniform free from loose stones.

5.3. Test for Stone

i) Soundness - The rock fragments shall be tested for its soundness as per IS-2386-Part-II.

ii) Abrasion - The rock fragments shall be tested for its abrasion as per IS-2386-Part IV.

iii) Water absorption test – As per IS-2386.

iv) Quality of stone should confirm following standards

1 Soundness	Maximum 12 %
2. Abrasion	Maximum 40 %
3. Water absorption	Maximum 5 %

5.4. THICKNESS OF STONE PACKING

In no case the minimum thickness of hand placed packing shall be less than 30 cm.

5.5. PLACEMENT OF RIP RAP / LAUNCHING APPRON

Hand placed Packing

The hand placed packing stone shall consists of size 0.02 cum and above size and laid on edge starting from the bottom. The stone shall be laid compactly with staggered joints and so matched & interlocked that, they shall be keyed

together with minimum of joint space. Then rock fragments and spalls shall be driven by a hammer into interstices to wedge the packing in place.

The hand placed packing shall preferably be laid in one course and the layer thickness is same at the stone size. If two layers of stones are used the header stone extending through both layer and spaced at about 1.5m. shall be used. In two layers placing the top layer stones shall be larger.

5.6. MEASUREMENT AND PAYMENT

Thickness of packing shall be measured at a number of locations and the payment shall be made towards the average thickness arrived out of the measurements. Payment for packing shall be made at the applicable unit price per cubic meter in the bill of quantities for packing which unit price shall include the cost of procuring or finishing, hauling and placing the rock for packing including the rock spalls.

SECTION –6

FINE DRESSING AND TURFING

6. FINE DRESSING AND TURFING

6.1 **Description**: This work shall consist of supplying and laying live sods on the slope and other locations as ordered by the Engineer in accordance with the following specifications.

6.2 **Materials**: The sods shall consist of a dense well rooted growth of permanent and desirable grasses. Indigenous to the general locality where it is to be used, and shall be practically free from weeds or undesirable greases. At the time the sods is out. The grass on the sod shall have a length of approximately 2 inches (if longer, the grass shall be cut to approximately this length and the sod shall have been ranked free from debris). The sod shall be cut in uniform strips cot larger than it is convenient for handling and transport. The thickness of the sod shall be as uniform as possible approximately 3/4 inch or more depending on the nature of the sod, so that practically all of the dense root system of the grasses will be retained but exposed in the sod strip and so that the sod can be handled without undue tearing or breading. In the event the sod which is to be cut is in a dry condition, so as to cause crumbling or breaking during cutting operations, the contractor at his own expense, shall at least 12 hours before cutting the sod, apply water to the same in sufficient quantity to provide a well moistened condition of the sod to the depth to which it is to be cut. Top soil of the area to be turfed shall consists of soil of the area to be turfed shall consist of soils adapted to the sustenance's of plant life.

6.3 **Construction Method**

Preparation of the Earth Bed:

All areas desired to be covered with sod shall be fine dressed to required contour, to an extent such that the finished work after laying sod with necessary top soil incorporated in the bed will be in accordance with required liens, grades, slopes and cross section. The area to be sodded shall be free from stones, roots or other undesirable foreign materials.

The soil of the area to be sodded shall be loosened to a depth of approximately not less than and to soil shall be spread evenly over the prepared bed to a depth of 2 inches and the clods and lumps shall be broken down to provide a uniform texture to the soil.

6.4 **Placing of Sod:**

The earth bed upon which the sod to be placed shall be moistened to the depth manipulated, if naturally not sufficiently moist, and the sod after the

same has been and shall be properly protected and sprinkled with water until placed be laid in horizontal strips beginning at the bottom of the slopes and working onwards, when placing sods to length to the strips shall be laid at right angles to the direction of flow of water. Sods shall be laid so that the joints caused by abutting ends of sods strips were not continuous each sod strip shall be so laid to about against the strip previously laid.

As the sod is being laid shall be firmly and lightly tamped with suitable wooden door mean tampers to press the sod into the underlying soil. After tamping, the sod shall present smooth even surfaces free from bumps or depressions, at such points. Where water start flowing over a sodded area the upper edge of the sod strip shall be thoroughly compacted to conduct the surface water over the upper edge of the sod. No sods shall be laid during the dry months of March to July.

6.5 **Watering**

The sod shall be thoroughly watered immediately after placing and shall be kept thoroughly wet for a period of atleast seven days after laying and shall be maintained in a satisfactory condition.

6.6 **Measurement and Payment**

Measurement of turfing shall be made after full and satisfactory growth of the turfing. The unit and price shall contain all the specification as mentioned in the tender schedule. Sod shall be measured by units of square meters and will be paid for at the contract unit price of square meter of sod in place which shall be full compensation for preparing the earth bed, for furnishing, placing, top dressing and watering the sod and for all labour, equipment, tools and incidental necessary to complete the work in accordance with contract.

SECTION – 7

EXPANSION JOINTS/CONTRACTION JOINTS

DETAILS SPECIFICATION OF EXPANSION JOINTS/CONSTRUCTION JOINTS(EJ/CI) FOR CANAL STRUCTURE

The joint should be left in concrete/masonry in required places as per drawing and design. Embedded parts if any will have to be provided prior to casting of concrete/construction of masonry. Old surface of the concrete/masonry joints should be made clean free of dirt, grease, protrusions or any objectionable materials as per the direction of the Engineer-in-charge. The face of the joints should be made straight. The surface of joints should be painted with bitumen /coal tar and fitted with the approved sealing materials like bituminous filler boards, etc. The adjacent concreting masonry then only can be constructed.

In the case of P.V.C. water stop the pieces should be jointed together at the site by vulcanizing thoroughly to make it water tight having sufficient strength to withstand the designed water pressure exerted on it

In case of copper seal, the thickness of the copper sheet should be of 16 gauge (1.63 mm) and minimum of 0.6m wide with 'V', 'U' or 'Z' groove of size 2.5 cm. at its longitudinal axis. The groove should be perfectly straight and uniform. Adjacent copper sheet should be perfectly brazed together on both sides for the whole width by butting the two sheets against each other. If lapping between adjacent sheet are given, the maximum lapping should be 5 cm. and should be held together tight. Brazing should be done on both sides for the whole width. The joints should be brazed, water tight and should be capable of withstanding the hydraulic pressure exerted on it. M.S. anchor rods of 6 mm to 8mm dia 30cmlong with hook on outer side and should be brazed with the copper sheet @ 50 cm centre to centre approximately on both sides of copper sheet preferably staggered. The minimum length of the rod to be brazed is minimum 5 cm. and brazing should be done on both side of the rod.

The edges of the copper sheet should also be given a link at about 0.5 M. interval to have a better grip with concrete. The brazing should be done as per relevant IS specification.

The P.V.C water stop shall be dense homogeneous and free from holes and other imperfections. The cross section of the water stop shall be uniform along its lengths and thickness shall be symmetrical.

Location and embedment of the P.V.C./Copper water stops shall be as shown on the drawings, with approximately one half of the width of water stops embedded in the concrete on each side of the joints. In order to eliminate faulty installation that may result leakage, care shall be taken that the water stops shall be installed so as to form continuous water tight diaphragm in the joints unless otherwise shown. Adequate provision shall be made to completely protect the water stops during the progress of the work.

Additional vibrations over and above that used for adjacent concrete placement shall be carried out to assure complete embedment of the water stops in the concrete. Larger pieces of aggregate near the water stops shall be removed by hand during embedment to assure complete contact between the water stop and surrounding concrete.

SECTION-8

ROAD WORKS

8. ROAD WORKS

8.1 Scope of Work:

These specifications cover Construction of Water Bound Macadam Road followed by Pre-mix Carpeting and Seal Coating as per clause 404 of MoSRT&H Specifications for Road and Bridge Works.

8.2 W.B.M. Road:

8.2.1 General

a) Base Materials (Soling Stone)

As per clause 404.2.1 of MOST the physical requirement of Base/Sub-base material shall be as per Table 400-C of I.S. 6579-1981.

Sl No.	Test	Test Method	Requirement	Remarks
1.	Los Angles Abrasion valve.	IS:2386(Part-IV)	Maxm. 40%	
2.	Impact value	IS:2386(Part-IV)	Maxm. 30%	
3.	Combined flakiness and elongation. Indians	IS:2386(Part-l)	Maxm. 30%	
4.	Water absorption	IS:6579-1981	Maxm. 2%	As per IS6579
5.	Soundness	NA2 SO4 5 cycles.	Maxm. 20%	As per IS6579

(b) The stone metal shall be obtained from rock excavation in canal if available or quarries as approved by the Engineer prior to collection. The metal shall be of approved quality with all leads and lifts. The metal shall be obtained from hard, tough, sound, durable, stone of close texture and reasonably free from decay and weathering. Places of the stone shall be angular and roughly cubical in shape. Round, elongated or flaky materials shall be rejected. No round or oblong pebbles or angular chips, larger or similar than the specified size shall be allowed. The size of metal shall be as per the item specified in the bill of quantities. All unsound, weathered or disintegrated stone obtained from the upper surface layer of the quarry or other are not acceptable.

(c) Samples of metal, collected from the approved quarries shall be got tested by the contractor at his cost in the laboratory. The test results shall conform to the standard requirements laid down for metal to be used for WBM work.

(d) The physical requirements for standard size metal shall confirm to the lest results in the Table below:

Test	Test Method	Requirement
Loss Angles Abrasion Value	IS: 2386_ Part- 4	Maximum 40%
Impact Value	IS: 2386_ Part- 4 or IS:5640	Maximum 30%
Combined Flakiness & Elongation Indices	IS: 2386_Part-1	Maximum 30%

(e) The grading requirements of the metal and screening to be used for WBM shall be as under.

Grading No.	Size Range	IS Sieve	Percentage by weight passing
Gr-I	90 mm to 45 mm	125 mm	100
		90 mm	90-100
		63 mm	25-60
		45 mm	0-15
		22.4 mm	0-5
Gr- II	63 mm to 45 mm	90 mm	100
		63 mm	90-100
		53 mm	25-75
		45 mm	0-15
		22.4 mm	0-5
Gr- III	53 mm to 22.4 mm	63 mm	100
		53 mm	95-100
		45 mm	65-90
		22.4 mm	0-10
		11.2 mm	0-5
Gr – A	13.2 mm	13.2 mm	100
		11.2 mm	95-100
		5.6 mm	15-35
		180 micron	0-10
Gr – B	11.2 mm	11.2 mm	100
		5.6 mm	90-100
		180 micron	15-35

(f) Wherever any doubt exists as to whether the above requirements are satisfied, whole or any part of the collection of metal shall be got tested by the Contractor at his cost, if so ordered by the Engineer.

(g) For road work complete stacking of metal as per requirement shall be carried out in 2km. length before spreading. Collection shall always commence at one end of thekm. and be carried towards the other end unless the Engineer directs otherwise.

8.2.2 Measurement and Payment:

Measurement for payment will be made on cubic metre basis without any deduction for voids on finished rolled surface. The rate includes cost of materials, all taxes, cess, conveyance to the site with all leads and lifts and filling the boxes including all labour, tolls, equipment testing and other incidental expenses and labour charges for spreading the metal to the required grade and camber including filling interstices with moorum including watering and consolidation and including hire running charges of all machineries complete.

8.3 General:

(a) Metal shall not be spread without the permission of the Engineer. Metal should be spread under careful supervision by trained coolies. The Contractor shall see that uniform spreading as per collection of metal is done the Contractor shall spread the metal fully from the stacks without keeping any balance, unless directed by the Engineer to keep some stacks in balance for making good any unevenness or depressions left during rolling work to ensure that the materials are spread to the required thickness, the road surface shall be marked on length, over which the contents of heaps are to be spreads. The bonds of earth or moorum one on either side, shall be made along the outer edge of metalling simultaneously with spreading of metal. These bonds shall be laid with a distance between them equal to the width of the road to road to metal and shall be enough to prevent the loose metal from spreading during consolidation as well as to retain water used for consolidation. Payment for bonds will not be made.

(b) Metal shall be screened and rubbish, dust, grass etc, shall be removed and spread evenly on the prepared approved surface in grade and camber by using camber boards. The surface shall be checked at every 15m. by means of templates. While the correctness of the camber in between shall tested by strings and corrected, as required. Between the straight length and the curves and at the meeting points of the convex and concave portions of reverse curves the change in camber of the road to super elevation shall be made very gradually as my be directed by the Engineer.

(c) Spreading of metal shall proceed only 200m. (maximum) in advance of the rolling operations. Collection and spreading of metal shall not be carried out in one and the same kilometre. At the time of rolling, all surface irregularities, hollows, depressions, humps shall be set right.

8.3.1 Measurement and Payment:

Measurement for payment will be made on cubic metre basis without any deduction for voids on finished rolled surface. The rate includes cost of materials, all taxes, cess, conveyance to the site with all leads and lifts and filling the boxes including all labour, tolls, equipment testing and other incidental expenses and labour charges for

spreading the metal to the required grade and camber including filling interstices with moorum including watering and consolidation and including hire running charges of all machineries complete.

8.4 Collecting transporting and spreading moorum on road side as directed including consolidation.

8.4.1 General:

(a) Material for the purpose shall be of approved quality. Any material which is found inferior shall be rejected and the Contractor shall remove the rejected material from the site at his cost the materials shall be collected from canal excavation if surplus or from quarries approved by the Engineer. The material shall be granule and giddy.

(b) Moorum:

As per CI.404.2.6 the moorum used for filling the voids in the coarse aggregate shall have:

(a) Liquid Limit- Maxm. 20%

(b) Plasticity Index- Maxm. 6%

(c) Fraction passing 75 Micron Sieve does not exceed Maxm. 10%

(d) Grading (As per Table 400-8)

Grading Classification	Size of Screening	I.S. Sieve designation	Percentage by Wt. passing the I.S. Sieve
A	15.2 mm.	13.2mm	100
		11.2mm	95-100
		5.6mm	15-35
		100 microns	0-10
B	11.2mm.	11.2mm.	100
		5.6mm.	95-100
		180 microns	15-35

(c) The material shall be got approved by the Engineer prior to collection on the site. It shall be free from all rubbish, dust and any organic materials as well as clods of black cotton soils.

8.4.2 Measurement & Payment:

Measurement for payment will be made on cubic metre basis.

8.5 General:

Spreading of materials shall be started after the collection in a particular kilometre is completed. Measured and recorded in the measurement books.

Permission of the Engineer shall be obtained before spreading moorum. Before spreading, it shall be seen that the formation is dressed to the required camber and grade. The moorum to be spread over the metalled surface shall be uniform. It shall be used for filling the interstices of metal and for forming a smooth running surface. Moorum blind age shall be spread evenly with a twisting motion of the baskets. No more moorum blind age shall be spread evenly with a twisting motion for gross measurements and no deduction of voids shall be made. If the moorum is to be spread over earthen embankment as a sub base or for side shoulders or as blind age, it shall be spread in a manner as directed by the Engineer to the required width and thickness. The contractor shall make good all unevenness, depressions, projection etc. during consolidation work.

8.5.1 Measurement and Payment:

Payment shall be made on cubic metre basis.

8.6 Consolidating WBM surface with rolling including watering.

8.6.1 General:

(a) Immediately following the spreading on the coarse aggregates, rolling shall be started with three wheeled power roller of 8 to 10 tonne capacity or equivalent vibratory roller. The weight of the roller shall depend upon the type of the aggregate and shall be indicated by Engineer.

(b) On super elevated portions where the rolling shall proceed from inner edge to outer, rolling shall begin from the edge and shall, be compacted with roller moving forward and backward. The roller shall then move inwards parallel to the centre line of the road, in successive passes uniformly lapping preceding tracks by atleast on half wheel width.

(c) Rolling shall continue until the aggregate is thoroughly keyed and the dripping of the aggregate ahead of the roller is no longer visible. During rolling slight sprinkling of water may be done. If necessary rolling shall not be done when the sub grade is soft or yielding or when it causes a wavelike motion in the sub-grade or sub-grade or sub-base course.

(d) The rolled surface shall be checked transversely and longitudinally with templates and any irregularities corrected by loosening the surface, adding or removing necessary amounts of aggregates and rerolling till the entire surface conform to desired camber and grade. In no case shall use of screening be permitted to make up depression.

(e) Blind age material, where required to be used, shall be applied, successively in two or more than layers a slow uniform role. After each application the surface shall be capacity. Premixed with water the resulting alum swept in with hand brooms to fill the voice properly and rolled fining which water shall be applied to the wheels of the rollers. If necessary to wash down the binding material sucking to them these operations shall continue until the resulting slurry after filling the voids forms a wage ahead of the wheels of the moving roller.

(f) After final compaction of water bound macadam course the road shall be allowed to dry overnight. Next morning hungry spots shall be filled with screening of blending

materials directed. Lighting sprinkling with water if necessary and rolled. No traffic shall be allows on the road until the macadam has set. The Engineer shall have the discretion to stop hauling traffic using the completed water bound macadam course if in his opinion it would cause to the surface.

8.6.2 Measurement & Payment:

Measurement for payment will be made on Cubic metre basis. The Unit rate is for finished work which shall include cost of watering, machinery, fuel, labour and costs all incidental operations needed to complete the work as per requirements.

8.7. **Consolidation of Moorum in layers as directed including Watering.**

8.7.1 General:

The specification for consolidation shall generally be as detailed at 8.6 above, except that consolidaton under this item has to be done on moorum on side berms.

8.7.2 Measurement and Payment:

Measurement for payment will be on Cubic metre basis.

8.8. Supplying machine crushed stone chips at site of work, size 6mm to 12mm.

8.8.1 General:

Stone chips shall consist of regular fragments of clean, hard, tough and durable rock of uniform quality throughout. These shall consist of regular fragments of clean, hard, tough and durable rock of uniform quality throughout. These shall be obtained by crushing rock and shall be free of elongated and flaky pieces soft and disintegrated materials and vegetable or deleterious matter. They shall satisfy the quality requirements set forth as under.

SI No.	Test	IS for Test Method	Requirements
1.	Loss Angles Abrasion value	IS:2388 (part-V)	35% Maximum
2.	Aggregate Impact Value	IS:2388	30% Maximum
3.	Flakiness Index	IS:2385	30% Maximum
4.	Stripping Value	IS:6241	25% Maximum
5.	Water Absorption	IS:2386	25% Maximum

(Part-III)

Aggregates shall satisfy requirements of either of the two tests.

(b) Size of the stone chips shall be under:

(i) 12mm size Passing 20mm sieve and retained on 10mm sieve.

(ii) 5mm size Passing 10mm sieve and retained 2.36 mm sieve

(c) Samples of stone chips collected from the approved quarries shall be got testes by the contractor at his cost in laboratory. The test results shall confirm to the

standard requirement as laid down herein above. Collection of stone chips as per approved samples shall be allowed by the engineer. Payment at full rates for the stones chips will not made till the test results form the laboratory are received and found acceptable.

(d) Collection shall always commence from the one of the kilometre and carried continuously towards the other end,unless the engineer directs otherwise.

(a) Control or quality or material will be exercise by the engineer carrying out the following tests as the frequencies shown against each.

Type of construction	Test	Frequency material
Chips/bajri For open graded	(i) aggregate impact on test per (ii) Flakiness index of aggregate (iii) Strip ping value and water absorption of aggregates	100 m2 of aggregate Carpet and seal coat initially, one set of the 3 representative specimens for each source of supply Subsequently when warranted by change in the quality of change in the quality of aggregates.
	(iv) Grading of aggregates	one test per 100m3 of aggregates.

8.8.2 Measurement and payment:

Measurement for payment will be made on cubic metre basis without deduction for voids on the finished section.

8.9. Supplying bitumen 60/70at site of work:

8.9.1 General

Bitumen **60/70**conforming to these specifications shall be supplied by the contractor at site of work and got tested at laboratory at the contractor's coat.

8.10 Providing 20mm thick premix carpet and 6 mm seal coat

8.10.1 General:

(a) This work shall consist of laying an open graded carpet of 20mm thickness in a single course and seal cot (including of asphalt, stone ships) composed of suitable small sized aggregated premixed with a bituminous binder on a previously prepared approved base.

(b) Qualities of materials required for 10 square metre of road surface for 20mm thick open graded premix carpet with seal coat are as given in table below:

Aggregates for carpet:	11.2mm to 6mm size	0.14 Cubic metre
Coat stone clippings	6mm to 0.09mm size	0.13 Cubic metre
		Total -0.27 Cubic metre
Aggregate for Seal		6mm size
Coat stone chippings		0.09cubic metre

(c) Binder for premixing quantities in terms of straight run bitumen for carpet & seal coat.

(i) For 0.27 cubic metre of 11.2mm and 6mm size stone chips.		2.2 kg/Sqm.
(ii) Tack coat		0.2 kg/Sqm.
(iii) For 0.09 cubic metre of 6mm size stone chips		0.9 kg/Sqm.
	Total	3.30 kg/Sqm.

(d) Carpet shall not be laid during rainy weather or when the base course is damp or wet or when the atmospheric temperature under shade is 1600 c or below.

(e) The underlying base on which the bituminous carpet is to be laid shall be prepared shaped and conditioned to the specified lines, grade and cross section as directed by the engineer. The surface shall be well changed with wire brushes swept with borrows and finally dust removes with stocks as found necessary preparatory to bituminous construction. The temperature of bitumen at the time of application shall be in the range of 160^0c to 175^0 c.

(f) Tack coat consists of application single coat of bituminous material to an existing road surface.

(g) Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the engineer. The rate of spread in terms of straight run bitumen shall be 10 kg per 10 square meter area for surface. The binder shall be applied uniformly. The tack coat shall be applied just prior to ongoing bituminous constructions.

(h) Mixers of approved type shall be used for mixing aggregates with the bituminous binder. The binder shall be heated to the temperature approved by the engineer, avoiding local over hating and ensuring a continuous supply. Aggregates shall be dry before they are placed in the mixer after about 15 seconds of dry mixing the heated binder shall be distributed over the aggregates at the rate specified

kerosene to an mixing of binder with chipping shall be contained until thoroughly coated with the bidder. The mix shall be immediately transported from the mixer to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered over in transit, if so directed.

(i) The premixed materials shall be spread on the road surface with rakes to the required thickness and camber, or distributed evenly with the help of drag spreader without any undue loss of time. The camber shall be checked by means of camber boards and inequalities eventide out. As soon as surface length of bituminous material has been laid, rolling shall commence. When the roller has passed over the whole area once, any high spots or dispersions that become apparent shall be correct by removing or adding premixed materials. The contractor shall provide necessary labour for keeping the roller wheels damp during rolling so as to prevent the premix form adhering to the wheels and being picked up. The edged along the transverse of the carpet laid and compacted earlier shall be cut to their full depth so as to expose fresh surface which shall be painted with a thin surface coat of appropriate bitumen before the new mix is placed against. .

(j) Seal coat shall be applied immediately after the laying of bituminous course of carpet. Before application of seal coat materials, surface shall be cleaned free of any dust or other extraneous matter.

(k) Coarse sand or stone dust flushing at the rate of O.03cum/10sqm shall done on complete asphalt surface, at the contractor's cost.

(l) Traffic may be allowed soon after final rolling when the premixed material has cooled down to surrounding temperature.

(m) Control on quality of works will be exercised by the engineer by carrying out the following tests at the frequencies, shown against each.

SI. No.	Type of Construction material	Test	Frequency
1.	Tack coat	i) Binder temperature	At regular close intervals For application
		ii) Rate of spread binder	Two tests per day
2.	Open graded premix carpet with seal coat	i) Temperature of binder at applications	At regular close intervals
		ii) Binkers content (Vide astb d2122)	Two tests per day for work of every 3 km length in on
		iii) Rate of spread	through checks on materials

& layers thickness

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n) The contractor shall at all times carry out work on the road or highway in a manner creating least interference to the traffic curing the execution of the same. For all works involving construction on existing roads or highway the contractor in accordance with the directives of the engineer, provide and maintain, during the execution of the work, a passage for traffic either along or as a part of the existing carriage way under construction.

8.10.2 Road diversion

(a) The contractor shall construct and maintain the road diversion for the traffic with necessary sign boards working signals as approved by the engineer. The cost of construction the road diversion works shall be payable under related items of schedule of quantities. However, the contractor shall prepare the proposal for the diversion works considering proper and economical use of the canal excavation in construction of the engineer before commencing the works. After completion of the diversion works, same shall be maintained by the contractor his cost in satisfactory condition during the period of construction and till the traffic is allowed to pass over the completed structure.

(b) The contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades including signs, marking, light and flagmen as may be required by the engineer for the information and protection of traffic approaching or passing through the section of the road or highway under construction. Before taking up any construction phased programme for the control of traffic on the road highway shall be drawn up in consolation with the engineer.

(c) The barricades erected on either side of the carriage way portion of the carriage way closed to traffic shall be strong to resist violation and painted with after black and white and red lanterns or warning stack of similar type shall be mounted on the barricades at night and kept thought from sunset to sunrise at the points where traffic is to device from its normal path, the changes stocks shall be clearly marked with the aid of payment markings, painted drums or a similar device as directed by the engineer. At night the passage shall be allowed with lanterns or other suitable light source.

(d) One way traffic shall be established whenever the traffic is to be passed of the carriage way inadequate for two lane traffic. This shall be done with the help of flagmen kept positioned on opposite sides during all hours. For regulation of traffic,

the flagmen shall be equipped with red and green flags and lanterns light. On both sides, suitable regulatory I warning signs shall be installed for the guidance of road users. On each approach at least two signs shall be put up, one close to the point where transition of carriageway begins and the other 120 meters away. The signs shall be of approved designs and of refectory type if so directed.

8.10.3 Measurement and payment

Open graded carpet and seal coat shall be measured and paid in square metres.

8.11. Wet Mix Macadam (WMM)

Wet Mix Macadam is a sub-base/base course of the pavement wherein clean, crushed graded aggregates and granular material, like, graded coarse sand are mixed with water and rolled to a dense mass on a prepared surface. The work may be done in layers. The thickness of an individual layer shall not be less than 75 mm and can be upto 250 mm.

8.11.1 MATERIALS

8.11.2 *Aggregate*

8.11.3 *Physical Requirements*

Coarse aggregates shall be crushed stone/crushed gravel/shingle, not less than 90 percent by weight of gravel/shingle retained on 4.75 mm sieve shall have at least two fractured faces. The aggregates shall conform to the physical requirements set forth in

Table 1.

If the water absorption value of the coarse aggregates is greater than 2 percent, soundness test shall be carried out on the material as per IS:2386 (Part V) with sodium sulphate which should not exceed 12 percent.

Table 1 Physical Requirement of Coarse Aggregates for Wet-Mix Macadam

Sl. No.	Test	Test Method	Requirements
1.	*Los Angeles Abrasion Value or	IS:2386 (Part IV)	40 percent (Maximum)
	*Aggregate impact Value	IS:2386(Part IV) or IS:5640)	30 percent (Maximum)
2.	**Combined Flakiness and Elongation indices (Total)	IS:2386 (Part I)	35 percent (Maximum)

* Aggregates may satisfy requirements of either of the two tests.

** To determine the combined proportion of flaky and elongated particles, the flaky stone from a representative sample should first be separated out. Flakiness index is weight of flaky stone divided by weight of stone sample. Only the elongated particles be separated out from the remaining (non-flaky) stone metal. Elongation index is weight of elongated particles divided by total non-flaky particles. The value of flakiness index and elongation index so found are added up.

8.11.4 ***Grading Requirements***

Materials shall have particle size distribution and particle shape which provide high mechanical stability and should contain sufficient fines to produce a dense material when compacted. If the amount of fine aggregate produced during the crushing operation is insufficient, non-plastic angular sand may be used to make up the deficiency. In constructing a crushed stone road base, the aim should be to achieve maximum impermeability compatible with good compaction and high stability under traffic.

The aggregates shall conform to the grading given in **Table 2**.

Table 2 Grading Requirements of Aggregates for Wet-Mix Macadam

IS Sieve Designation	**53.00 mm**	**45.00 mm**	**22.40 mm**	**11.20 mm**	**4.75 mm**	**2.36 mm**	**600* micron**	**75* micron**
Percent by Weight Passing Sieve	100	95-100	60-80	40-60	25-40	15-30	6-18	4-8

* The fraction passing the 75 micron sieve shall not be greater than two-thirds of the fraction passing the 600 micron sieve.

The grading of the WMM shall be within and approximately parallel to the grading envelope. The grading within the limit set forth in **Table 2** shall be graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or the vice versa. The grading can be produced by crushing rock and may be an all-in product, usually termed a 'crusher-run'. If it is unable to achieve the required grading directly and continuously from crushing, screen the material into at least four fractions and reconstitute the material to conform to the Specifications by mixing it together in a pug mill.

Material finer than 425 micron shall have Plasticity Index (PI) not exceeding 6. For determination of laboratory MDD/OMC, for sample having aggregate passing through 37.5

mm sieve, bigger size mould of volume 2250 cc as specified in IS:2720, (Part VIII) shall be used.

8.11.5 CONSTRUCTION OPERATIONS

8.11.5.1 Weather and Seasonal Limitations

The work of laying of wet mix macadam shall not be done during rain.

8.11.5.2 Preparation of the Sub-base/base

The surface of the sub-base/base to receive the WMM course shall be prepared to the specified lines and cross-fall (camber) and made free of dust and other extraneous matter. Any ruts or soft yielding places shall be corrected in an approved manner and rolled until firm surface is obtained, if necessary by sprinkling water. Laying of WMM over an existing bituminous surface is not permitted.

8.11.5.3 Provision of Lateral Confinement of Wet Mix Layer

While constructing WMM, arrangement shall be made for the lateral confinement of wet mix. This shall be done by laying materials of adjoining shoulders along with that of wet mix layer. The sequence of operations shall be such that the construction of the shoulder is done in layers each matching the thickness of the adjoining pavement layer. Only after a layer of pavement and corresponding layers in shoulder have been laid and compacted, the construction of the next layer of pavement and shoulder shall be taken up.

8.11.5.4 Preparation of Mix

When the WMM mix is the crusher run material, it shall be stockpiled with the front end loader. Before sending the mix for laying, the stockpile shall be watered and homogeneously mixed and loaded to the tipper/dumper. In other case WMM shall be prepared in an approved mixing plant of suitable capacity conforming to requirements detailed in **Annexure (Equipment for Wet Mix Macadam)** . In exceptional cases, for small quantity of wet mix work, mixing may be done in ordinary concrete mixer.

Optimum moisture for mixing shall be the laboratory OMC. While adding water, due allowance should be made for evaporation losses. However, at the time of compaction, water in the wet mix should not vary by more than ± 2 percent.

8.11.5.5 Spreading of Mix

Immediately after mixing, the mixed material shall be transported to site and spread uniformly and evenly upon the prepared sub-base/base in required quantities. Hauling of the mix over a freshly completed stretch is not permitted. Transportation of mix is usually done by tipping trucks. In order to avoid moisture loss in transit due to evaporation, mix should be covered with tarpaulin. The material is usually kept wet during transport and laying to reduce the likelihood of particle segregation.

The mix may be spread by a paver finisher. However in case of multilayer construction the bottom layer/layers may be allowed to be laid by motor grader. In exceptional cases, for portions where mechanical means cannot be used, manual method of spreading can be

adopted. The equipment used for spreading shall be capable of spreading the material uniformly all over the surface. Single full width paver or two pavers of lesser width working in tandem within the short distances should be used for obtaining good results. The paver finisher shall be self-propelled, having features given in **Annexure**.

The surface of the layer as spread shall be carefully checked with templates and all high or low spots remedied by removing or adding wet mix material as may be required. The layer thickness may be checked by depth blocks during construction. No segregation of coarse or fine particles shall be allowed. The layer as spread shall be of uniform gradation and shall not have pockets of fine materials.

8.11.5.6 Compaction

After the mix has been laid to the required thickness, grade and cross-fall/camber, the same shall be uniformly compacted to the full depth with a suitable roller. The speed of roller shall not exceed 5 km/hr. Formulation of compaction methodology to meet the compaction requirements of the Specifications shall be based on trial section. Guidelines in this regard are available in **Annexure**.

In portions having uni-directional crossfall/superelevation, rolling shall commence from the lower edge and progress gradually towards the upper edge. Thereafter roller should progress parallel to the center line of the road, uniformly overlapping each preceding track by at least one third width until the entire surface has been rolled.

In portions in camber, rolling should begin at the edge with the roller running forward and backward until the edge has been compacted firmly. The roller then progress gradually towards the center parallel to center line of the road uniformly overlapping each of the proceeding track by at least one third width. The process of compaction is then to be repeated from the other edge of the pavement upto the center line until the entire pavement is compacted.

Any displacement occurring as a result of reversing of the direction of a roller or from any other cause shall be corrected. Alternate trips of the roller shall be terminated in stop atleast 1 m away from the preceding stop.

Along forms, kerbs, walls or other places not accessible to the roller, the mix shall be thoroughly compacted with mechanical tampers or a plate compactor. Skin patching of an area without scarifying the surface to permit proper bonding of the added material shall not be permitted.

Rolling should not be done when the subgrade is soft or yielding or when it causes a wave-like motion in the sub-base/base coarse or sub-grade. If irregularities develop during rolling which exceed 12 mm when tested with a 3 metre straight edge, the surface should be loosened and premixed material added or removed as required before rolling again so as to achieve a uniform surface conforming to the desired grade and cross-fall. In no case should the use of unmixed material be permitted to make up the depressions.

Rolling shall be continued till the density achieved is atleast 100 percent of the maximum dry density for the material as determined by the method outlined in IS:2720 (Part VIII).

After completing, the finished surface shall present a well-closed appearance, free from movement under compaction equipment or any compaction marks, ridges, cracks and loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of the layers and recompacted until the specified density is achieved throughout the entire layer. The finally compacted layer shall be free from surface laminations, portions exhibiting segregation of the fine and coarse aggregate, corrugations, or other defects that may adversely affect the performance of the layer.

Longitudinal joints and edges shall be constructed true to the delineating line parallel to the center line of the road. All longitudinal and transverse joints shall be cut vertical to the full thickness of the previously laid mix before laying the fresh mix.

8.11.5.7 Setting and Drying

The laid wet mix macadam course shall be allowed to dry for 24 hours before priming.

8.11.6 OPENING TO TRAFFIC

No vehicular traffic except construction vehicles with speed less than 5 km/hr shall be allowed on the finished WMM surface.

8.11.7 SURFACE FINISH, CONSTRUCTION TOLERANCES, QUALITY CONTROL OF WORK AND TESTING

8.11.7.1 The surface level of a WMM as a base course shall have the tolerance of + 10 mm and - 10 mm. For checking compliance with this, surface levels shall be taken on a grid of points placed 6.25 m longitudinally and 3.5 m transversely. For 10 consecutive measurements taken longitudinally or transversely, not more than one measurement shall be permitted to exceed the above tolerances, thus one measurement being not in excess of 5 mm above the permitted tolerance.

8.11.7.2 The longitudinal profile shall also be checked by a 3 metre straight edge at the middle of each traffic lane along a line parallel to the center line of the road. The maximum allowable difference between the road surface and underside of a 3 metre straight edge shall be 8 mm.

The frequency of the quality control tests shall be as under:

Table 3 Frequency of Quality Control Tests of WMM

Sl. No.	Description of Quality Control Test	Frequency of Quality Control Test
1.	Gradation	One test per 500 m3 subjected to minimum 2 tests per day
2.	Plasticity Index	One test per 500 m3 subjected to minimum 2 tests per day
3.	Moisture Content prior to compaction	One test per 250 m3
4.	Density of compacted layer	One test per 2000 m2 subjected to

		minimum 4 test per day
5.	Aggregate Impact Value/Los Angeles Abrasion Value	One test per 1000 m3 subjected to minimum 1 test per day
6.	Flakiness and Elongation Index	One test per 500 m3 subjected to minimum 1 test per day

8.11.7.3 The in-place dry density shall be measured according to sand replacement method. If a nuclear method is used for determining density and moisture content, tests will be done at least at the same frequency required when using the sand replacement method but at each nuclear densometer test location, the average of two readings taken at positions rotated by 180 degree shall be used. A check/comparison test using the sand replacement method shall be carried out as required by the Engineer.

Initial calibration of the nuclear testing equipment shall be done by carrying out at least fifty tests in parallel with the sand replacement method for each different material encountered. Whenever there is a change of source of material calibration shall be carried out in accordance with the manufacturer's guidelines or as required by the Engineer to establish a moisture correction and any correction of density required. Check tests will be used to update the initial calibration of the nuclear density testing equipment. The calibration shall be repeated at regular intervals i.e. for every change of material source or 3 months, whichever is earlier.

For testing the compaction requirements, test locations shall be chosen only through random sampling techniques. Control shall not be based on the result of any one test but on the mean value of 5-10 density determinations. The number of tests in one set of measurements shall be 6 (if non-destructive tests are carried out, the number of tests shall be doubled) as long as it is felt that sufficient control over the constituent materials forming the mix is being exercised. If considerable variations i.e. 15 percent and above are observed between individual density results, the minimum number of tests in one set of measurement shall be increased to 10. The acceptance criteria shall be subject to condition that the mean density of a set of measurement shall not be less than the specified density plus:

$$1.65 - [1.65 / \sqrt{(\text{No. of Samples})} \times \text{standard deviation}]$$

For ready reference & using the afore-mentioned equation, the acceptance criteria shall be subjected to the compliance of the following requirements:

No. of Tests	**6**	**7**	**8**	**9 or more**
Minimum average value (% relative field compaction)	100.5	100.6	100.7	100.8
Minimum value of any single test	96.8	96.7	96.6	96.5

(% relative field compaction)				

8.11.7.4 Rectification of Surface Irregularity

Where the surface irregularity of the layer as laid exceeds the permissible tolerances or where the course is otherwise defective due to underside layer soil/GSB getting mixed with the aggregates, the full thickness of the layer shall be scarified over the affected area reshaped with added premix material removed and replaced with fresh premix material and recompacted. The area treated in this manner shall not be less than 5 m long and 2 m wide. In no case shall depressions be filled up with unmixed and ungraded material or fines.

8.11.8Measurement and payment

Wet Mix Macadam shall be measured and paid in Cum metres.

ANNEXURE

(Refer Para 8.11.5.4)

EQUIPMENT FOR WET MIX MACADAM

1. **Production of Aggregates**

Multi-stage stone crushing plant with vibratory screening arrangement and conveyor based stockpiling arrangement is suitable for obtaining required shape and size of aggregates and storing them in different stockpiles. The stone crushing plant should have necessary process controls for consistent production of required size and quantity of aggregate.

2. **Wet Mix Plant**

This plant consists of following: considering the relatively larger sized aggregates only power mixer (forced mixing) should be used, which could be Vertical Shaft Mixers (Pan Mixers) or Horizontal Shaft Mixers (Trough Mixers or Pugmill). Pan Mixers are generally suitable for aggregate sizes up to 40 mm, whereas Trough Mixers or Pugmill can handle even larger sized aggregates. Plant should be calibrated for accuracy before commencing work and thereafter at regular intervals.

i) . **Bin Feeder Unit:** This is the unit for aggregate gradation control and feeding. It should have minimum 4 storage bins with adjustable quadrant side gates for smooth flow of aggregate onto auxiliary conveyor underneath. It is advisable to have grizzly screens for oversize particle rejection on top of bins, in the absence of which a scalping screen should be used after the bin feeder. The auxiliary conveyors should preferably be driven by variable speed motors. These auxiliary conveyors should discharge aggregate onto a single gathering conveyor underneath which should then transfers material onto the Secondary Conveyor (if grizzly screens are present) or onto the Scalping Screen (if grizzly screens are absent). In those plants with fixed speed motors, gradation is controlled by adjusting the gate openings. A surface vibration should be provided on the outside of the sand/fines bin to maintain uniform flow.

ii) **Grizzly Screen/Scalping Screen:** Both are used for screening of oversized particles which might cause damage to the mixing elements, if allowed to pass into it. grizzly screens are a grid of parallel metal bars set on a static inclined frame on top of the bin at an angle of 30 degree to 45 degree in the direction of the slope and movement of aggregates. A single deck vibratory scalping screen placed at the discharge end of the gathering conveyor will also screen out oversized particles.

iii) **Water Supply Unit:** Water Supply Unit consists of a water storage tank, a water pump, pump drive motor and water pipelines. The tank has to be of adequate capacity with provision for replenishing the water. The water pump feeding water to the mix is usually a centrifugal pump driven by an electric motor. The pump capacity should be adequate to provide the design moisture content at maximum plant production rate. Water pipeline draws water from the storage tank and discharges it into the pugmill through a set of

nozzles which are formed by making perforations in the pipe. The nozzle pipe should be installed transverse to the direction of aggregate flow for uniform mixing with water.

iv) **Pugmill:** This is basically a trough mixer with paddle arms and paddle tips mounted on shaft(s). Usually a twin shaft pugmill is used. The rotating paddle tips churn the mix within the stationery pugmill chamber. This forced mixing causes thorough and uniform mixing of aggregate and water to produce a homogenous mix. The pugmill should have replaceable inner liner plates. The clearance between the tips of the paddles and liners should be less than maximum aggregate size so that the aggregates are pushed forward while mixing. The paddles should be adjustable so that clearance can be set according to maximum size of aggregate. The size of the mixing chamber and the size and number of paddles determine the maximum output capacity of the pugmill. The pugmill should be fully covered. There should be safety mechanism to prevent accidental powering-on of the pugmill while being accessed during inspection or maintenance or cleaning.

v) **Gob Hopper:** This hopper is available at the discharge end of the load out conveyor and is used for temporary storage of mix and for enmass drop of the mix onto dumper/tipper to minimise segregation. The hopper gates are hydraulically or pneumatically controlled and may be operated manually or automatically (preferable).

vi) **Conveyor System:** Belt conveyors are used at various stages for aggregate and mix handling. Usually, there is a secondary conveyor which takes aggregate from the Bin Feeder and loads them into the pugmill. There is also a loadout conveyor which takes the mix from the pugmill and loads it into the gob hopper. The inclination of belt conveyors should be less than 19 degree to prevent aggregate rollback. For steep angles ribbed belts or cleated belts may be used. High level conveyors should have belts with cleats on sides and/or safety sheets below belts, to restrain or retain aggregates falling over the sides. Conveyors having load cells installed underneath should have a self tensioning arrangement to maintain constant tension in the belt.

vii) **Aggregate Metering System:** Generally a load cell based conveyor weighing arrangement is used to measure the aggregate mass flow rate. If a scalping screen is used, the load cell should be placed under the secondary conveyor, otherwise it may be placed under the gathering conveyor too. High end plants may have individual bins of the bin feeder unit mounted on load cells so as to have precise control on aggregate gradation. In such cases the sum of individual aggregate mass flow rates from individual bins yield the total aggregate mass flow rate. The aggregate metering system should be calibrated before commencement of work and thereafter at regular intervals which should not be more than 7 days for conveyor weighing arrangement and 1 month for bin weighing arrangement. The tolerance shall be ± 2 percent.

viii) **Water Metering System:** Metering of water flow rate can be achieved with the help of electronic flow meter measuring the water flow rate and (i) variable speed centrifugal pump or (ii) Electronically operated hydraulic Valve. In the former case the pump discharge itself is controlled by varying the speed of centrifugal pump with the help

of a variable speed motor. In the latter case, the effective flow into the water pipeline discharging into the pugmill is controlled with the valve which diverts a portion of the flow back into the water storage tank through a bypass line. The metering system should be calibrated before commencement of work and thereafter at regular intervals which should not be more than 7 days for variable speed motor driven centrifugal pump, not more than 3 months for electronically operated hydraulic valve. A mechanically operated totalizer should be installed in the water pipeline after the delivery valve to record the cumulative flow and use it to calibrate the electronic flow meter. The tolerance shall be ±1 percent.

ix) **Control Cabin:** There shall be a central control cabin housing the control system for centralized plant operations. The control cabin shall be designed and erected to enable full view of the plant from inside. Alternatively, CCTV system may be used to provide real-time view of the full plant. The control cabin shall have air conditioning, proper illumination, and furnishing. It should have a public address system for addressing/warning people outside. The operation and maintenance manual of the plant, calibration charts, plant logbook, and such other documents related to plant operation, maintenance and performance shall be kept in the control cabin at all times.

x) **General Requirements:** The plant shall be functionally adequate, operationally efficient, ergonomically designed and environmentally compliant. It should have necessary safety features, some of which are mentioned below, with the express understanding that these are not exclusive and there may be others.

a) The pugmill should have fail-safe power cut-off mechanism during access.

b) All motors, couplings and high speed drives or components shall be fully covered.

c) All electrical components and wirings shall be properly insulated and earthed.

d) All high level conveyors will have aggregate fall protection system.

Concrete batching plants having forced mixing arrangement and all the above process control features can also be used for production of WMM.

3. **Paver Finishers**

Paver finisher shall have following features:

i) It shall have loading hoppers of adequate capacity with hydraulically actuated wings.

ii) It shall have a suitable distributing mechanism for transfer of mix from the hopper unit to the screed unit with provision for varying the feed rate as per requirement.

iii) The distribution mechanism shall be such that both bidirectional (for normal paving) and unidirectional (for one side paving) spreading is possible in front of the screed and transverse to the direction of paving.

iv) The screed shall have side plates on both sides for lateral confinement of the mix.

v) The screed shall have tamping and vibrating arrangement having proper stroke/amplitude and frequency for imparting initial compaction to the layer as it is spreads without rutting or otherwise disturbing the surface profile.

vi) The screed shall be easily extensible to the required width with the help of a hydraulically operated telescopic mechanism. For mechanical pavers, bolt-on extension may be used.

vii) The spreading augers shall have provision for add-on extension so that gap between auger and side plate is always less than 150 mm to avoid the requirement of manual filling.

viii) The paver shall be equipped with necessary control mechanism so as to ensure that the laid mat is true to the specified thickness and profile and is free from surface blemishes.

ix) Hydrostatic Pavers shall be capable of working with installed or retrofitted electronic sensors and controllers for automatic precision control of paving operation.

4. **Compaction Equipment**

Compaction shall be done with the help of smooth-wheeled roller (or vibratory roller without vibration), vibratory roller, pneumatic-tyred roller, etc. having minimum static weight of 100 kN with or without ballast. In confined spaces, where standard road roller cannot be used, mini compaction equipment like rammers, vibratory plate compactor, vibro tamper, plate rammer, etc. may be used.

The exact configuration of the compaction equipment fleet, the operational equipment settings like ballast, amplitude/vibration, number of passes, direction of proceed, overlap between passes, sequence of compaction (in case fleet with different compactors are used) is decided on the basis of compaction trials. For selection of initial parameters, guidelines given in **Table 4** may be used.

Type of Compaction Equipment	**Category**	**Minimum Number of Passes for Layers Not Exceeding the Following Compacted Thickness**		
		100 mm	**150 mm**	**250 mm**
Smooth-wheeled roller (or vibratory roller operating without vibration)	Mass per metre width of roll: over 2700 kg up to 5400 kg over 5400 kg	 16 8	 Unsuitable 16	 Unsuitable Unsuitable
Vibrating Roller	Mass per metre width of vibrating roll: Over 700 kg upto 1300 kg Over 1300 kg upto 1800 kg Over 1800 kg upto 2300 kg Over 2300 kg upto 2900 kg Over 2900 kg upto 3600 kg Over 3600 kg upto 4300 kg Over 4300 kg upto 5000 kg Over 5000 kg	 16 6 4 3 3 2 2 2	 Unsuitable 16 6 5 5 4 4 3	 Unsuitable Unsuitable 10 9 8 7 6 5

For the purposes of above **Table 4**, the following shall apply:

i) The number of passes is the number of times that each point on the surface of the layer being compacted shall be traversed by the item of compaction plant in its operating mode.

ii) The compaction plant in the **Table 4** is categorised in terms of static mass. The mass per metre width of roll is the total mass on the roll divided by the total roll width. Where a smooth-wheeled roller has more than one axle, the category of the machine shall be determined on the basis of the axle giving the highest value of mass per metre width.

iii) Where the mechanical vibration is applied to two rolls in tandem, the minimum number of passes shall be half the number given in the above Table 4 for the appropriate mass per metre width of one vibrating roll but if one roll differs in mass per metre width from the other, the number of passes shall be calculated as for the roll with the smaller value. Alternatively, the minimum number of passes may be determined by treating the machine as having a single vibrating roll with a mass per metre width equal to that of the roll with the higher value.

8.12 BITUMINOUS MACADAM

8.12.1 GENERAL:

Bituminous macadam (BM) shall consist of mineral aggregate and appropriate binder, mixed in a hot mix plant and laid with a mechanized paver. It is an open graded mixture suitable for base course. It is laid in a single course or in a multiple layers on a previously prepared base. Thickness of the single layer shall be 50 mm to 100 mm. 2.3 Since the bituminous macadam is an open-graded mixture there is a potential that it may trap water or moisture vapour within the pavement system. Therefore, providing proper drainage outlet to the BM layer should be considered to prevent moisture-induce damage to the BM and adjacent bituminous layers.

8.12.2. MATERIALS:

a) The **bitumen** shall be viscosity graded paving bitumen complying with Indian Standard Specification for paving bitumen, IS:73. The grade of bitumen to be used would depend upon the climatic conditions and the traffic. Guidelines for selection of viscosity grade of paving grade bitumen are given in Tables 1.1 and 1.2.

Both the highest daily mean air temperature and the lowest daily mean air temperature mentioned in Table 1.2 can be obtained for the weather station nearest to the project site from the Indian Metrological Organization (IMO). The IMO has data on daily mean high temperature for all 365 days in a year for all weather stations based on historical records on the last 30-40 or more years. This daily mean high temperature on a specific day is the same as daily "normal" high temperature for that day as usually reported in newspapers. The highest of the 365 daily mean high air temperatures (which usually occurs on some day in May or June) is used in Table 1.2. Likewise, the lowest daily mean air temperature (which usually occurs on some day in January) can also be obtained form the IMO. Since these are mean high temperatures based on the average of 30-40 years data, these temperatures are significantly lower than, the absolute maximum temperatures, which may have occurred in a specific year.

Table 1.1 Viscosity Graded (VG) bitumen and their General Applications

Viscosity Grade (VG)	General Applications
VG-40 (40-60 penetration)	Use in highly stressed areas such as those in intersections, near toll booths, and truck parking toll in lieu of old 30-40 penetration grade.
VG-30 (50-60 penetration)	Use of paving in most of India in lieu of old 60/70 penetration grade
VG-20 (60-80 penetration)	Use in cold climatic, high altitude regions of North India
VG-10 (80-100 penetration)	Use in spraying applications such as surface dressing and paving in very cold climatic region in lieu of old 80/10 penetration grade

Highest Daily Mean Air Temperature, C

Lowest Daily Mean Air Temperature, C	Less than 20 C	20 to 30 C	More than 30 C
More than -10 C	VG-10	VG-20	VG-30
-10 C or lower	VG-10	VG-10	VG-20

b) COARSE AGGREGATE:

The coarse aggregate shall consist of crushed rock, crushed gravel or other gravel or other hard material retained on 2.36mm sieve. It shall be clean, hard, durable and cubical shape, free from dust and soft organic and deleterious substances. The aggregate shall satisfy and physical requirements specified in Table 2.

Property	Test	Requirement	Test method
Cleanliness	Grain size analysis	Max. 5% passing 0.075 micron	IS 2386 Part I
Particle shape	Flakiness & Elongation Index (combined)	Max. 40%	IS 2386 Part I
Strength *	Los Angeles Abrasion Value	Max. 40%	IS 2386 Part IV
	Aggregate Impact Value	Max. 30%	IS 2386 Part IV
Durability	Soundness (Sodium or Magnesium), 5 cycles		
	Sodium Sulphate	Max. 12%	IS 2386 Part V
	Magnesium	Max. 18%	IS 2386 Part V

	Sulphate		
Water absorption	Water absorption	Max. 2%	IS 2386 Part III
Stripping **	Coating and Stripping of Bitumen Aggregate	Min Retained Coating 95%	IS 6241

Note:
* The coarse aggregate may satisfy either of the two strength tests.
** If the coarse aggregate fails this test, 2% hydrated lime shall be used in the mix.

Where crushed gravel is proposed for use as aggregate, not less than 90% by weight of the crushed material retained on 4.75 mm sieve shall have at least two fractured faces resulting from crushing operation.

c) FINE AGGREGATE:

Fine aggregate shall consist of crushed or naturally occurring mineral material, or a combination of two, passing 2.36 mm sieve and retained on 75 micron sieve. It shall be clean, hard, durable, free from dust and soft organic and other deleterious substances. The amount of rounded, natural sand in the total fine aggregate shall be limited to 10% if the BM is used within 100mm from the road surface and to 50% if the BM is used more than 100 mm below the road surface.

8.12.3 AGGREGATE GRADING AND BITUMEN CONTENT:

The combined grading of the coarse aggregate and fine aggregate, when tested in accordance with IS 2386 Part I, wet sieving method, shall conform to limits given in table 3. The type and quantity of bitumen and appropriate thickness is also given in **Table3.**

Grading	1	2
Nominal maximum aggregate size*	40 mm	19 mm
Layer thickness	80-100 mm	50-75 mm
IS Sieve size (mm)	Cumulative % by weight of total aggregate passing	
45	100	
37.5	90-100	
26.5	75-100	100
19	-	90-100
13.2	35-61	56-88
4.75	13-22	16-36
2.36	4-19	4-19
0.3	2	2-10
0.075	0-8	0-8
Bitumen content **	3.3	3.4

* Nominal maximum aggregate size is one size larger than the first sieve, which retains more than 10% material.

** For regions where highest daily mean air temperature is 300 C or lower and lowest daily mean air temperature is -10^0 C or lower, the bitumen content may be increased by as much as 0.5%.

The combined aggregate grading shall not vary from the lower limit on one sieve to the higher limit on the adjacent sieve to avoid gap grading. The aggregate may be proportioned and blended to produce a uniform mix complying with the requirements in Table 3.

8.12.4. CONSTRUCTION

8.12.4.1 Cleaning of the surface: The surface shall be cleaned of all loos extraneous matter by means of mechanical broom, high-pressure air jet received from a compressor or any other approved equipment / method.

8.12.4.2 Filling up of potholes and sealing of cracks: Any potholes and /or cracks shall be repaired and sealed.

8.12.4.3 profile corrective course: Depending upon site requirement, profile corrective course for correcting the existing pavement profile shall be laid either as a separate layer or as a composite layer with varying thickness. Where the maximum thickness of the profile corrective course is less than 40mm, the profile corrective course shall be laid as an integral part of the overlaying layer. In other cases the profile corrective course shall be constructed as a separate layer. When it is laid as a separate layer, type of material for the use as the profile corrective course may differ.

8.12.4.4 Prime Coat: Prime Coat shall be as per IRC:16-2007 "Standard Specification and Code of Practice for Prime and Tack Coat".

8.12.4.5 Tack Coat: Tack Coat shall be as per IRC: 16-2007 "Standard Specification and Coat of Practice for Prime and Tack Coat".

8.12.5 MIXING

Bituminous macadam shall be prepared in a hot mix plant (HMP) of adequate capacity and capable of yielding a mix of proper and uniform quality with thoroughly coated aggregate. Essential features for HMP are given in **Annexure I**. The temperature range of bitumen and aggregate at the time of mixing for different grade and type of bitumen is given in Table 4. The difference in the temperature of aggregate and bitumen shall not exceed 15^0 C. In order to ensure uniform quality of mix the plan shall be calibrated from time to time.

8.12.6 TRANSPORTATION

Bituminous material shall be transported in clean insulted covered vehicles. An asphalt release agent such as soap or limewater, which does not adversely affect the bituminous mix, may be applied to the interior of the vehicle to prevent sticking and to facilitate discharge of the material.

8.12.7 LAYING

8.12.7.1 Weather and seasonal limitations: Bituminous macadam shall not be laid:

a) in presence of standing water on the surface,

b) when rain in imminent and during rains, fog or dust storm,

c) when the base /binder course is damp,

d)when the air temperature on the surface on which it is to be laid is less than 10^0 C,

(e) When the wind speed at any temperature exceed the 40 km/h at 2-meter height.

8.12.7.2 Preparation of the base: Base shall be prepared by carrying out all or some of the of the operations as per Clause 4.1, depending upon the site conditions.

8.12.7.3 Spreading: Except in areas where paver cannot have access, bituminous mixture shall be spread, levelled and tamped by self-propelled hydrostatic paver finisher preferably equipped with sensor. As soon as possible after arrival at site the asphalt mix shall be supplied continuously to the paver and laid without delay. The rate of delivery of material to the paver shall be regulated to enable the paver to operate continuously. The travel rate of paver and the method of operation shall be adjusted to ensure even and uniform flow of bituminous material across the screed, free from dragging, tearing and segregation.

Restricted areas (such as confined space, footways, irregular shape and varying thickness, approaches to expansion joints etc.) where paver cannot be used, the material shall be spread, raked and levelled with suitable hand tool by trained staff.

When laying bituminous macadam near expansion joint, the machine laying shall be stopped about 300 mm short of joint. The remainder of the pavement up to the joint and the corresponding area beyond it shall be laid manually. The laying of bituminous macadam shall be completed before the mix temperature reaches the values specified in the Table 4.

Table 4. Mixing, Laying and Rolling Temperatures for Bituminous Macadam (Degree Celsius)

Bitumen Viscosity Grade	Bitumen Temperature	Aggregate Temperature	Mixed Material Temperature	Laying Temperature	*Rolling Temperature
VG-40	160-170	160-175	160-170	150 Min	100 Min
VG-30	150-165	150-170	150-165	140 Min	90 Min
VG-20	145-165	145-170	145-165	135 Min	85 Min
VG-10	140-160	140-165	140-160	130 Min	80 Min

* Rolling must be completed before the mat cools to these minimum temperatures Bituminous material, with temperature greater than 1450C shall not be laid or deposited on bridge deck, waterproofing system unless precautions against the heat damage have been taken.

8.12.7.4 COMPACTION

Compaction shall commence as soon as possible after laying and shall be completed before the temperature falls below the range specified in Table 4. Rolling of the longitudinal joints shall be done immediately behind the paving operation. After this, the rolling shall commence at the edge and progress towards the centre longitudinally except at sections with unidirectional camber, where it shall progress from lower edge to upper edge parallel to centreline of the pavement.

All deficiencies in the surface after laying shall be made good by the attendant behind the paver, before initial rolling is commenced. The initial or breakdown rolling shall be done with an 8 to 10 tonnes dead weight or vibratory steel wheel roller. The intermediate rolling shall be done with 8 to 10 tonnes dead weight or vibratory roller with an amplitude 0.3mm to 0.8 mm and frequency between 30 to 50 hz. or with a pneumatic roller of 12 to 15 tones, with a tire pressure of at least 0.56 M Pa. The finished rolling shall be done with 6 to 8 tonnes smooth wheel roller. Rolling shall continue until at least 98% of the lab density obtained in the Marshall mould made using approved gradation and bitumen content is achieved. The number of roller passes should be established on a control strip prior to starting the main work. The mixtures with a maximum aggregate size upto 25 mm shall be compacted in a 4-inch Marshall mould with 50 blows on each side. The mixtures with a maximum aggregate size of more than 25 mm shall be compacted in a 6-inch Marshall mould with 75 blows on each side in accordance with the Asphalt Institute MS-2 (Sixth Edition). For smaller works where no density is specified rolling shall continue until there is no further movement under roller.

The bitumen macadam shall be rolled in the longitudinal direction with the roller as close to the pave as possible. The overlap on successive passes should be at least one-third of the width of the rear roll or in the case of pneumatic wheeled rollers, at least the nominal width of 300mm. The roller should move at a speed of no more than 5 km/hour. The roller shall not be permitted to stand on pavement, which has not been fully compacted. All precautions shall be taken to prevent dropping of oil, grease, petrol or other foreign material on the pavement. The wheel of the rollers shall be dept moist with the water or spray system provided with the machine to prevent the mixture from adhering to the wheels. Minimum moisture to prevent adhesion between wheels and mixture shall be used and surplus water shall not be allowed to stand on the partially completed pavement.

8.12.7.5 JOINTS

Where joints are made in bitumen macadam, the material shall be fully compacted and joint made flush in one of the following ways:

a) All joints shall be cut vertical to the full thickness of the previously laid mix. All loosened material shall be discarded and the vertical face be coated with any viscosity grade bitumen, or cold applied emulsified bitumen. While spreading the material along the joint the material spread shall over 25 mm to 30 mm on the previously laid mix beyond the vertical face of the joint. The thickness of the loose

overlap material should be approximately a quarter more than the final compacted thickness. The overlapped mix should be bumped back with a lute just across the joint so that the excess material on the hot side can be pressed to obtain a high joint density.

b) By using two or more pavers in echelon, where this is practicable and in sufficient proximity for adjacent width to be fully compacted by continuous rolling.

c) By heating the joints with an approved infrared joint heater when the adjacent width is being lad, but without cutting back or coating with the binder. The heater shall raise the temperature of the full depth of material, to minimum rolling temperature for a width of 75 mm. The temperature shall not exceed the maximum allowed temperature.

For transverse joints method a) above can apply. In multi-layer construction the joint in one layer shall offset the joint in the underneath layer by about 150mm.

8.12.8 ARRANGEMENT FOR TRAFFIC

It shall be ensured that the bituminous macadam surface is covered with the next pavement coarse within a maximum of 48 hours until which no traffic shall be applied. In case of delay, the course may be covered with the seal coat in accordance with the appropriate IRC standard prior to opening to traffic.

8.12.9. CONTROLS

8.12.9.1 SURFACE FINISH

The levels of the bituminous macadam shall not vary from those calculated with reference to longitudinal and cross profile of the roads as per the Contract beyond 6 mm over 3 m length when tested with a template and straight edge.

For checking the compliance with the above requirement measurements of the surface level shall be taken on a grid of points spaced 6.25 m along the length and 0.5 m from the edges and at the centre of the pavement. The compliance shall be deemed to have been met for the final surface only if the tolerance given above is satisfied for any point on the surface.

In case where surface level fall outside the specified tolerance, the Contractor shall be liable to rectify these by replacing the full depth of layer. In all cases of replacement the area treated shall not be less than 5m length and not less than 4.5 m in width.

8.12.9.2 SURFACE EVENNESS

The measurement and checking of surface evenness shall be done by a 3-m straight edge in accordance with the procedure in IRC:SP16-2004.

The maximum permissible surface evenness using longitudinal profile 3-m straight edge shall be 6 mm. The maximum permissible evenness using transverse profile camber shall be 4 mm.

The maximum permissible frequency of surface evenness in 300 m length in longitudinal profile shall be as per Table 5.

Table 5. Maximum Permissible Frequency of Evenness

Type of layer	**Evenness, mm**	**NH/SH**	**MDr and Lower Category**
Bituminous	4-6	20	40

Macadam			

Where the surface evenness falls outside the tolerance, the Contractor shall be liable to rectify these in the manner described below:

When surface is low the deficiency shall be corrected by adding fresh materials after applying tack coat if needed and re-compacting to specification. When the surface is high, the full depth of the layer shall be removed and replaced with fresh material and compacted to the specification.

8.12.9.3 QUALITY CONTROL DURING CONSTRUCTION

The material supplied and the work shall conform to the specifications prescribed in the preceding Clauses. To ensure the quality the material and the works shall be subjected to tests described hereunder. The tests and minimum frequency for each test in indicated in the Table 6.

8.12.9.4 ACCEPTANCE CRITERIA

The acceptance criteria for test on density (N=3) shall be subjected to the condition that the mean value of N samples is not less than the specified value plus [1.65 – 1.65/(No of samples)0.5] x standard deviation.

Sl.	**Test**	**Frequency**
1	Quality of bituminous binder	As per number of samples and tests per lot specified in IS 73
2	Aggregate impact value/Los Angles Abrasion value	One test per 50 m3 of the aggregate
3	Flakiness & Elongation Index	One test per 50 m3 of the aggregate
4	Soundness test (Sodium or Magnesium Sulphate test)	One test for each method for each source and when ever there is change in the quality of aggregate
5	Water absorption aggregate	1 test for each source and when ever there is change in the quality of aggregate
6	Percent of fractured faces	When crushed gravel is used as aggregate one test per 50m3 of aggregate
7	Mix grading	One set for individual constituent and mixed aggregate from dryer for each 400 tonnes of mix subject to minimum of two tests per day per plant
8	Stripping (IS:6241)	1 test for each mix design and whenever there is change in the source or quality of coarse aggregate
9	Temperature of binder in boiler, aggregate in dryer and mix at the	At regular interval

	time of laying and compaction	
10	Binder content	One set for each 400 tonnes of mix subject to minimum of two tests per day per plant
11	Rate of spread of mix material	At regular interval
12	Density of compacted layer	One test per 250m3 area

Annexure-I

Features of Hot Mix Plants & Pavers for Bituminous Construction:

Hot mix plant shall be of suitable capacity of batch mix type. Total system for crushing of stone aggregates and feeding of aggregate fractions in required proportions to achieve the desired mix, must be capable of meeting the overall specification requirements under stringent quality control. The plant shall have the following essential features:

A – General.

(a) The plant shall have a coordinated set of essential units capable of producing uniform mix as per the job mix formula.

(b) Cold aggregate feed system with minimum 4 bins having belt conveyer arrangement for initial proportioning of aggregates from each bin in the required quantities. In order to have free flow of fines from the bin, bin should be fitted with vibrator to intermittently shake it.

(c) Belt conveyers below each bin should have variable speed drive motors. There should be electronic load sensor on the main conveyer for measuring the flow of aggregates.

(d) Dryer unit with the burner capable of heating the aggregate to the required temperature without any visible un-burnt fuel or carbon reside on the aggregate and reducing the moisture content of the aggregate to the specified minimum.

(e) The plan shall be fitted with suitable type of thermometric instruments at appropriate places so as to indicate or record/register the temperature of heated aggregate, bitumen and mix.

(f) Bitumen supply unit capable of heating, measuring/metering and spraying of bitumen at specific temperature with automatic synchronization of bitumen and aggregate feed in the required proportion.

(g) A filler system suitable to receive bagged or bulk supply of filler material and its incorporation to the mix in the correct quantity wherever required.

(h) A suitable built-in dust control system for the dryer to contain /recycle permissible fines into the mix. It should be capable of preventing the exhaust of fine dust into atmosphere for environmental control wherever so specified by the Engineer.

(i) The plant should have centralized control panel/cabin capable of pre-setting, controlling/synchronizing all operations stating from feeding of cold aggregates to the discharge of the hot mix to ensure proper quality of mix. It should have indicators for any malfunctioning in the operation.

(j) Every hot mix plant should be equipped with siren or horn so that the operator may use the same before starting the plant every time in the interest of safety of staff.

B – For a Batch Type Plant.

(i) Gradation control unit having minimum four decks vibratory screens for accurate sizing of hot aggregate and storing them in separate bins. This unit should be fully covered to reduce the maintenance of cost and for better environmental condition.

(ii) Proper arrangement for accurate weighing of each size of hot aggregate from the control panel before mixing.

(iii) Paddle mixer unit shall be capable of producing a homogeneous mix with uniform coating of all particles of the mineral aggregate with binder.

C – For Continuous Type Plant.

(i) Gradation control unit having vibratory screens for accurate sizing of hot aggregate and storing them in separate bins. This unit should be fully covered to reduce the maintenance cost and for better environmental condition.

(ii) There should be appropriate arrangement for regulating and volumetric condition of the flow of hot aggregate from each bin to achieve the required proportioning.

(iii) Paddle mixer unit shall be capable of producing a homogenous mix with uniform coating of all particles of the mineral aggregate with binder.

D – For Drum Mix Plant.

(i) It is pre-requisite that only properly screened and graded materials are fed to the bins. If required, a vibratory screening unit shall be installed at the plant site to ensure the same. A primary 4-deck vibratory screening unit shall be installed before the multiple bin cold fed system for screening the aggregates and grading the same.

(ii) Belt conveyers below each bin should have variable speed drive motors. There should be electronic load sensor in the main conveyer for measuring the flow of aggregate.

(iii) There should be arrangement to measure moisture content of the aggregate(s) so that moisture correction may be applied for working out requirements of binder and filler.

E – Paver Finisher.

(a) Loading hoppers and suitable distribution mechanism.

(b) All drives having hydrostatic drive/control.

(c) The machine shall have a hydraulically extendable screed for appropriate with requirement.

(d) The screed shall have tamping and vibrating arrangement for initial compaction to the layer as it is spread without rutting or otherwise marring the surface. It shall have adjustable amplitude and variable frequency.

(e) The pave shall be equipped with necessary control mechanism so as to ensure that the finished surface is free from surface blemishes.

(f) The paver shall be fitted with an electronic sensing device for automatic levelling and profile control within the specified tolerances.

(g) The screed shall have an internal heating arrangement.

(h) The paver shall be capable of laying either 2.5 to 4.0 m width or 4.0 to 7.0 m width as stipulated in the Contract.

(i) The paver shall be so designed as to eliminate skidding/slippage of the tyres during operations.

8.13 SEMI DENSE BITUMINOUS CONCRETE (SDBC)

8.13.1. GENERAL

8.8.13.1

Semi-dense bituminous concrete shall be used as a wearing course and shall not be laid directly over WBM or any granular base. The item shall consist of mineral aggregates and appropriate binder mixed in a hot-mix plant and laid with a paver on a previously prepared base in accordance with the Specifications and conforming to the lines, grades and cross sections.

8.13.2 DESIGN CRITERIA

Being high cost specification, semi-dense bituminous concrete mixes should be properly designed so as to satisfy certain criteria needed to assure satisfactory performance and durability. The mix as designed and laid should satisfy the re- quirements given in Table 1 based on Marshall method which is suggested for the present for the sake of simplicity and uniformity.

TABLE I. Requirement of the mix

(i) Number of compaction blows on each end of Marshall specimen	50
(ii) Marshall stability in kg (Minimum)	340
(iii) Marshall flow (mm)	2-4
(iv) Per cent voids in mix	5-10
(v) Per cent voids in mineral aggregate filled with bitumen	55-75
(vi) Binder content as per cent by weight of total mix (to be decided based_onMarshali design method)	4.5-6.0

Notes 1.it is suggested that higher stability values consistent with other requirements should be achieved as far as possible.

2, At bus stops, parking areas and roundabouts, near minimum flow value should be adopted.

1. The attempt should be to have well graded aggregate and the per cent voids in the mix closer to the lower limit.

8.13.3 MATERIALS

In order to satisfy the requirements spelt out in para 3, the semi-dense bituminous concrete mix shall consist of coarse aggregate fine aggregate and filler in suitable proportions and mixed with sufficient binder content. True and representative samples of the aggregates proposed to be used on the specific job shall be tested in the design

laboratory and proper blend of the aggregates shall be worked out so that the gradation of the final composition will satisfy either of the three limits set forth in Table 2.

Table2. Gradation of aggregate in the final mix

Grading Number	1	2	3
Sieve size	(per cent passing by weight)		
22.4 mm	-	100	100
13.2mm	100	85-100	79-100
11.2mm	85-100	70-92	68-90
5.6mm	42-64	42-64	33-55
2.8mm	22-38	22-38	22-38
710 Micron	11-24	11-24	6-22
355 Micron	7-18	7-18	4-14
180 Micron	5-13	5-13	2-9
90 Micron	3-9	3-9	0-5

Grading No. 1 is suggested for compacted thickness of 25mm and Grading Nos. 2 and 3 for compacted thickness of 25-40 mm.

The exact bitumen content required shall be arrived at as per Marshall procedure for the aggregate gradation worked out in the laboratory and by using the same paving bitumen proposed to be used in the field.

The material shall further satisfy the following physical requirements. 42.1

Bitumen:

The bitumen shall be paving bitumen of suitable penetration grade within the range of S 35 to S 90 or A. 35 to A.90 (30(40 to 80/100) as per IS: 73 Paving Bitumen'. The actual grade of bitumen to be used shall be decided by the Engineer-in-charge, appropriate to the region, traffic, rainfall and other environmental conditions.

Coarse aggregate:

The coarse aggregate shall be crush- ed material retained on 2.8 mm sieve and shall be crushed stone, crushed slag, crushed gravel (shingle) and shall consist of angular, clean, tough and durable fragments, free from disintegrated pieces and organic or deleterious matter and adherent coatings. The aggregate shall preferably be hydrophobic arid of low porosity. When the hydrophilic aggregates are used, the bitumen shall be treated with anti-stripping agents of approved quality in suitable doses. The aggregate, shall satisfy the physical requirements as given in Table 3.

TABLE 3. Physical requirements or coarse aggregate

Test	Requirement (per cent maximum)	Test Method
Aggregate Impact Value	30	IS 2386 (Part IV)
or Los,. Angeles Abrasion Value	40	—do—

Flakiness Index	30	IS: 2386 (Part I)
Stripping Value	25	1S: 6241
Water Absorption	1	IS : 2386 (Part III)
Soundness		
Loss with Sodium sulphate 5 cycles	12	IS : 2386 (Part V)
Loss with Magnesium sulphate, 5 cycles	18	—do—

Notes: I * For slag, the unit weight shall not be less than 1120 kg/m^2

2.Water absorption upto 2 per cent may be permitted in exceptional cases.

Fine aggregate:

The fine aggregate shall be the fraction passing 2.8 mm sieve and retained on 90 &m sieve, and shall consist of crushed screenings, natural sand or a mixture of both, It shall be clean, hard, durable, uncoated, dry and free from injurious, soft or flaky pieces and organic or deleterious matter. 4.2.4. Filler The requirement of filler in semi-dense bituminous mixes shall normally be met by the material passing 90 micron sieve in fine aggregate. In case the fine aggregate is deficient in material passing 90 micron sieve, extra filler shall be added. The filler shall be an inert material, the whole of which passes 710 micron sieve, at Least 90 per cent passes 180 Micron sieve and not less than 70 per cent passes 90 micron sieve. The filler shall be stone dust, cement, hydrated lime, fly ash or other approved non-plastic mineral matter.

8.13.4 JOB MIX FORMULA

While the laboratory mix design gives the different proportions of the Mineral aggregate combination in terms of individual sieve sizes, for actual operational purposes in the field, blending of two or more sizes of aggregates (each size having within it a range of individual sieve sizes) would be necessary. This blending ratio is obtained on a weight basis, giving the per cent weight of the coarse aggregate, fine aggregate and filler needed to give the ultimate aggregate gradation. It can also be proportioned on a Volumetric basis based on the unit weight or bulk density of the agregates supplied. This mineral aggregate combination together with the corresponding optimum bitumen content as determined in the laboratory constitutes the job mix formula for implementation during construction.

It is emphasised that in order that this formula be adhered to in practice, the nix design shall be worked out based on a correct and truly representative sample of the materials that will actually be used in the specific construction project.

8.13.5 CONSTRUCTION

Preparation of the Base: The base over which the semi-dense bituminous concrete is to be laid shall be completely free from dust, caked mud, etc. before laying the surface course. Where the existing base is potholed or rutted, the irregularities shall be filled in with premixed materials and well rammed. If the existing base is extremely irregular and wavy, it may be considered worthwhile to lay a bituminous levelling course (Profile

Corrective Course) of adequate thickness to avoid an excessive use of the costly surface course. A tack coat at the rate of 6 to 7.5 kg of bitumen per 10 m^2 shall be given over a bituminous base or binder course if the existing surface is dry and hungry, and 5 to 5.5 kg per 10 m^2 on a normal bituminous base.

Preparation of the Mix

It is imperative that the semi-dense bituminous concrete mix be manufactured by using a hot-mix plant of adequate capacity to yield a mix of proper and uniform quality. The plant may be either a batch type or a continuous one having a coordinated set of essential units such as a dryer for heating the aggregates, arrangements for grading and batching by weight or volume the required quantities of aggregates, a bitumen heating and control unit for metering out the correct quantity of heated bitumen together with a paddle mixer for intimate mixing of bitumen and aggregates. A fines feeder for incorporation of the correct quantity of filler is also a necessary auxiliary.

Spreading of the Mix

The mix shall be transported from the mixer by tipper trucks to the work site and spreading done preferably by means of a self-propelled mechanical paver with suitable screed capable of spreading, tamping and finishing the mix true to grade, line and cross-section. The mix should be spread in such a manner that after compaction, the required thickness of carpet is uniformly laid.

Longitudinal joints and edges shall be constructed true to line marking parallel to the centre line of the road. Longitudinal joints should be offset atleast by 150 mm from those in binder course, if any, and transverse joints or construction joint shall be placed in the vertical plane after cutting back to the original thickness of the previously laid mix. The vertical cut face shall be painted with hot bitumen prior to the laying of fresh mix against it.

8.13.6 Compaction

The mix after spreading shall be thoroughly and uniformly compacted by rolling by a set of rollers at a speed not more than 5 km per hour, immediately following the paver. The initial or break down rolling shall be with 8-12 tonne three wheeled steel roller and the surface finished by final rolling with the 8-10 tonne tandem roller. Before finishing with the tandem roller, break- down rolling shall preferably be followed by an intermediate smooth wheel pneumatic roller of 15 to 30 tonne having a tyre pressure of 7 Kg/sq.cm. The joints and edges shall be rolled with a 8-12 tonne three wheel roller. All the compaction operations i.e. breakdown rolling, Intermediate rolling and finish rolling can be accomplished by using a vibratory roller of 8-10 tonne static weight. During finish rolling the vibratory system shall be switched off.

The wheels of roller shall be kept moist to prevent the mix from adhering to them. In no case shall fuel/ lubricating oil used for this purpose nor excessive water poured on the wheels. Rolling shall commence longitudinally from edge and progress towards the centre except on super-elevated portions where it shall progress from the lower to upper edge, parallel to the centre line of the pavement. The roller should proceed on the fresh material with rear fixed wheel leading so as to minimise the pushing of the mix and each pass of the roller shall overlap the preceding one by half the width of the rear wheel.

Rolling shall be continued till the desired density of not less than 98 per cent of the lab design density is achieved and all roller marks are eliminated.

8.13.7 Opening to Traffic

Traffic may be allowed after completion of the final rolling when the mix has cooled down to the surrounding temperature.

8.13.8 CONTROLS

Adequate quality control at every stage of the work is essential and as such a field laboratory must be set up to ensure the following controls.

Periodic sieve analysis of each type of the aggregate at the cold feeder end should be made to see that the gradation of aggregates reasonably follows the original gradation of the job mix designed. The number of samples per day would depend upon the number of bulk supply of the aggregates made in a day at the plant site. The physical properties as required in Table 3 shall be determined at the rate of one test each for every 50-100 m 3 of aggregates or as directed by Engineer-in-charge.

Periodic check on penetration and softening point of the binder should also be done in the manner specified in IS: l203 and 1205.

It shall be ensured that the aggregates are not totally wet as otherwise it would affect the output of the plant adversely. The aggregate temperature measuring device installed at the end of dryer should be checked periodically to see that the aggregate temperature never exceeds 163°C. A tolerance upto 10°C on the lower side may be permitted.

The bitumen temperature should be well within the limits specified. The viscosity of heated bitumen shall be between 150 and 300 centi stokes for which the normal temperature range for paving bitumen is 1500-177°C.

At no time, the difference in temperature between aggregate and bitumen should exceed 14°C.

Periodic check of the aggregate at the gradation control unit (if the plant is fitted with one) or at the hot bin gates should be made to see that the proportion of the aggregates as specified in the job mix formula is complied with.

At least one sample for every 100 tonnes of bituminous mix discharged at the pugmill chute or a minimum of one sample per plant per day shall be collected and the following tests done

(i) Three Marshall specimens shall be compacted and tested for the average stability, f1ow~voids content and density. The value should closely follow the laboratory design values.

(ii) Bitumen shall be extracted from about 1000 grams of the mix and bitumen content determined.

(iii) A sieve analysis of the aggregates after the bitumen is extracted, shall be done and the gradation determined.

The permissible variations of the individual percentages of the various ingredients in the actual mix from the job mix formula shall be within the limits indicated in Table 4.

TABLE 4. Permissible variations from job mix formula

SI. No.	Description of Ingredient	Permissible variation by weight of total mix (per cent)
1	Aggregate passing 13.2 or larger sieve	± 8
2	Aggregate passing 11.2 mm sieve and 5.6 mm sieve	± 7
3	Aggregate passing 2.8 mm sieve and 1.4 mm sieve	± 6
4	Aggregate passing 710 micron sieve and 355 pm sieve	± 5
5	Aggregate passing 180 micron sieve	± 4
6	Aggregate passing 90 micron sieve	± 3
7	Bitumen content	± 0.3

The temperature of the mix at the time of laying shall not exceed 160°C and shall not be less than 120°C.

Rolling operations shall be conducted when the mix is neither too hot nor too cold so that shoving or hair cracks may be eliminated. Rolling operation shall be completed in every respect before the temperature of the mix falls below 80°C.

After the mix is compacted the thickness laid may be checked by noting the depth of penetration of hot steel scale. This shall also be correlated with the measured area of the surface laid and the total plant output of the mix in tonnes (as given in the plant scale).

For every 500 m^2 or less of compacted surface, one field density test should be conducted to determine the density of the mix as laid, compacted and finished. The density shall not be less than 98 per cent of the laboratory density.

The longitudinal profile of the finished surface shall be tested with a straight edge 4.5 m long parallel to the centre line and the transverse profile with a camber template. Any irregularity greater than 6 mm shall be corrected. The longitudinal profile of the finished surface shall also be tested with a roughometer / profllometer and it should be ensured that the roughness shall not exceed 2500 mm per kilometre.

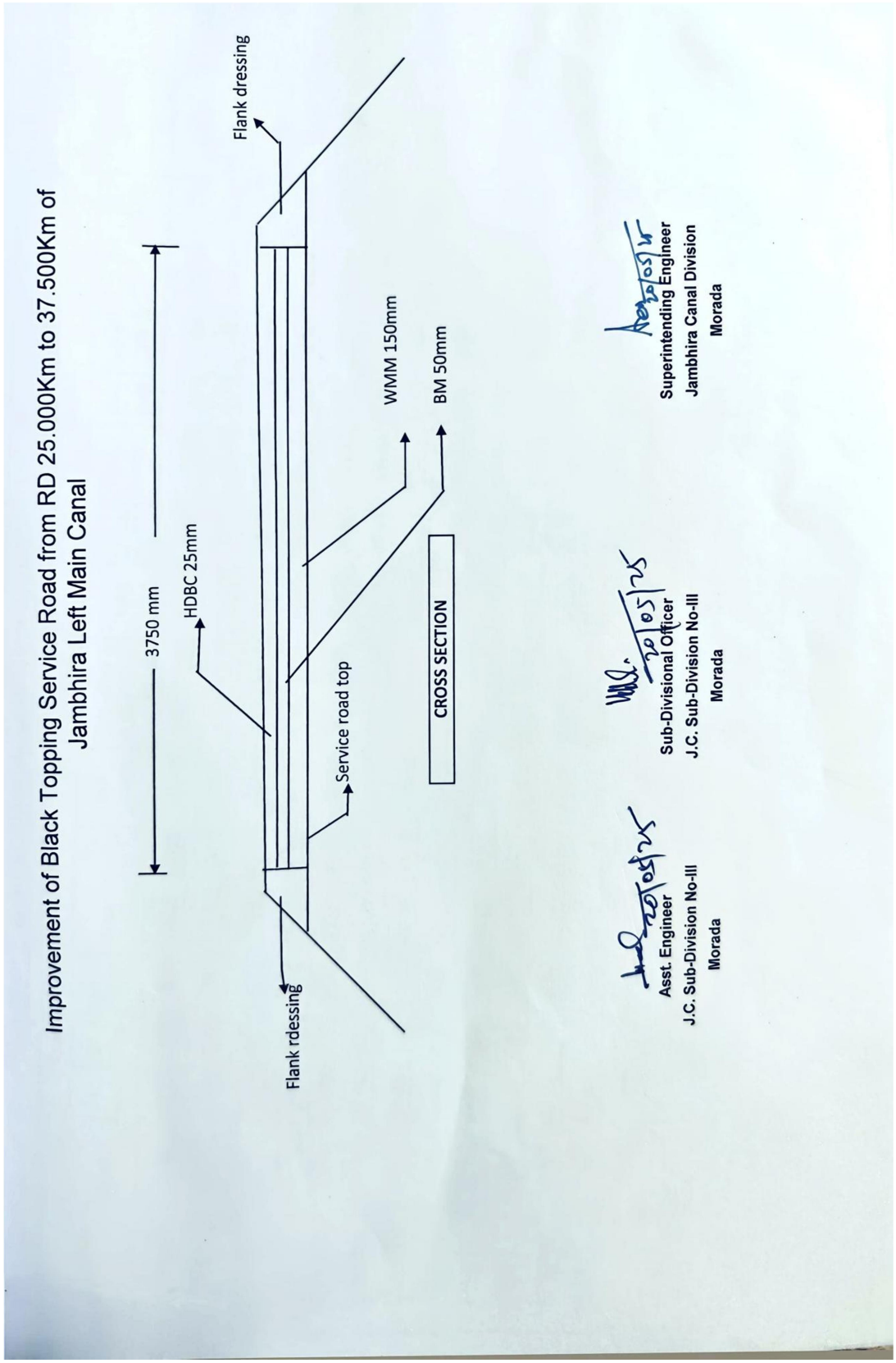
8.13.9 WEATHER AND SEASONAL LIMITATIONS

Semi-dense bituminous concrete carpet shall not be laid during rainy weather or when the base/binder course is damp or wet, and normally when the atmospheric temperature in the shade is 15°C or less.

CHAPTER-VI

DRAWINGS

(Tender purpose, not for execution)



CONTRACTOR (AGENCY) SUPERINTENDING ENGINEER