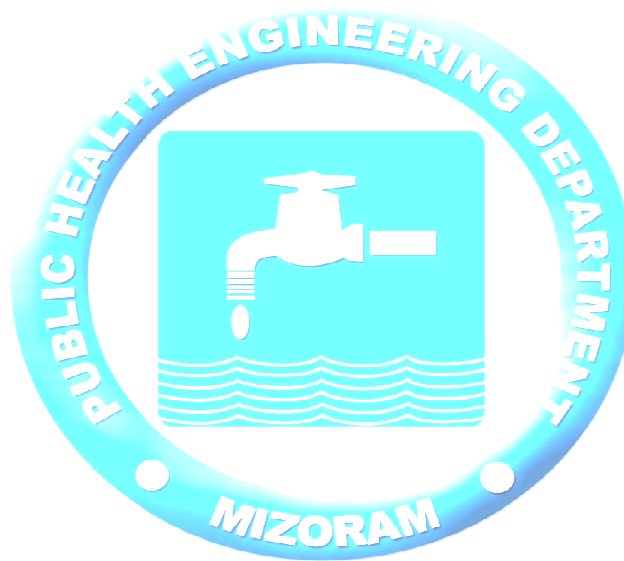


**GOVERNMENT OF MIZORAM
PUBLIC HEALTH ENGINEERING DEPARTMENT**

Tender Amount: Rs. 1,06,43,000.00



TENDER NO. 7 OF 2022-2023/CWC

TENDER DOCUMENT

FOR

**CONSTRUCTION OF UNDERGROUND RESERVOIR FOR NE
DILTLANG W/S/S**

PRESS TENDER NOTICE
PUBLIC HEALTH ENGINEERING DEPARTMENT
TENDER NOTICE

The Superintending Engineer, PHED, Champhai WATSAN Circle, Champhai on behalf of the Governor of Mizoram invites bids in two envelope system with sealed item rate tender in prescribed form affixing Court Fee Stamp worth Rs. 7.5/- (non refundable) for non tribal and up-to-date House Tax Payee Certificate for tribal from reputed contractors experienced in similar type of works. The tender will be received in the office of the undersigned upto **12:00 hours** on **13.09.2022**. Late submission of tender will not be accepted. The tender so received will be opened on **13.09.2022 at 13:00 hours** in presence of the intending tenderer or his authorized representative. If for any unforeseen reason, the Tenders could not be received & opened on the stipulated date & time, the same will be received and opened in the next working day at the same time for which no separate communication will be made.

NIT No.	Name of Work	Tendered Amount (in Rs)	Earnest Money (in Rs)	Time of Completion	Cost of Tender. (in Rs)
7 of 2022-23/CWC	Construction of Underground reservoir of 18 lakh litre capacity with RCC Lining for NE Diltlang W/S/S.	1,06,43,000.00	2,13,000.00	12 months	1,000.00

Detailed tender documents may be obtained from the Office of the undersigned on any working days from **16.08.2022 to 12.09.2022** on payment of Tender Cost as mentioned above (non -refundable) without which, the tender shall summarily be rejected. The undersigned reserves the right to reject any or all of the tenders without assigning any reason thereof.

Sd/-
(C. LALHMACHHUANA)
Superintending Engineer, PHED
Champhai WATSAN Circle, Champhai.

Copy to-

1. PS to Hon'ble Minister, PHED, Mizoram for favour of kind information.
2. The Secretary (PHED), Govt. of Mizoram for favour of kind information.
3. The Engineer-in-Chief (PHED), for favour of kind information.
4. The Chief Engineer Zone-I (PHED), for favour of kind information.
5. The Chief Engineer Zone-II (PHED), for favour of kind information.
6. The Executive Engineer (PHED), Champhai WATSAN Division, Champhai for information.
7. Director, Information and Public Relation, Aizawl, Mizoram for information and with a request to publish the Tender Notice in any two Local News paper for two days.
8. Concerned file.
9. Office Notice board.


Superintending Engineer, PHED
Champhai WATSAN Circle, Champhai.
Champhai.

**OFFICE OF THE SUPERINTENDING ENGINEER
PUBLIC HEALTH ENGINEERING DEPARTMENT
CHAMPHAI WATSAN CIRCLE, CHAMPHAI**

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Item Rate/percentage rate Tender & Contract for Works

- (A) Tender No: 7 of 2022-2023/CWC
- (B) For the work of:-**Construction of Underground Reservoir of 18 lakh litre capacity with RCC lining for NE Diltlang W/S/S.**
- (i) To be submitted by **12:00 hours on 13.09.2022** to
**The Superintending Engineer, PHED
Champhai WATSAN Circle, Champhai.**
- (ii) To be opened in presence of tenderers' who may be present at **13:00 hours on 13.09.2022** in the office of **The Superintending Engineer, PHED
Champhai WATSAN Circle, Champhai**

Issued to:

Signature of officer issuing the documents

Designation:

Date of Issue:

**GOVERNMENT OF MIZORAM
OFFICE OF THE SUPERINTENDING ENGINEER
CHAMPHAI WATSAN CIRCLE
PUBLIC HEALTH ENGINEERING DEPARTMENT**

**NOTICE INVITING TENDER
(TENDER NO 7 OF 2022-2023/CWC)**

The Superintending Engineer, PHED, Champhai WATSAN Circle, Champhai, on behalf of the Governor of Mizoram invites bids in two envelope system with sealed item rate tender from reputed/eligible contractors experienced in similar type of works and registered in appropriate class with Central/ State Govt. Departments/ Undertakings etc. for the work of **Construction of Underground reservoir of 18 lakh litre capacity with RCC Lining for NE Diltlang W/S/S**. The tender will be received in the office of the undersigned upto **12:00 hours** on **13.09.2022**. Late submission of tender will not be accepted. The tender so received will be opened on the same date i.e. **13.09.2022** at **13:00 hours** in presence of the intending tenderer or his authorized representative. If for any unforeseen reason, the quotations could not be received & opened on the stipulated date & time, the same will be received and opened in the next working day at the same time for which no separate communication will be made.

The enlistment of the contractors should be valid on the last date of sale of tenders.

In case the last date of sale of tender is extended, the enlistment of contractor should be valid on the original date of sale of tenders. In case both the last date of receipt of application for issue of tenders and sale of tenders are extended, the enlistment of contractor should be valid on either of the two dates i.e. original date of sale of tender or on the extended date of sale of tenders.

- 1.1 The work is estimated to cost **Rs. 1,06,43,000.00/-**
 - 1.2 Tenders will only be issued to eligible contractors of CPWD/MPHE/MPWD (Class –III& above) and Empanelled Firm under Govt. of Mizoram, provided they produce definite proof from the appropriate authority, which shall be to the satisfaction of the PHE Department.
 2. Agreement shall be drawn with the successful tenderer on prescribed Form No. CPWD 8. Tenderer shall quote his rates as per various terms and conditions of the said form which will form part of the agreement.
 3. The time allowed for carrying out the work will be **12 Months** from the date of start as defined in schedule 'F' or from the first date of handing over of the site, whichever is later, in accordance with the phasing, if any, indicated in the tender documents.
 4. The site for the work is available.
 5. **Important Dates:**
Tender Date: 16.08.2022
Last Date for Issue of Tender Document: 12.09.2022
Last Date for Submission of Tender: 13.09.2022
Technical Bid Opening Date: 13.09.2022
Financial Bid Opening Date: To be informed
- Tender document consisting of plans, specifications, the schedule of quantities of the various classes of work to be done and the set of terms & conditions of contract to be complied with by the contractor whose tender may be accepted and other necessary documents can be seen in the office of the **Superintending Engineer, Champhai WATSAN Circle between hours of 10.00 AM & 3.00 PM from 16.08.2022 to 12.09.2022 every day except on Saturday and Sundays and Public Holidays.**
6. Tender documents and Receipt will be issued from the office of the Superintending Engineer, PHED, Champhai WATSAN Circle, Champhai during the hours specified above, on payment of **Rs. 1,000/-**

(Rupees one thousand five hundred only) in cash.

7. Tenders must be accompanied with **Earnest money** of **Rs. 2,13,000** in the form of Bank Guarantee/ fixed deposit receipt of a scheduled bank/demand draft of a scheduled bank issued in favour of **Superintending Engineer, PHED, Champhai WATSAN Circle**.

The tender and the earnest money shall be placed in separate sealed envelopes, each marked “**Tender**” and “**Earnest Money**” respectively. Both the envelopes shall be submitted together in another sealed envelope with the name of work and due date of opening written on envelope, which will be received by **12:00 PM** on **13.09.2022** and will be opened in his office on the same day at **13:00 PM**. The envelope marked “**Tender**” of only those tenderers, whose earnest money are in order and placed in the other envelope shall be opened, and any tender not accompanied by specified earnest money shall be rejected.

8. **PREPARATION OF BIDS**

8.1 Language of the Bid

8.1.1 All Documents relating to the bid shall be in the English Language.

8.2 Documents Comprising the Bid

8.2.1 The bid to be submitted by the bidder shall be in two separate parts:

Part I shall be named “**Technical Bid**” and shall comprise

- i) Undertaking and form of tender submission as specified in Sample form alongwith Tender Document duly signed on each pages by the tenderer with date.
- ii) House Tax Payee Certificate (Original)
- iii) Tribal Certificate
- iv) Tax Clearance Certificate
- v) Valid Contractor Registration Certificate alongwith Qualification Information and supporting documents as specified in SI No. 1.2 of CPWD Form-6
- vi) Undertaking in prescribed format as provided in Sample Forms
- vii) Documents to be provided as specified in Schedule ‘F’ under Clauses 10A,18 and 36
- viii) Affidavit in prescribed format as provided in Sample Forms

Part II shall be named “**Financial Bid**” and shall comprise

- i) Form of Bid as specified in Sample Forms
- ii) Schedule of Quantities for Items specified in Schedule ‘A’.
- iii) Bill of Quantity as provided in Annexure 4.

Each part (Part-I Technical Bid & Part-II Financial Bid) will be separately sealed, marked in accordance with the Sealing and Marking Instructions in SI No. 7 of CPWD form-6 and shall be placed inside the aforementioned envelope marked “Tender”.

9. The description of the work is as follows:


Name of work: **Construction of Underground reservoir of 18 lakh litre capacity with RCC Lining for NE Diltlang W/S/S.**

Tenderers are advised to inspect and examine the site and its surroundings and satisfy themselves before submitting their tenders as to the nature of the ground and sub-soil (so far as is practicable), the form and nature of the site, the means of access to the site, the accommodation they may require and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their tender. A tenderer shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charge consequent on any misunderstanding or otherwise shall be allowed. The tenderer shall be responsible for arranging and maintaining at his own cost, all materials, tools & plants, water, electricity access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents.

Submission of a tender by a tenderer implies that he has read this notice and all other contract documents and has made himself aware of the scope and specifications of the work to be done and of conditions and rates at which stores, tools and plant, etc. will be issued to him by the Government and local conditions and other factors having a bearing on the execution of work.

10. The Department does not bind itself to accept the lowest or any other tender and reserves the authority to reject any or all the tenders received without the assignment of any reason. All tenders in which any of the prescribed condition is not fulfilled or any condition including that of conditional rebate is put forth by the tenderer shall be summarily rejected.
11. Canvassing whether directly or indirectly, in connection with tenderers is strictly prohibited and the tenders submitted by the contractors who resort to canvassing will be liable to rejection.
12. The competent authority on behalf of Governor of Mizoram reserves to himself the right of accepting the whole or any part of the tender and the tenderer shall be bound to perform the same at the rate quoted.
13. The contractor shall not be permitted to tender for works in the Circle/ Division responsible for award and execution of contracts, in which his near relative is posted as Divisional Accountant or as an officer in any capacity between the grades of Superintending Engineer and Junior Engineer (both inclusive). He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any Gazetted Officer in the Department. Any breach of this condition by the contractor would render him liable to be removed from the approved list of contractors of this Department.
14. No Engineer of gazette rank or other Gazetted Officer employed in Engineering or Administrative duties in an Engineering Department of the Government of Mizoram is allowed to work as a contractor for a period of one year after his retirement from Government service, without the previous permission of the Government of Mizoram in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found any time to be such a person who had not obtained the permission of the Government of Mizoram as aforesaid before submission of the tender or engagement in the contractor's service.
15. The tender for the works shall remain open for acceptance for a period of 90 days from the date of opening of tenders. If any tenderer withdraws his tender before the said period or issue of letter of acceptance, whichever is earlier, or makes any modifications in the terms and conditions of the tender which are not acceptable to the department, then the Government shall, without prejudice to any other right or remedy, be at liberty to forfeit 50% of the said earnest money as aforesaid. Further the tenderer shall not be allowed to participate in the retendering process of the work.
16. The contractor shall be required to deposit an amount equal to **3% (three percent)** of awarded value of work as **Performance Guarantee** in the form of an irrevocable bank Guarantee Bonds of any Scheduled Bank or State Bank of India in accordance with the form prescribed or in the form of Government Securities or fixed deposit receipts etc. within period specified in schedule 'F' from the date of issue of letter of acceptance. This period can be further extended by the Engineer-in-charge upto a maximum period as specified in Schedule 'F' on written request of the contractor stating the reason for delays in procuring the said Guarantee, to the satisfaction of the Engineer-in-charge. In case of failure by the contractor to supply the performance guarantee within the specified, full earnest money shall be forfeited.
17. This notice inviting Tender, along with latest **General conditions of Contract for CPWD Works** shall form a part of the contract document. The successful tenderer/contractor, on acceptance of his tender by the Accepting Authority shall within 10 days from the stipulated date of start of the work, sign the contract consisting of:-
 - a) The Notice Inviting Tender, all the documents including additional conditions, specifications and drawings, if any, forming the tender as issued at the time of invitation of tender and acceptance thereof together with any correspondence leading thereto.
 - b) Standard C.P.W.D. Form 8 and 2-Envelops Bidding System
18. The department shall deduct CESS @ 1% on the value of work done from each bill of the contractor as per prevailing Government instruction/orders. In lieu, the department shall issue a certificate of deduction of the Tax at source to the contractor.
19. **Quoted rate above the tendered amount and below 3% of tendered amount shall be summarily rejected.**
20. No tender will be considered for acceptance unless the detailed tender papers are duly purchased by the intending tenderer. A copy of the receipt for the money deposited against purchase of the tender document shall have to be submitted along with the tender as a proof of purchasing the same.

21. **Tenderer has to read carefully and accept and comply with all terms and conditions of this tender laid down herein. The tender should sign on both sides of each paper as a token of acceptance of all terms and conditions of this tender.**
Technical Bid includes all technical and commercial offers of the tenderer.
Financial Bid includes price bid of all items included in Schedule 'A';
Financial Bid should contain only "Schedule-A" of "Proforma of Schedules" including BOQ as provided in Annexure 4; Overwriting should be avoided.
22. Defect liability period of the contract shall be 12 (twelve) months from the date of handing over the asset to the Department. Any defect noticed during this period shall have to be rectified by the contractor at his/ their own cost and risk.
23. The Public Health Engineering Department, Govt. of Mizoram, reserves the right to add, amend or to delete any of the items of work or part thereof and the contractor shall carry out the same as per the instruction of the Engineer-in-Charge.
24. The Public Health Engineering Department, Govt. of Mizoram takes no responsibility for delay, loss or non-receipt of tenders sent by post. Unsealed tenders or Telex/Telegraphic/Fax offers shall not be considered for acceptance.
25. The tender documents shall remain the property of the Public Health Engineering Department, and if obtained by one intending tenderer, shall not be used by any other tenderer.
26. The tender shall be completely filled in all respects and shall be tendered together with requisite information. Any tender incomplete in all particulars shall be liable to be rejected.
27. If any contradiction arises in any clauses of the NIT, clauses in CPWD form-8 supersede all other clauses of the NIT.


(C.LALHMACHHUANA)
Superintending Engineer, PHED
Champhai WATSAN Circle, Champhai

GENERAL CONDITIONS OF CONTRACT

1. Signing of contract		Successful tenderer/contractor, on acceptance of his tender by the accepting authority, shall, within 10 days from the date of issue of letter of intent, sign contract agreement.
2. Performance guarantee	i	Contractor shall submit an irrevocable performance guarantee of 3% (three percent) of Contract amount within 10(ten) days from the date of issue of LOI.
	ii	The performance guarantee shall be valid up to the stipulated date of completion plus 60 days beyond that.
	iv	In the event of the contract being terminated or rescinded, the performance guarantee shall stand forfeited in full and shall be absolutely at the disposal of the Governor of Mizoram.
3. Recovery of security deposit		An amount of 5% of the gross amount of each bill shall be deducted as a security deposit. This amount shall be released after defect liability period.
4. Compensation for delay	(i)	For delay of work, the contractor shall pay compensation to the government @ 1.5% per month not exceeding 10% of the tendered value of work or of the tendered value of the item or group of completed items of work.
	(ii)	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.
5. Time and extension		Time allowed for execution of the work or extended time as specified shall be the essence of the contract.
6. Terms and conditions of payment		<ol style="list-style-type: none"> 1. Payment will be made to the contractor in time on submission of bills based on progress of the work subject to availability of fund. 2. The contractor shall be at liberty to submit bills for payment every month during the construction period. While payment of such bills, an amount of 5% of the gross amount of each bill shall be deducted as a security deposit.

<p>7. Materials to be provided by the contractor</p>	<p>The contractor shall, at his own expense, provide all materials, required for the works other than those which are stipulated to be supplied by the government.</p> <p>The contractor shall, at his own expense and without delay; supply to the engineer-in-charge samples of materials to be used on the work and shall get these approved in advance. All such materials to be provided by the contractor shall be in conformity with the specifications laid down or referred to in the contract. The contractor shall, if requested by the engineer-in-charge furnish proof, to the satisfaction of the engineer-in-charge that the materials so comply. The engineer-in-charge shall within thirty days of supply of samples or within such further period as he may require intimate to the contractor in writing whether samples are approved by him or not. If samples are not approved, the contractor shall forthwith arrange to supply to the engineer-in-charge for his approval, fresh samples complying with the specifications laid down in the contract. When materials are required to be tested in accordance with specifications, approval of the engineer-in-charge shall be issued after the test results are received.</p> <p>The contractor shall at his risk and cost submit the samples of materials to be tested or analyzed and shall not make use of or incorporate in the work any materials represented by the samples until the required tests or analysis have been made and materials finally accepted by the engineer-in-charge. The contractor shall not be eligible for any claim or compensation either arising out of any delay in the work or due to any corrective measures required to be taken on account of and as a result of testing of materials.</p> <p>The contractor shall, at his risk and cost, make all arrangements and shall provide all facilities as the engineer-in-charge may require for collecting, and preparing the required number of samples for such tests at such time and to such place or places as may be directed by the engineer-in-charge and bear all charges and cost of testing unless specifically provided for otherwise elsewhere in the contract or specifications. The engineer-in-charge or his authorized representative shall at all times have access to the works and to all workshops and places where work is being prepared or from where materials, manufactured articles or machinery are being obtained for the works and the contractor shall afford every facility and every assistance in obtaining the right to such access.</p> <p>The engineer-in-charge shall have full powers to require the removal from the premises of all materials which in his opinion are not in accordance with the specifications and in case of default, the engineer-in-charge shall be at liberty to employ at the expense of the contractor, other persons to remove the same without being answerable or accountable for any loss or damage that may happen or arise to such materials. The engineer-in-charge shall also have full powers to require other proper materials to be substituted thereof and in case of default, the engineer-in-charge may cause the same to be supplied and all costs which may attend such removal and substitution shall be borne by the contractor. The contractor shall, at his own expense, provide a material testing lab at the site for conducting routine field tests. The lab shall be equipped at least with testing equipments.</p>
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8. Mobilization advance	Mobilization advance of 10% of the contract value at 10% per annum simple interest shall be given to the contractor if applied for in writing.
9. Work to be executed in accordance with specifications, drawings, orders, etc.	<p>The contractor shall execute the whole and every part of the work in the most substantial and workmanlike manner both as regards materials and otherwise in every respect in strict accordance with the specifications. The contractor shall also conform exactly, fully and faithfully to the design, drawings and instructions in writing in respect of the work signed by the engineer-in-charge and the contractor shall be furnished free of charge one copy of the contract documents together with specifications, designs, drawings and instructions as are not included in the standard specifications of Central Public Works Department or in any Bureau of Indian Standard or any other, published standard or code or schedule of rates or any other printed publication referred to elsewhere in the contract.</p> <p>The contractor shall comply with the provisions of the contract and with the care and diligence execute and maintain the works and provide all labor and materials, tools and plants including for measurements and supervision of all works, structural plans and other things of temporary or permanent nature required for such execution and maintenance in so far as the necessity for providing these, is specified or is reasonably inferred from the contract. The contractor shall take full responsibility for adequacy, suitability and safety of all the works and methods of construction.</p>
10. Foreclosure of contract due to abandonment or reduction in scope of work	<p>If at any time after acceptance of the tender, government shall decide to abandon or reduce the scope of the works for any reason whatsoever and hence not require the whole or any part of the works to be carried out, the engineer-in-charge shall give notice in writing to that effect to the contractor and the contractor shall act accordingly in the matter. The contractor shall have no claim to any payment of compensation or otherwise whatsoever, on account of any profit or advantage which he might have derived from the execution of the works in full but which he did not derive in consequence of the foreclosure of the whole or part of the works.</p> <p>The contractor shall be paid at contract rates, full amount for works executed at site.</p>
11. Suspension of work	<p>(i) The contractor shall, on receipt of the order in writing of the engineer-in-charge, (whose decision shall be final and binding on the contractor) suspend the progress of the works or any part thereof for such time and in such manner as the engineer-in-charge may consider necessary so as not to cause any damage or injury to the work already done or endanger the safety thereof:</p> <p>The contractor shall, during such suspension, properly protect and secure the works to the extent necessary and carry out the instructions given in that behalf by the engineer-in-charge.</p>
12. Compensation incase of delay of supply of material By government.	The contractor shall not be entitled to claim any compensation from government for the loss suffered by him on account of delay by government in the supply of materials where such delay is covered by the difficulties relating to the supply of wagons, force majeure or any reasonable cause beyond the control of the government.

	This will not be applicable for works where no material is stipulated.
13. Action in case work not done as per specifications	All works under or in course of execution or executed in pursuance of the contract, shall at all times be open and accessible to the inspection and supervision of the engineer-in-charge, his authorized subordinates in charge of the work and all the superior officers, officers of the quality assurance unit of the department or any organization engaged by the department for quality assurance and of the Chief Technical Examiner's office, and the contractor shall, at all times, during the usual working hours and at all other times at which reasonable notice of the visit of such officers has been given to the contractor, either himself be present to receive orders and instructions or have a responsible agent duly accredited in writing, present for that purpose. Orders given to the contractor's agent shall be considered to have the same force as if they had been given to the contractor himself.
14. Contractor liable for injuries, damages, defects	If the contractor or his working people, equipments or machineries cause injury to human/animals or break, deface, destroy any property or cause any damage to any item of the work, from any cause whatever or if any defect or other faults appear in the work, the contractor shall upon receipt of a notice in writing on that behalf make the same good at his own expense.
15. Contractor to supply tools & plants etc.	The contractor shall provide at his own cost all materials, machinery, tools & plants required for work execution and maintenance.
16. Labor laws to be complied by the contractor	<p>(i) The contractor shall obtain a valid license under the Contract Labour (R&A) Act, 1970, and the Contract Labour (Regulation and Abolition) Central Rules, 1971, before the commencement of the work, and continue to have a valid license until the completion of the work. The contractor shall also abide by the provisions of the Child Labour (Prohibition and Regulation) Act, 1986.</p> <p>The contractor shall also comply with the provisions of the building and other Construction Workers (Regulation of Employment & Conditions of Service) Act, 1996 and the building and other Construction Workers Welfare Cess Act, 1996.</p> <p>Any failure to fulfill these requirements shall attract the penal provisions of this contract arising out of the resultant non-execution of the work.</p>
	(ii) No labour below the age of eighteen years shall be employed on the work.

	(iii)The engineer-in-charge may require the contractor to dismiss or remove from the site of the work any person or persons in the contractors' employ upon the work who may be incompetent or misconduct himself and the contractor shall forthwith comply with such requirements. In respect of maintenance/ repair or renovation works etc. where the labour have an easy access to the individual houses, the contractor shall issue identity cards to the laborers, whether temporary or permanent and he shall be responsible for any untoward action on the part of such labour. AE/JE will display a list of contractors working in the colony/Blocks on the notice board in the colony and also at the service centre, to apprise the residents about the same.
17. Work to be executed as per the approval of engineer-in-charge	All works to be executed under the contract shall be executed under the direction and subject to the approval of the engineer-in-charge 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.
18. Settlement of disputes & arbitration	All questions and disputes relating to the meaning of the specifications, design, drawings and instructions here-in before mentioned and as to the quality of workmanship or materials used on the work or as to any other question, claim, right, matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or these conditions or otherwise concerning the works or the execution or failure to execute the same whether arising during the progress of the work or after the cancellation, termination, completion or abandonment thereof shall be dealt by a Dispute Redressal Committee duly constitute by the State Government:
19. Levy /taxes payable by contractor	(i) Sales tax/VAT/ GST, etc. Building and other Construction Workers Welfare Cess or any other tax or Cess in respect of this contract shall be payable by the contractor and government shall not entertain any claim whatsoever in this respect.
20. Termination of contract on death of contractor	Without prejudice to any of the rights or remedies under this contract, if the contractor dies, the divisional officer on behalf of the Governor of Mizoram shall have the option of terminating the contract without compensation to the contractor.

GENERAL RULES AND DIRECTIONS

Officer inviting Tender:	Superintending Engineer, PHED Champhai WATSAN Circle, Champhai
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Definitions:

2(v)	Engineer-in-charge	Executive Engineer, PHED Champhai WATSAN Division, Champhai
2(viii)	Accepting authority	Chief Engineer, Zone-II, PHED. Mizoram
2(xi)	Standard schedule of rate	MPWD/PHE Schedule of Rates
2(xii)	Department	PHED Govt. of Mizoram
9(ii)	Latest standard CPWD Contract Form GCC	Applicability of the Clauses under CPWD Form 8 for this particular tender are listed below

Clause 1:

1	Time allowed for submission of performance guarantee from the date of issue of letter of intent:	10 Days
2	Maximum allowable extension beyond the period provided in (1) above	5 Days

Clause 1(A):

I	Security deposit	5% of contract amount
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Clause 2:

I	Authority for fixing compensation under clause 2:	SE
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Clause 2A (Incentive for early completion):

i	Whether Clause 2A shall be applicable	No
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Clause 3& 3A (When contract can be terminated):Applicable.

Clause 4 (Contractor liable to pay compensation even if action not taken under Clause3):Applicable.

i	Number of days from the date of issue of letter of intent for reckoning date of start:	15 Days	
ii	Milestone(s) as per table given below:-		
Sl. No	Description of milestone (Physical)	Time allowed in days for execution of work (from date of start)	Amount to be withheld in case of non-achievement of milestones
	No description of milestone (Physical) in The DPR	As before column	Penalty clause applicable as per clause-2 of CPWD Form-8.
	“NIL”	“ NIL”	
iii	Time allowed for execution of work::		12 Months

iv	Authority to decide:		
	(i) Extension of time:		As per CPWD Works Manual
	(ii) Rescheduling of mile stones:		SE i/c

Clause 5 (Time and extension for delay):

Clause 6, 6A (Measurements of work done) : Applicable

Clause 7 (Payment on inter to intermediate certificate to be regarded as advances) : Not applicable

Gross work to be done together with net payment /adjustment of advances for material collected, if any, since the last such payment for being eligible to interim payment:	Rs.....
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Clause 8, 8A and 8B (Completion Certificate and Completion Plans) : Applicable

Clause 9 (Payment of bill): Payment will be made depending on the availability of fund and no other claims shall be made by the contractor. Interest shall not be claimed by the contractor if payment is not made due to unavailability of fund.

Clause 10A (Materials to be provided by contractor):All materials will be provided by the contractor at his own expense.

List of testing equipment to be provided by the contractor at site lab (Contractor may list down all testing equipments).

1		2		3	
4		5		6	

Clause 10B(ii): Mobilization advance: Applicable if the contractor made a request in writing provided fund is available.

Clause 10C:Payment on account of increase in price/wages due to statutory orders:Not applicable.

Clause 10CA: Payment due to variation in prices of materials after receipt of tender: Not applicable

Clause 10CC: Payment due to increase/decrease in prices/wages: Not applicable

Clause 10D: Dismantled materials Govt. property: Applicable.

Clause 11:Applicable, all specification and appropriate latest IS Code and CPHEEO Manual will be followed for each item.

Clause 12: Deviation on extra items, substituted items, quantities etc. :Applicable

Clause 13: Foreclosure of contract due to abandonment or reduction in scope of work: Applicable

Clause 14: Carrying out part work at risk & cost of contractor: Applicable

Clause 15: Suspension of work: Applicable

Clause 16:Action in case work not done as per specifications : Applicable

Clause 17: Contractor liable for damages, defects during maintenance period :Applicable

Clause 18: Contractor to supply tools and plants :

List of mandatory machinery, tools & plants to be owned or leased by the contractor are as follow. Contractor has to list down the items with quantity, owned or leased and related documents must be furnished.

Sl.No.	Item Description	Quantity	Unit	Owned/Leased
1	Generator 3 KVA or more capacity	1	No	
2	Concrete mixer of full bag capacity or more	1	No	
3	Needle vibrator (Electric driven)	1	No	
4	Needle vibrator (Engine driven)	1	No	
5	Excavator	1	No	
6	Pickup/ tipper four wheel drive	1	No	
7	Concrete slump testing cone	1	No	
8	Jackhammer	1	No	
9	Digital clamp meter (AC/DC)	1	No	
10	Safety equipments			
	a. Safety helmets	10	No	
	b. Safety harness	4	No	
	c. Ropes	5	No	
	d. Fire extinguishers	4	No	
	e. First aid kits	4	No	

Clause 18A & 18 B:Applicable

Clause 19 (Labour Laws to be complied by the contractor) :Applicable

Clause 20 (Minimum Wages Act to be complied with) :Applicable

Clause 21(Works not to be sublet. Action in case of insolvency) : Applicable

Clause 22: Applicable

Clause 23 (Changes in firm's constitution to be intimated) : Applicable

Clause 24: Applicable

Clause 25: (Settlement of disputes & arbitration) :Applicable

Constitution of Dispute Redressal Committee (DRC)	Competent authority to appoint
As per provisions of CPWD Works Manual.	Secretary to the Govt. of Mizoram, PHE Department.

Clause 26: (Contractor to indemnify Govt. against patent rights) :Applicable

Clause 27: (Lumpsum provisions in tender) :Applicable

Clause 27: (Lumpsum provisions in tender) :Applicable

Clause 28: (Action where no specifications are specified) :Applicable

Clause 29 & 29A: (Withholding and lien in respect of sum due from contractor) :Applicable

Clause 31, 31A & 32: (Water supply) :Applicable

Clause 33: (Return of surplus materials) :Applicable

Clause 34: (Hire of plant & machinery) :Applicable

Clause 35: (Condition relating to use of asphaltic materials) :Applicable

Clause 36 (i): These are minimum requirement. If available, in addition to this may also be mentioned.

Sl No	Minimum qualification of technical representative	Discipline	Number	Experience Required
1	Graduate engineer	Civil	1	3 yrs
4	Diploma engineer	Civil	1	2 yrs

Note: A retired assistant engineer from government service holding diploma will be treated at par with graduate engineers.

Clause 37: (Levy/Taxes payable by contractor) :Applicable.

Clause 38: Conditions for reimbursement of levy/taxes if levied after receipt of tender :Not applicable.

Clause 39:(Termination of contract on death of contractor) : Applicable

Clause 40:(If relative working in the department then contractor not allowed to tender) : Applicable

Clause 41:(No gazette engineer to work as contractor within one year of retirement) : Applicable

Clause 43: Compensation during war situations:Not applicable

PROFORMA OF SCHEDULES

(Operative Schedules to be supplied separately to each intending tenderer)

SCHEDULE - 'A'

Schedule of Quantities (as per PWD – 3). **Quoted rate should be both in figure and words.**

Sl.No	Name of work	Unit	Quoted rate in figure (In Rs.)	Quoted Rate In words
1	Construction of Underground Reservoir of 18 lakh litre capacity with RCC lining for NE Diltlang W/S/S	Job		

SCHEDULE - 'B'

Schedule of materials to be issued to the contractor:-**Note: No materials will be issued to the contractor.**

SCHEDULE - 'C'

Tools and plants to be hired to the contractor:-**Note: Tools and Plants should be arranged by the contractor.**

SCHEDULE - 'D'

Extra schedule for specific requirements/ document for the work, if any :-**As per Annexure-1 to Annexue-4.**

SCHEDULE - 'E'

Reference to General Conditions of contract.

Name of Work: **Construction of Underground Reservoir of 18 lakh litre Capacity with RCC lining For NE Diltlang W/S/S.**

Estimated cost of work:	Rs. 1,06,43,000.00
(i) Earnest Money:	Rs. 2,13,000.00
(ii) Performance Guarantee:	Rs. 3 % of awarded amount
(iii) Security Deposit:	Rs. 3 % of the awarded amount

SCHEDULE - 'F' (General Rules and Directions)

SAMPLE FORMS

UNDERTAKING AND FORM OF TENDER SUBMISSION

I/We have read and examined the notice inviting tender, schedules A, B, C, D, E & F, Specifications applicable, Drawings & Designs, General Rules and Directions, Conditions of Contract, Clauses of contract, Special conditions, Additional conditions, Schedule of Rate & other documents and Rules referred to in the conditions of contract and all other contents in the tender document for the work.

I/We hereby tender for the execution of the work specified for the Governor of Mizoram within the time specified in Schedule 'F' viz., schedule of quantities and in accordance in all respect with the specifications, designs, drawing and instructions in writing referred to in Rule-1 of General Rules and Directions and in Clause 11 of the Conditions of contract and with such materials as are provided for, by, and in respect of accordance with, such conditions so far as applicable.

We agree to keep the tender open for ninety (90) days from the due date of its opening and not to make any modification in its terms and conditions.

A sum of Rs. 2,13,000.00 is hereby forwarded as Earnest Money in the form of treasury challan/fixed deposit receipt of scheduled bank/demand draft of a scheduled bank/ Irrevocable Bank Guarantee issued by a scheduled bank. If I/We fail to furnish the prescribed Performance Guarantee within prescribed period, I/We agree that the Governor of Mizoram shall be, without prejudice to any other right or remedy, at liberty to forfeit the said earnest money absolutely. Further, if I/We fail to commence work as specified, I/We agree that Governor of Mizoram shall, without prejudice to any other right or remedy available in law, be at liberty to forfeit the said earnest money and the performance guarantee absolutely, otherwise the said earnest money shall be retained by him towards security deposit to execute all the works referred to in the tender documents upon the terms and conditions contained or referred to those in excess of that limit at the rates to be determined in accordance with the provision contained in Clause 12.2 and 12.3 of the tender form. Further, I/We agree that in case of forfeiture of Earnest Money & Performance Guarantee as aforesaid. I/We shall be debarred for participation in the re-tendering process of the work.

I/We undertake and confirm that eligible similar work(s) has/have not been executed by us/through another contractor on back to back basis. Further that, if such a violation comes to the notice of Department, then I/We shall be debarred for tendering in PHE DEPARTMENT in future forever. Also, if such a violation comes to the notice of Department before date of start of work, the Engineer-in-Charge shall be free to forfeit the entire amount of Earnest Money Deposit/Performance Guarantee.

I/We hereby declare that I/We shall treat the tender documents drawings and other records connected with the work as secret/confidential documents and shall not communicate information/derived there from to any person other than a person to whom I/We am/are authorized to communicate the same or use the information in any manner prejudicial to the safety of the State.

Dated:

Witness

Signature :

Name :

Address :

.....

Occupation :

Signature of Contactor :

Name of Contractor :

Postal Address :

.....

Contact No. :

**Form of Earnest Money Deposit
Bank Guarantee Bond**

WHEREAS, (Name of contractor) (hereinafter called "the contractor") has submitted his tender dated for the construction of (name of work) (hereinafter called "the Tender")

KNOW ALL PEOPLE by these presents that we (name of bank) having our registered office at (hereinafter called "the Bank") are bound unto (Name and division of Executive Engineer) (hereinafter called "the Engineer-in-Charge") in the sum of Rs. (Rs. in words) for which payment well and truly to be made to the said Engineer-in-Charge the Bank binds itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this ... day of ... 20...
THE CONDITIONS of this obligation are:

- (1) If after tender opening the Contractor withdraws, his tender during the period of validity of tender (including extended validity of tender) specified in the Form of Tender;
- (2) If the contractor having been notified of the acceptance of his tender by the Engineer in-Charge:
 - (a) fails or refuses to execute the Form of Agreement in accordance with the Instructions to contractor, if required;
OR
 - (b) fails or refuses to furnish the Performance Guarantee, in accordance with the provisions of tender document and Instructions to contractor,
OR
 - (c) fails or refuses to start the work, in accordance with the provisions of the contract and Instructions to contractor,
OR
 - (d) fails or refuses to submit fresh Bank Guarantee of an equal amount of this Bank Guarantee, against Security Deposit after award of contract.

We undertake to pay to the Engineer-in-Charge up to the above amount upon receipt of his first written demand, without the Engineer-in-Charge having to substantiate his demand, provided that in his demand the Engineer-in-Charge will note that the amount claimed by him is due to him owing to the occurrence of one or any of the above conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date* ... after the deadline for submission of tender as such deadline is stated in the Instructions to contractor or as it may be extended by the Engineer-in-Charge, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this Guarantee should reach the Bank not later than the above date.

DATE ...

WITNESS ...

SIGNATURE OF THE BANK

SEAL

(SIGNATURE, NAME AND ADDRESS)

*Date to be worked out on the basis of validity period of 6 months from last date of receipt of tender.

FORM OF BID

Description of the works:-

.....
.....

BID : NIT no. 7 of 2022-2023/CWC Date. 16.09.2022
To : The Superintending Engineer, PHED, Champhai WATSAN Circle, Champhai
Address :

1. We offer to execute the Works described above and remedy any defects therein in conformity with the conditions of Contract, specification, drawing, Bill of Quantities and Addenda for the sum(s) of
.....
.....(.....
.....)
2. We undertake, if our Bid is accepted, to commence the Work as soon as in reasonably possible after the receipt of the Engineer's notice to commence, and to complete the whole of the works comprised in the contract within the time stated in the document.
3. We agree to abide by this Bid for the period of 90 days from the date fixed for receiving the same, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
4. Unless and until a formal Agreement is prepared and executed this Bid, together with your written acceptance thereof, shall constitute a binding contract between us.
5. We understand that you are not bound to accept the lowest or any tender you any received.

Signature

(in block capitals or typed)

Address

.....
.....

Witness

.....
.....

Address

.....
.....

Occupation

.....
.....

Sample letter of acceptance of tender

GOVERNMENT OF MIZORAM
OFFICE OF THE
PHE DEPARTMENT,

No.

Dated, the

To

(Name and address of the contractor)

Subject :

.....
(Name of the work as appearing in the tender for the work)

Dear Sir (s),

Your tender for the work mentioned above has been accepted on behalf of the Governor of Mizoram at your tendered/negotiated tender amount of Rs..... (Rupees.....only), which is% below/above the estimated cost of Rs. (Rupees.....only).

2. You are requested to submit the performance security/guarantee of Rs..... (Rupees.....only) within days* of issue of this letter. The performance guarantee shall be in the prescribed form as provided in clause 1 of the General Conditions of Contract for CPWD Works, and shall be valid up to

3. On receipt of the prescribed performance guarantee, necessary letter to commence the work shall be issued, and the site of work handed over to you thereafter.

4. Please note that the time allowed for carrying out the work as entered in the tender (..... days/weeks/months) shall be reckoned from theday* after the date of issue of this letter.

Yours faithfully,

.....
.....

For and on behalf of Governor of Mizoram

.....Division, PHED,

**Form of Performance Security (Guarantee)
Bank Guarantee Bond**

In consideration of the President of India (hereinafter called “The Government”) having offered to accept the terms and conditions of the proposed agreement between.....and (hereinafter called “the said Contractor(s)”) for the work (hereinafter called “the said agreement”) having agreed to production of an irrevocable Bank Guarantee for Rs. (Rupees only) as a security/guarantee from the contractor(s) for compliance of his obligations in accordance with the terms and conditions in the said agreement.

1. We, (hereinafter referred to as “the Bank”) hereby undertake to pay to the Government an amount not exceeding Rs. (Rupees..... Only) on demand by the Government.
2. We,(indicate the name of the Bank) do hereby undertake to pay the amounts due and payable under this guarantee without any demure, merely on a demand from the Government stating that the amount claimed as required to meet the recoveries due or likely to be due from the said contractor(s). Any such demand made on the bank shall be conclusive as regards the amount due and payable by the bank under this Guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. (Rupeesonly)
3. We, the said bank further undertake to pay the Government any money so demanded notwithstanding any dispute or disputes raised by the contractor(s) in any suit or proceeding pending before any court or Tribunal relating thereto, our liability under this present being absolute and unequivocal. The payment so made by us under this bond shall be a valid discharge of our liability for payment thereunder and the Contractor(s) shall have no claim against us for making such payment.
4. We, (indicate the name of the Bank) further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said agreement and that it shall continue to be enforceable till all the dues of the Government under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged or till Engineer-in-Charge on behalf of the Government certified that the terms and conditions of the said agreement have been fully and properly carried out by the said Contractor(s) and accordingly discharges this guarantee.
5. We, (indicate the name of the Bank) further agree with the Government that the Government shall have the fullest liberty without our consent and without affecting in any manner our obligation hereunder to vary any of the terms and conditions of the said agreement or to extend time of performance by the said Contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Government against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor(s) or for any forbearance, act of omission on the part of the Government or any indulgence by the Government to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.
6. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).
7. We, (indicate the name of the Bank) lastly undertake not to revoke this guarantee except with the previous consent of the Government in writing.
8. This guarantee shall be valid up tounless extended on demand by the Government. Notwithstanding anything mentioned above, our liability against this guarantee is restricted to Rs..... (Rupees) and unless a claim in writing is lodged with us within six months of the date of expiry or the extended date of expiry of this guarantee all our liabilities under this guarantee shall stand discharged.

Dated theday offor.....(indicate the name of the Bank)

AFFIDAVIT

1. I, the undersigned, do hereby certify that all the statements made in the required attachments are true and correct.
2. The undersigned also hereby certify that neither our firm M/S _____ has abandoned any works in India nor any contract awarded to us have been rescinded during the last five years prior to the date of this Bid.
3. The undersigned hereby authorize and request any Bank, person, firm or corporation to furnish pertinent information deemed necessary and required by the Department to verify this statement or regarding my (our) competence and general reputation.
4. The undersigned understand and agree that further information may be requested and agrees to furnish any such information at the request of the Department.

(Signature of Authorised Signatory of the Firm) _____

Name of the signatory _____

Title of the signatory _____

Date _____

UNDERTAKING

I, the undersigned do hereby undertake that the Bid submitted by our Firm M/S _____ [name and address of Bidder] is valid for a period of _____ days and valid till _____

Signed by an Authorized Signatory of the firm: _____

Title of the Signatory _____

Name of Firm _____

Date _____

Sample letter for commencement of work

**GOVERNMENT OF MIZORAM
OFFICE OF THE
PHE DEPARTMENT**

No.

Dated, the

To

(Name and address of the contractor)

Subject:

(Name of the work as appearing in the tender for the work)

Ref: 1. Performance security/guarantee submitted by you vide your letter no.....
dated.....for the above work.
2. This office letter of intent/acceptance of your tender no.....date

Dear Sir (s),

1. You are requested to contact the Assistant Engineer/SDO (complete address) for taking possession of site and starting the work at once.

2. In continuation to the letters referred to above, you are requested to attend this office to complete the formal agreement within fifteen days from the date of this letter.

Yours faithfully,

Executive Engineer
For and on behalf of Governor of Mizoram
.....Division,

Sample Agreement Form

THIS AGREEMENT is made on the day of, 2022

BETWEEN

The Executive Engineer, Champhai WATSAN Division, Champhai, Public Health Engineering Department,
Government of Mizoram, on behalf of the Governor of Mizoram (hereinafter called the Employer),
AND
.....(hereinafter called the Contractor).

WHEREAS the Employer desires to engage the Contractor for execution of the Work, viz **Construction of Underground reservoir of 18 lakh litre capacity with RCC Lining for NE Diltlang W/S/S** and the Contractor has agreed to such engagement upon and subject to the terms and conditions hereinafter appearing.

NOW IT IS HEREBY AGREED as follows:

Article 1. Contract Documents

The following documents shall constitute the Contract between the Employer and the Contractor, and each shall be read and construed as an integral part of the Contract:

- i. This Contract Agreement and the Appendices hereto as follows:-

Notice Inviting Tender

General Rules and Directions

Conditions of Contract

Clauses of Contract

General Specifications and Special Conditions`

Schedule of Quantities`

Letter of the contractor submitting the tender

Letter of Intent issued by the Tender Accepting Authority

Letter of The Executive Engineer regarding commencement of the work

CPWD Safety Code

Model Rules for protection of health and sanitary arrangements for workers employed by the CPWD or its contractors

Central PWD Contractor's Labour Regulations

List of Acts and Omissions for which fines can be imposed.

- ii. If there are varying or conflicting provisions made in any one document forming part of the contract, the Tender Accepting Authority shall be the deciding authority with regard to the intention of the document and his decision shall be final and binding on the contractor.

Article 2. Contract Price and Terms of Payment

2.1 Contract Price

The Employer hereby agrees to pay to the Contractor the Contract Price in consideration of the performance by the Contractor of its obligations hereunder. The Contract Price shall be Rs. (Rupees) only which is inclusive of all taxes, cess etc.,

2.2 Terms of Payment

The terms and procedures of payment according to which the Employer will reimburse the Contractor are given in SI No.6 of General Conditions of Contract,

Article 3. Effective Date

3.1 Effective Date

The Effective Date from which the Time for Completion of the whole Works shall be counted is the date 30 (thirty) days after issuance of letter of Intent and subject to fulfillment of the following conditions:

- (a) This Contract Agreement has been duly executed for and on behalf of the Employer and the Contractor;
- (b) The Contractor has submitted to the Employer the performance security/guarantee of Rs.....(Rupees) only in prescribed form with a validity of 60 days beyond the date of completion.

Article 4. Scope of Works & Maintenance

As per Item description in Appendix-5 of Article 1 with 1 (one) years service maintenance and repair.

Article 5. Communications

4.1 The address of the Employer for notice purposes is: **Executive Engineer, PHED Champhai WATSAN Division, Champhai.**

4.2 The address of the Contractor for notice purposes is:

IN WITNESS WHEREOF the Employer and the Contractor have caused this Agreement to be duly executed by their duly authorized representatives the day and year first above written.

Signature: _____
(Z.D. DENGTHUAMA)
Executive Engineer, PHED
Official Seal:

Signature of Authorized : _____
For(Name of Firm)
Name:
Official Seal:

WITNESS:

1. Name :
Profession :
Address :

2. Name :
Profession :
Address:

ANNEXURE-1: GENERAL SPECIFICATIONS

- 1.1** Materials and methods of construction for all civil works shall be as per relevant Indian standard specification; part of which are incorporated in the standard specification of PHED and MPWD and all will be followed during the execution of the work. The work shall be executed as per the guidelines and provisions of B.I.S. All materials shall conform to Indian standard code of practice National Building Code and CPHEEO manual to maintain quality of work.
- 1.2** All materials to be used shall conform to the relevant specifications as per the latest version of the Indian Standards, unless otherwise stated in the detailed specifications of items of work. A set of specimen samples of all approved materials shall be kept in bottle or otherwise at site, cost of which is to be borne by the contractor.
- 1.3** Water required for the execution of the work and for the water tightness test of the reservoir shall be supplied by the contractor at his own cost in satisfactory manner to the Engineer-in-Charge of work.
- 1.4** The hydraulic test of water retaining structure shall have to be given by the contractor without any extra cost. The filling of the reservoir shall be carried out gradually at the rate not exceeding 30 cm rise in water level per hour and shall not exceed 2.0 meter in 24 hours and total period of 72 hours. Records of leakage starting at different levels of water in the reservoir if any shall be kept. The reservoir once filled shall be allowed to remain filled for seven days before any readings of drop in water level are recorded. The level of the water shall be recorded again at subsequent intervals of 24 hours over a period of seven days. The total drop in surface level over a period of seven days shall be taken as an indication of the water tightness of the reservoir, which for all practical purposes shall not exceed 40 mm.
- If the structure does not satisfy the condition of test and the daily drop in water level is increasing the period of test may be extended for a period of seven days and if the specified limit is then reached the structure may be considered as satisfactory.
- 1.5** If even after extending the period of test, the drop is more than permissible, the contractor should empty the reservoir, rectify the defects in tank, by the re-plastering whenever necessary, applying water proofing paint etc. and give the water tightness test till the drop in level is within the permissible limit. This shall be repeated at the cost of the contractor without claiming extra cost. Any delay in giving water tightness will invite panel action under relevant topics/standards of the tender agreement.
- 1.6 Bricks**
Only 1st class kiln burnt bricks shall be used unless otherwise specified. They shall be of a uniform deep cherry color; thoroughly burnt, regular in shape with sharp and square areas and they must emit a clear ringing sound on being struck.
- They must be free from cracks, chips, flaws, stones or lumps of any kind and they shall not absorb water more than one seventh of their own weight after soaking them in water for 15 minutes. The bricks shall show no sign of efflorescence either dry or subsequent to soaking in water.
- 1.7 Sand**
The source from which sand is to be obtained shall be subject to the approval of Engineer-in-charge. The sand shall be clean, sharp and gritty to touch and be freed from earth and other impurities by washing. The sand shall be washed to such a degree that when a handful is mixed with clean water in a glass and allowed to stand for an hour the precipitate of mud over the sand shall not exceed 5%.
- 1.7.1 Course Sand:** It is to be screened through a sieve of 64 meshes to the square inch so as to exclude large particles from the work. The fineness modulus shall not be less than 1.0
- 1.7.2 Fine sand:** It is to be screened through a sieve of 64 meshes to the square inch so as to exclude large particles from the work. The fineness modulus shall not be less than 2.5. The sand should conform to IS 382-1982 for fine and course aggregates from natural sources.
- 1.7.3 Stone chips:** It shall be obtained from crushing trap quartzite or hard stones and from quarries approved by Engineer-in-charge. It shall be of approved quality and proper grade. It shall pass through ¾ “ mesh and retained on ¼ “ mesh. It shall be free from dirt, leaves, clay and any organic matter. The material conforming generally to IS 383-1983 for course and fine aggregate from natural sources or IS 515-1959 for natural and manufactured aggregates for use in mass concrete with latest revisions.

1.8 Cement

Ordinary or lowest heat Portland cement conforming I.S. 269 –1989 or PPC conforming to IS: 1489 (Part 1 & 2) of Star cement /Top Cem shall be used prior to approval the Engineer-in-charge. All cement shall be fresh when delivered. Cements of different types are not to be mixed with one another. Consignments shall be used in the order of delivery. Admixture, if any, shall be used only after approvals.

1.9 Reinforcement

Steel reinforcement shall be of mild steel of tested quality conforming to I.S.- 432 -1966/ H.Y.S.D. bars conforming to IS -1786/1779- with latest amendments of reputed make.

All the reinforcement shall be clean and free from rust, mild scales, dust, paint, oil, grease, adhering earth or any other material or coating that may impair the bond between the concrete and the reinforcement, or cause corrosion of the reinforcement or disintegration of concrete.

Neither the size nor length of bar or wire shall be less than the size or length described in the bar schedule or elsewhere and the length shall not be more than 50 mm in excess of the length as described.

Welded joints in reinforcement may be used but in cases of important connection, tests shall be made to prove that the joints are of the full strength of bars connected, welding of reinforcement shall be done in accordance with the recommendations of the relevant Indian standards for welding mild steel bars used in the reinforcement concrete construction.

Bending and overlapping, placing in position, fabrication, binding, reinforcement with wire of approved gauge shall be done as per I.S. 432 – 1960 (revised) and I.S. 1786 – 1966 and I.S. 2502 (revised). Handling and storage of materials for concrete or RCC should be followed as per I.S. 4082 –1977.

1.10 Water

The water to be used in making and curing of concrete, mortar etc. shall be free from objectionable quantities of silts, organic matter, injurious amount of oils, acids, salts and other impurities etc. as per IS-456-1978. The Engineer-in-charge or his authorized representatives will determine whether or not such quantities of impurities are objectionable.

Such comparison will usually be made by comparison of compressive strength, water requirement, time of setting and other properties of concrete made with distilled or every clean water and concrete made with the water proposed for use, Permissible limit for solids when tested in accordance with I.S. 3025-1964. Shall be as tabulated below

1) Organic	Permissible limit for solids
Maximum permissible limit.	200 mg/litre.
2) In-organic	3000 mg/litre.
3) Sulphate (As So 4)	500 mg/litre.
4) Chloride (As Cl.)	2000 mg/litre for P.C.C and 1000 mg/litre for R.C.C. work
5) Suspended matter	2000 mg/litre.

If any water to be used in concrete, suspected by the engineer-in-charge/or his authorized representative of exceeding the permissible limits of solids, samples of water will be obtained and get it tested by Engineer-in-charge in accordance with IS:3025-1964.

1.11 Cement Mortar

The motor shall consist of cement and sand mixed in proportion defined in relevant schedule item for various item of work. Only measured quantity shall be used. The sand shall be shovelled in a wooden measure of a clean masonry platform, after removing the measure box and spreading out sand if necessary, the cement (in required proportion) shall be emptied on the top of sand.

The sand and cement shall be then turned over with shovels once dry and made into the form of a hollow cone; into this water can be poured and the whole shall then be turned over completely twice. The color and consistency shall at this stage be quite uniform, if not, further turning shall be done.

Water shall be added by measured quantities if the engineer so direct. Only such quantities of mortar shall be mixed at one time as can be used at once before it can set. No mortar, which has once caked or begun to set, shall be used, nor shall such mortar be remixed; but it shall be removed from the site of the work immediately.

1.12 Cement concrete

The concrete shall consist of an aggregate of the proportion by volume defined in relevant schedule item or work. Only measured quantity shall be used.

1.12.1 Laying: The cement, sand and stone chips shall be mixed properly in mechanical mixer in such a manner as to avoid loss of water. The concrete shall be mixed for minimum period of 2 minutes or until it is of even colour and uniform consistency throughout. As soon as the concrete is mixed it should be removed to the work in iron vessels as rapidly as practicable. The concrete laid will be vibrated for compaction by the vibrators. Slump test will be carried at site during execution of work.

1.12.2 Curing: The concrete laid shall not be disturbed and shall be kept thoroughly damped by means of wet matting and sand until it shall have become thoroughly set and hard enough to prevent its drying and cracking.

The aggregate shall consist of stone ballast of quality approved by Engineer-in-charge and shall consist of graded size 20 mm and down wards as per specification or the size mentioned in the item description. Curing period for PCC shall be 14 days minimum. Use of curing compound shall be opted as per manufacturer's specification.

1.12.3 Formworks: The contractor shall furnish on the site of work sufficient number of centering, moulds or templates for its expeditious execution. The forms shall be made in such a way and of such materials as will ensure a smooth surface on the finished concrete. Forms and centering shall be left in place until the concrete has set sufficiently to permit the removal without danger to the structure.

1.13 Brick masonry work

1.13.1 Materials: The brick works shall consist of bricks and mortar in accordance with general specification and plans.

1.13.2 Soaking bricks: All bricks shall be soaked in clean water in tank for a period of at least twelve hours immediately before use. The contractor shall provide at his expense tanks of sufficient capacity to admit of the simultaneous immersion to two days supply of bricks for the work at its normal rate of progress.

1.13.3 Laying: All the best shaped uniformly coloured bricks shall be picked out and used for face work without any extra payment to the contractor.

All courses unless otherwise specified or ordered by the Engineer-in-charge, shall be truly horizontal and the walls shall be taken up truly plumb. Mortar joints shall never exceed 10 mm in thickness and this thickness shall be uniform throughout.

Vertical joints in alternate courses shall come directly over one another. The joints shall be raked out not less than 12 mm deep when the mortar is green so as to provide proper key for the plaster or pointing to be done.

Each face brick shall be set with both bed and vertical joints quite full of mortar. No damaged or broken brick shall be used in any part of the work except such as may be cut to size for closing the course.

The masonry shall be carried up regularly and no step shall be allowed more than 60 cm. Where the masonry of one part has to be delayed, the work must be raked back at an angle not exceeding 45 °. Angles and Junctions. At all angles forming the junction of walls, the brick shall at each alternate course be carried into their respective walls so as to thoroughly unite the work with English bond. Care shall be taken that when a brick is left out to allow support for the scaffold pole on the wall face, such brick shall always be a header and that not more than one header for each pole shall be left out.

1.13.4 Scaffolding: Proper scaffolding shall be provided whenever necessary having two sets of vertical supports and shall be subjected to the approval of the Engineer-in-charge; who may order the contractor to alter or strengthen the scaffolding if he considers it necessary, without thus becoming responsible either for the safety of the work or workmen or for any additional payment.

Holes shall be made good by bricks to match the face work when scaffolding is removed.

1.13.5 Curing: All brickwork shall be kept well watered for 10 days after laying.

1.14 Reinforced Cement Concrete

All R.C.C. work shall be of the grade M-20, M-25 as given in specifications and as provided in latest IS: 456-2000 (Amendment). The materials will be measured when dry. The stone chips should be thoroughly washed in clean water and stacked.

For water retaining structure minimum grade of concrete shall be M-30 (IS: 3370 latest)

1.14.1 Laying: Cement, sand and stone chips shall be mixed properly in a mechanical mixer in such a manner as to avoid loss of water. The concrete shall be mixed for minimum period of 2 minutes or until it is of even color and uniform consistency throughout. As soon as the concrete is mixed it should be removed to the work in iron vessels as rapidly as practicable. The concrete laid will be vibrated for compaction by vibrators. Slum test will be carried at site during execution of work.

1.14.2 Curing: The concrete laid should not be disturbed and shall be kept damped by means of wet matting and sand until it shall have become thoroughly set and hard enough to prevent its curing and cracking.

The aggregate shall consist of stone ballast of quality approved by Engineer-in-charge and shall consist of graded size 20 mm and downwards as per IS and CPHEEO specification or the size mentioned in the item description.

1.14.3 Formwork: Contractor shall furnish on the site of work sufficient number of centering, forms, moulds or templates for its expeditious prosecution, the forms shall be made in such a way and such material as will ensure a very smooth surface on the finished concrete. Forms and centering shall be left in place until the concrete has set sufficiently to permit the removal without danger to the structure.

1.14.4 Reinforcement: Steel bars for reinforcing concrete shall be of such shape to afford an approved mechanical bond with concrete to ensure intimate control between steel and concrete.

Steel reinforcement shall be either mild steel of tested quality confirming to IS-432-1996 or cold worked high strength deformed bars as per IS-1786-1979 in strength grade Fe-415 or hot rolled high yield strength steel deformed bars with minimum yield strength of 425 N/mm as per IS – 1939 –1966 (Amended 1968) Reinforcement bars will be rejected if the actual weight varies more than 5% from the standard weight.

All bars must conform to the requirement of Indian standard specification. They shall be protected at all time before placed in the concrete from mechanical injury and the weather and when placed in the work, they shall be free from dirt, scales, loose or scaly rust, paint and oil.

Bars which are to be embodied in concrete but remain exposed for sometime after being placed in the work shall, if directed be immediately coated with a thin grout of equal part of cement and sand. Bars shall be bent to the shape shown on the drawings and in conforming to approved templates. When bars are cut and bent on the work the contractor shall employ competent men and provide the necessary appliances for the purpose.

All steel shall be rigidly held in place with 18 gauge annealed steel wire, cement mortar (1:2) cubes. M.S. chairs and spacer shall be used in order to ensure accurate positioning of reinforcement. All joints in steel reinforcement shall be overlapped. The length of overlap for tension and compression shall be as per the requirement of Indian standard specification.

In water retaining structures a clear cover of 40 mm from the face of the steel should be provided.

1.15 Construction Joints

Construction joints shall be provided, where directed approved by the Engineer-in-charge. Such joints shall be kept minimum and shall be right angles to the direction of main reinforcement. In case of column and walls the joint shall be horizontal and 8 to 15 cm below the bottom of the beam or slab running into the column or wall head or below the anchor reinforcement of beam and slab coming into the column and wall and the portion of the column or wall between the stopping level and the top of slab shall be concerted with the beam or slab.

1.15.1 Vertical Joints: At the end of any days work or run of concrete, the concrete should be finished off against temporary shutter stop, which should be vertical be vertical and securely fixed. This stop should be removed as early as weather permits.

1.15.2 Horizontal Joints: Horizontal joints should be washed down two hours after a casting in the manner described above for vertical joints.

If the concrete has been allowed to hard excessively, the surface shall be chipped over its whole surface to depth of at least 10 mm and there after thoroughly washed. Before fresh concrete is added on the other side of a construction joints, the surface of the old concrete will be thoroughly wetted then covered with a thin layer of cement mortar (1:2).

All the construction joints in all concrete structure I contact with water or earth shall be provided with approved PVC water stops on both side with hot asphalt or approved metallic strips. The longitudinal joints in water stops shall be preferably hot welled.

1.15.3 Expansion joints: Expansion joints shall be provided wherever directed by the engineer in charge, on where necessary as per standard specification and practice. The filler to be used shall be of approved material.

1.16 Cement Plaster

12 mm thick cement plaster in (1:4) proportion shall be applied on outside surface of all concrete works from 30cm below ground level up to top. The surface in contact with water will have 12 mm thick cement plaster of not less than (1:3) proportion with 3% water proofing compound. The concrete surface shall be properly hacked, washed, cleaned and applied with thick cement slurry before applying. All brick work unless otherwise specified will be plastered externally and internally with 12mm cement plaster (1:6) proportion.

The plaster shall be protected from sun, rain and frost at the contractors expense by such means as the engineer may approve.

To protect the plaster from the sun, ordinarily the whole surface shall be covered with wet sakes. The contractor shall keep the plaster continuously waited for a period of seven days after application.

1.17 Flooring

Except where in otherwise specified flooring will have minimum 15cm thick sand filling, one brick flat soling and 100mm thick P.C.C (1:2:4) in ground floor and 25 mm thick patent stone flooring shall be provided over this base. In case flooring in raw water pump house 25mm patent stone flooring shall be provided directly over R.C.C. slab in strip placed in suitable manner to avoid construction cracks.

1.18 Door and Window

All the doors and windows shall be of good quality well seasoned and well-dressed Sal wood with oxidized iron fittings. All windows shall be provided with M.S. grill of approved design.

Rolling shutter of approved make and size 1.5m wide x 2.1m height with pusher and pull operated properly fabricated with 80 x 1.22mm M.S. lathers including all accessories and necessary fitting of approved quality as per PWD specification will be provided in the pump house.

All the doors and windows shall be painted with two coats of enamel paints over a coat of primer. The materials, the size, the shape and the fitting of doors and windows shall be approved by Engineer in Charge before put in position.

1.19 Roof

R.C.C. grade as per provision made in IS:456 will have to be provided in roof slab of adequate thickness.

1.20 Snowcem Wash

All the building shall have tow coat of snowcem wash of approved shade over a coat of cement primer including preparing the plastered surface smooth with sand paper, scaffolding, centering etc. all complete as per building specification.

1.21 Painting

All steel or wood shall have two coasts of synthetic enamel paint over a coat of priming as specified by the manufacture of the paint.

The make, shade and color of the paints shall have to be approved by the Engineer-in-charge before use.

1.22 Pipe Laying Works

The successful tenderer will have to get all the pipes inspected by PHED before dispatch to site at their own cost and will submit inspection report to the Deptt accordingly. The materials will be accepted by the Deptt after proper verification before laying. Sluice valves and air valves etc. shall have ISI marking. All inlet, outlet pipe and scour pipes, which requires to be fixed in walls of water retaining structure shall have puddle collars and shall be properly fixed during the casting of concrete itself. The laying works should conform to international standard I.S.O. 2531 (latest amendment).

1.22.1 Excavation of Trenches: No excavation of any trenches must be commenced until the pipes intended to be laid there in with all the necessary appliances for laying and jointing them have been arranged along its side. In the execution of all work of pipe laying no greater length of trenches that can be laid in 48 hours must be opened and should the pipe laying be delayed or stopped from any cause, the excavation of trenches must be stopped until the laying is resumed.

In trenches where pipes are to be laid ground shall be excavated to the required depths and gradients and holes shall be taken out where the joints occur, so that the barrels of the pipes shall be on a solid bed throughout. The trenches shall be excavated to depths sufficient to secure a covering over the pipe of not less than one meter and the trench must be during the progress of the work.

1.22.2 Laying: Pipes shall be laid in straight lines, free from all sharp bends and should be in proper alignment. Each pipe before it is laid shall be examined and tested with a hammer to prove its soundness and then shall be brushed through and washed to remove all solid or dirt.

Pipes shall be placed in trenches by means of chain pulley blocks taking care to see that earth does not get into the pipe.

1.22.3 Jointing: Welding Joint as per Specification of BIS etc

1.22.4 Cleanliness: The interior of the pipes must be carefully freed from all dust as the work proceeds, for which purpose a disc plate or brush sufficiently long to pass two or more joints from the end of pipe last laid shall be continuously drawn forward as the pipes are laid. The ends of the pipes must be securely protected during the progress of the work. The pipes laid shall not be made receptacle either for tools, hookahs, clothes or of any other matter during the progress of works.

1.22.5 Testing: The pipe line after laying and jointing shall be tested to a pressure at least doubles that of working pressure. The pipes and joints shall be absolutely watertight. The contractor shall provide the water, appliances and labour for testing the pipes at his own expense. Relevant IS code for field hydrostatic test pressure is IS: 12288. A leakage test shall be done concurrently with the pressure test as per IS: 3144, no pipe installation shall be accepted until the leakage is less than the formula :

$$qL = (ND \sqrt{P})^{3.3}$$

qL = allowable leakage in cm³/hr

N = no of joints in the length of pipe line under test.

D = diameter of pipe line in mm

P = average test pressure during the leakage test in kg/cm

In case the leakage is greater than the allowable value determined through the above formula the contractor shall identify all defective leakage joints, repair them until the leakage is within allowable limit and for these rectification works no extra payment shall be admissible.

1.22.6 Painting: All exposed surface of pipes, specials valves, Steel doors and windows, etc., shall have two coats of synthetic enamel paint of approved shade over a coat of red oxide primer etc. all complete as per approval and direction of the Engineer-in-chief.

1.23 Inspection

The contractor should get the pipe, specials, Sluice valve etc. inspected before dispatch to site as decided by the Superintending Engineer, Rural WATSAN Circle, Aizawl at their own cost. Materials will not be considered acceptable without inspection-cum-acceptance certificate of approved PHED inspection personnel.

ANNEXURE – 2: SPECIAL CONDITIONS

- 2.1** Structural Design and Drawings shall be given to the successful bidder before commencement of work. If any doubt or objection arises from the contractor, it must be informed to the Engineer-in-Charge. Contractor shall not be allowed to make any modifications without the approval of the Engineer-in-Charge.
- 2.2** The Engineer-in-Charge shall have power to make any alterations in Design, Drawings and Specifications that may appear to him to be necessary on the ground of safety, economy or convenience. However, this must be done with intimation along with reasons for altering to Contractor.

ANNEXURE-3: SCOPE OF WORK

The Scope of work shall comprise of the following items:

- 1) Earth Work
- 2) Plain Cement Concrete Work
- 3) Reinforced Concrete Work
- 4) Brick Work
- 5) Plastering work
- 6) Steel Work
- 7) Rain Water Harvesting Roof

ANNEXURE 4: BILL OF QUANTITY (BOQ)

Sl No	SOR No.	Item of Work	Unit	Qty.	Quoted Rate (in Fig)	Quoted Rate (in word)	Quoted Amount (in Fig)
		EARTH WORK					
1	1.03	Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth upto 30cm measured at a height of 1m above ground level and removal of rubbish upto a distance of 50 metres outside the periphery of the area cleared. a) By Manual Means (i) Light Jungle	Sqm	1500.00			
2	2.06	Earthwork in excavation over areas (exceeding 30cm in depth, 1.5m in width as well as 10sqm on plan) including disposal of excavated earth, lead upto 50m and lift upto 1.5m, disposed earth to be leveled and neatly dressed. a) Ordinary and Hard soil (i) Area I (ii) Area II (Volume of Reservoir)	Cum	6670.35			
3	2.17	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m.	Cum	8.63			
II		PLAIN CEMENT CONCRETE WORK					
4	4.02	Providing and laying in position cement concrete of specified grade excluding cost of centering and shuttering - All work upto plinth level: b) 1:2:4 (1 cement : 2 course sand : 4 stone aggregate 40mm nominal size) CC for Surface Lining and Periphery	Cum	103.29			
III		REINFORCED CONCRETE WORK					
5	5.01	Providing and laying in position reinforced cement concrete excluding cost of centering and shuttering, finishing and reinforcement in - All work upto plinth level:	Cum	95.53			

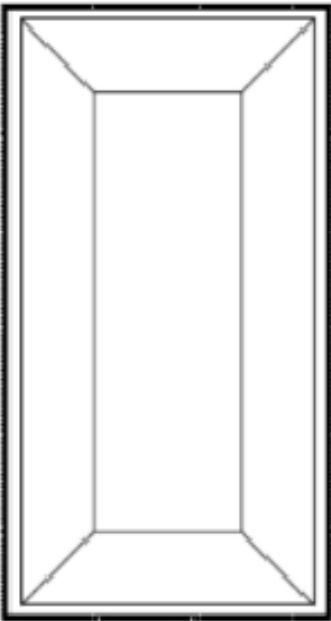
		a) 1:1.5:3					
6	5.18	Steel reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete. (b) TMT bars of Grade Fe-500 or more 10mm Ø @ 200mm c/c Along the length = 42.27 m Along the breadth = 22.70 m	Kg /Rm	3976.20			
IV		BRICK WORK					
	6.02	First class brick in Superstructure above plinth level upto floor V level. b) in cement mortar 1:4 (1 cement : 4 coarse sand) At the Inner and Outer periphery of Reservoir:	Cum	39.00			
V		PLASTERING WORK					
	20.11	15mm cement plaster 1:3 (1 cement : 3 fine sand) Surface of Cement Concrete lining And Surface of Brickwork	Cum	1292.86			
VI		STEEL WORK					
	10.08	Steel work in built up tubular (round, square or rectangular hollow tubes etc.) trusses etc., including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc. <div style="border: 1px solid black; padding: 5px; width: fit-content;"> Wt of one truss = 641.03 kg (As per Drawing) Purlin Using Size = 80M; Weight = 8.36 kg/m as per IS: 1161:1998 No. of Purlin = 19 : Length = 42 m </div>	Kg	13722.61			
VII		ROOFING : RAINWATER HARVESTING ROOF					

10	16.11	Providing Trapezoidal Polyester Coated Galvanised Steel Sheets Roofing of any colour of 1.06m width at all levels including fitting and fixing ridging with self drilling , self tapping screws, EPDM washers etc. complete excluding the cost of purlin, rafter and trusses. (i) For 0.5 mm thick (Dyna Roof) for Roof and Ridge	Sqm	1029.00			
VII		CARRIAGE	LS				
VIII		Cost Index	5.49%				

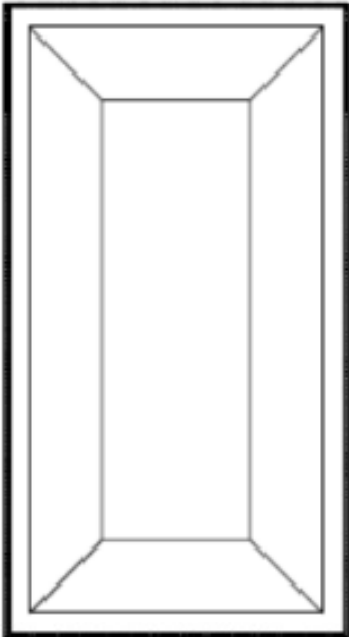
(.....) only.

DRAWINGS:-

PROJECT > NE Diltlang W/S	
SHEET TITLE > Reservoir for channel	
SCALE > Not to Scale	DATE > 16th August, 2020
SHEET NO. > 11	NOTE > All dimensions are in millimeters (mm).
DESIGNER > Junior Engineer, PHEO Houlsen Section, Champhai	
CHECKED BY >	
Sub-Divisional Officer, PHEO Champhai Project Sub-Division, Champhai	
APPROVED BY > Executive Engineer, PHEO Champhai WATSAN Division, Champhai	

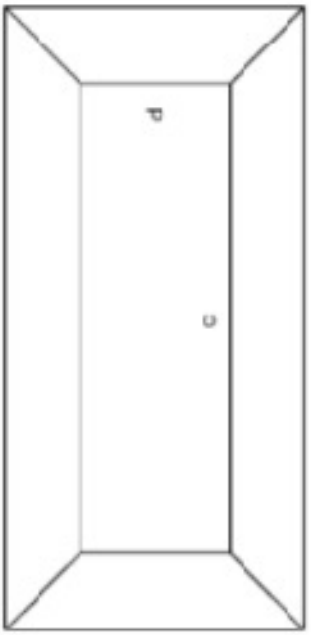


Brickwork at the inner periphery of Reservoir in m³
Long Wall = 42 m; Short Wall = 21.80 m; Breadth = 0.30 m; Height = 0.50 m;
Volume of Brickwork = $(42 + 21.8) \times 2 \times 0.3 \times 0.5 = 19.14 \text{ m}^3$



Brickwork at the outer periphery of Reservoir in m³
Long Wall = 43.4 m; Short Wall = 22.8 m; Breadth = 0.30 m; Height = 0.50 m;
Volume of Brickwork = $(43.4 + 22.8) \times 2 \times 0.3 \times 0.5 = 19.86 \text{ m}^3$

<p><u>SUBJECT</u> ></p> <p>NE Dilling Wall</p>	
<p><u>SHEET TITLE</u> ></p> <p>Reservoir RCC Lining</p>	
<p><u>SCALE</u> ></p> <p>Not to Scale</p>	<p><u>DATE</u> ></p> <p>19th August 2020</p>
<p><u>SHEET NO</u> ></p> <p>10</p>	<p><u>NOTE</u> ></p> <p>All dimensions are in millimeters (mm).</p>
<p><u>DRAWN BY</u> ></p> <p>Junior Engineer, PHED Hoshain Sadon, Champhal</p>	
<p><u>CHECKED BY</u> ></p> <p>Sub-Divisional Officer, PHED Champhal Project Sub-Division, Champhal</p>	
<p><u>APPROVED BY</u> ></p> <p>Executive Engineer, PHED Champhal WATSAN Division, Champhal</p>	




Cement Concrete for Concrete Lining in m³

a = 40 m; b = 20 m; c = 30.20 m; d = 10.20 m; h = 3.45 m; t = 0.15 m;

Surface Area = $(d + c) \times \sqrt{(b-d)^2/4 + h^2} + (b + d) \times \sqrt{(c-c)^2/4 + h^2} = 636.86 \text{ m}^2$

Volume of Cement Concrete for Reservoir Lining = $0.15 \times 636.86 = 95.53 \text{ m}^3$

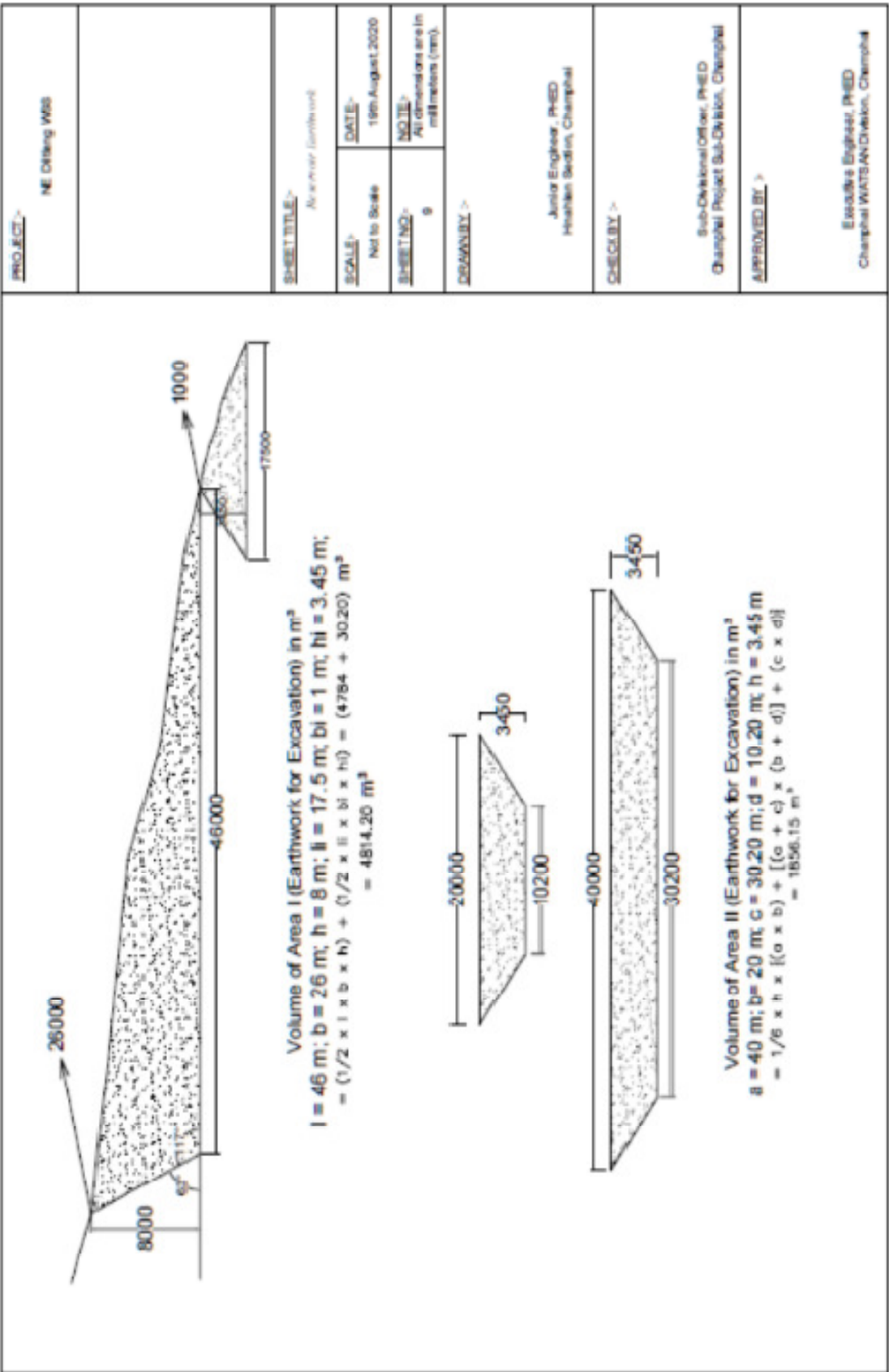


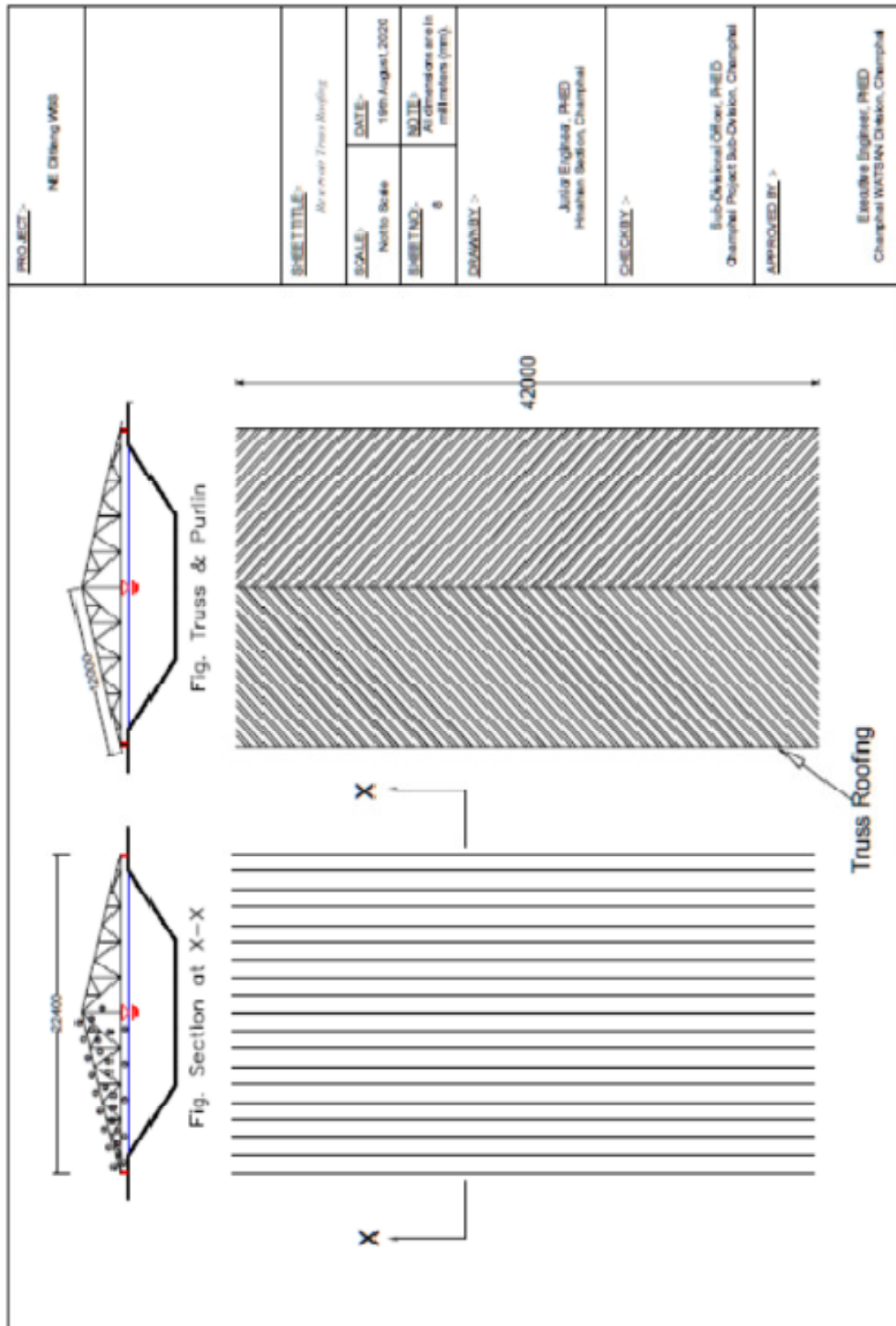
Cement Concrete for Reservoir Periphery in m³

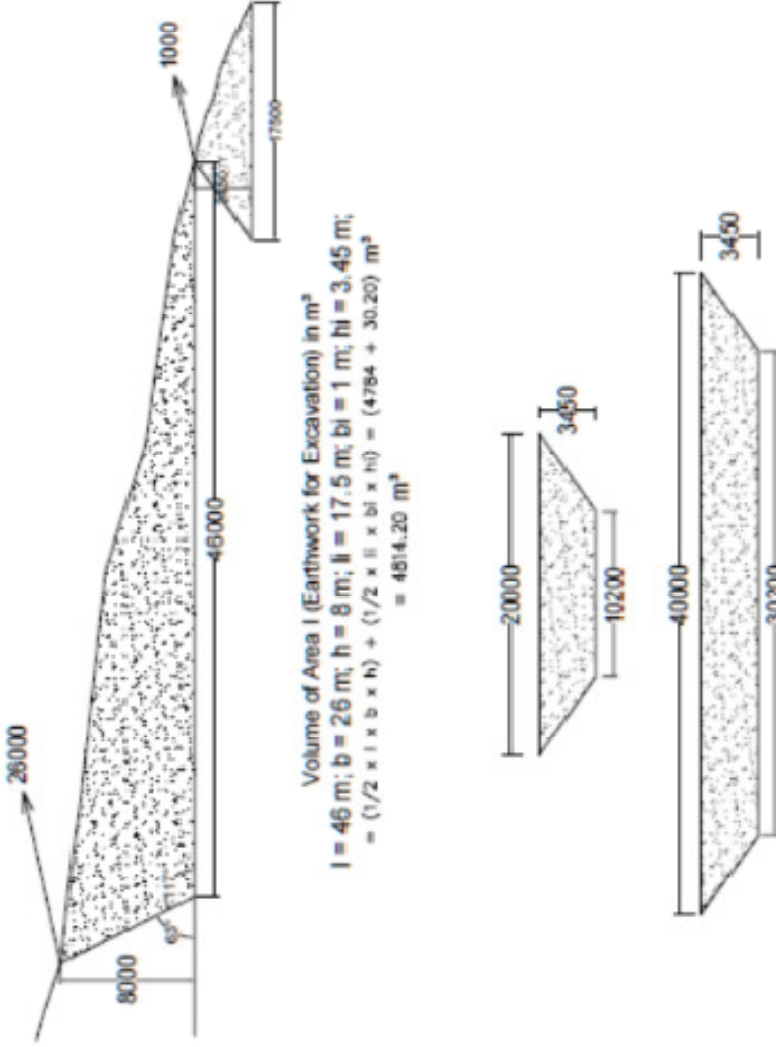
Long Wall = 46 m; Short Wall = 20 m; Width = 3 m; t = 0.15 m;

Surface Area = $(46 + 20) \times 2 \times 3 = 396 \text{ m}^2$

Volume of Cement Concrete for Reservoir Periphery = $0.15 \times 396 = 59.40 \text{ m}^3$





PROJECT > NE Dilling WSS	 <p>Volume of Area I (Earthwork for Excavation) in m³</p> $I = 46 \text{ m}; b = 26 \text{ m}; h = 8 \text{ m}; li = 17.5 \text{ m}; bi = 1 \text{ m}; hi = 3.45 \text{ m};$ $= (1/2 \times l \times b \times h) + (1/2 \times li \times bi \times hi) = (4784 + 30.20) \text{ m}^3$ $= 4814.20 \text{ m}^3$ <p>Volume of Area II (Earthwork for Excavation) in m³</p> $a = 40 \text{ m}; b = 20 \text{ m}; c = 30.20 \text{ m}; d = 10.20 \text{ m}; h = 3.45 \text{ m}$ $= 1/6 \times h \times [(a \times b) + [(a + c) \times (b + d)] + (c \times d)]$ $= 1856.15 \text{ m}^3$	
SHEET TITLE > <i>No answer Earthwork</i>		
SCALE > Not to Scale		DATE > 19th August, 2020
SHEET NO > 9		NOTE > All dimensions are in millimeters (mm).
DRAWN BY > Junior Engineer, PWD Hoshain Sadon, Champal		
CHECK BY > Sub-Optional Officer, PWD Champal Project Sub-Division, Champal		
APPROVED BY > Executive Engineer, PWD Champal WATSAN Division, Champal		

