PUNATSANGCHHU-I HYDROELECTRIC PROJECT AUTHORITY

BIDDING DOCUMENT

FOR

CONSTRUCTION OF FENCING, SEPTIC TANK AND SOAK PIT IN POTHEAD YARD, PHPA-I
(NIT No. PHPA-I/CE(C&P)/146-05/2023)

JULY, 2023

CONTENTS OF THE BIDDING DOCUMENT

SECTION I

NOTICE INVITING TENDER

PUNATSANGCHHU-I HYDROELECTRIC PROJECT AUTHORITY (PHPA-I)
NIT No. PHPA-I/CE(C&P)/146-05/2023

Sealed item rate bids are hereby invited for and on behalf of PHPA-I from experienced and financially sound Bhutanese bidders (***Small Class-W3***) fulfilling the eligibility criteria specified in the Bidding Document for the work "***Construction of fencing, septic tank and soak pit in Pothead Yard, PHPA-I***"

Eligibility Criteria

The participating Bidders shall fulfil the following criteria:

1. Have an average turnover of Nu. **1.8 million or more** of any 3 years of the last 5 years preceding the last date of bid submission.
2. Have a valid trade license and registered with CDB as ***Small Class (W3)***.
3. Have the latest income tax/corporate tax clearance certificates. If such a clearance certificate is not being issued by the concerned authority, an authenticated photocopy of the latest income tax return shall be submitted by the Bidders.
4. Bidders should have experience in having completed at least one similar work during the last 5 years of value Nu. **1.8 million or more**, and submit at least one Completion certificate issued by the previous client(s). Such certificate shall indicate the value, date, and site of works, and shall specify whether they were successfully completed.

The bidders can download the Bidding Document from the PHPA-I website: www.phpa1.gov.bt at free of cost w.e.f **1.07.2023 to 31.07.2023**

Any corrigendum/addendum/errata in respect of this tender shall be made available only at the mentioned website.

PHPA-I reserves the right to reject any or all the bids without assigning any reason thereof.

-sd-
Executive Engineer (Contracts)

SECTION II

TERMS & CONDITIONS OF CONTRACTS

TERMS AND CONDITIONS OF THE WORK

TERMS AND CONDITIONS OF THE CONTRACT

1 SCOPE OF WORK

PHPA-I invites sealed bids from eligible and qualified Bhutanese bidders for ***"Construction of fencing, septic tank and soak pit in Pothead Yard, PHPA-I".***

The scope of works shall be as specified in General Technical Specifications. The quoted rates by the Bidder(s) shall be indicated in the appropriate column of the Bill of Quantities (BoQ).

2 SPECIFICATIONS OF THE WORK

2.1 The specifications, the materials used and the Work done shall conform to the relevant Specifications for Building and Road Works (BSR): Royal Govt. of Bhutan, 2022/I.S. Code or as directed by the Engineer-in-Charge. The Contractor shall endeavor to provide all such necessary efforts in order to comply with the intent of these specifications to the satisfaction of the Engineer-in-Charge.

2.2 The BSR specifications outline the standard of materials, the technical procedure to conduct work including tests and quality checks, the mode of measurement, and the applicability of rates for the items of work in BoQ. Reference to relevant codes may be made wherever required or necessary.

3 ELIGIBLE CRITERIA

3.1 The participating bidders shall be reputed, experienced, and financially sound Bhutanese fulfilling the followings:

3.1.1 Have an annual turnover of Nu 1.8 Million or more of any 3 years of the last 5 years preceding the last date of bid submission.

3.1.2 Have a valid trade license and registered with CDB as *Small Class (W3).*

3.1.3 Have the latest income tax/corporate tax clearance certificates. If such a clearance certificate is not being issued by the concerned authority, an authenticated photocopy of the latest income tax return shall be submitted by the Bidders.

3.1.4 Bidders should have experience in having completed similar works during the last 5 years of value Nu. 1.8 million or more, and submit at least one Completion Certificate issued by the previous client(s). The Certificate shall indicate the value, date, and site of works, and shall specify whether they were successfully completed.

4 DOCUMENT COMPRISING THE BID

4.1 The Bid shall include the following documents:

4.1.1 Bid Security

4.1.2 Valid Trade License

4.1.3 CDB Registration Certificate

4.1.4 Latest tax clearance Certificate

4.1.5 Duly filled Bill of Quantities

4.1.6 Complete Bidding Document, duly signed by the bidder as its acceptance.

5 BID SECURITY (EMD)

5.1 Bidder shall furnish Bid Security for an amount of ***Nu. 36,000/-*** along with their bid, failing which bids will be rejected. Bid Security shall remain valid for ***30*** days beyond the validity of the Bid.

5.2 Bid Security shall be in any form: A Demand Draft or irrevocable Bank Guarantee issued by Banks of Bhutan, payable to Punatsangchhu-I Hydroelectric Project Authority.

5.3 Bid Security is liable to be forfeited if the bidder withdraws or amends within the period of bid validity or the successful bidder fails to sign the contract agreement.

5.4 The Bid Security of the successful bidder shall be returned after receipt of the Performance Security and signing of the Contract Agreement.

5.5 Bid Security of unsuccessful bidders shall be returned within 28 days of the signing of the contract with the successful bidder.

6 BID VALIDITY

A bid shall remain valid for ***90 days*** from the date of its opening.

7 SITE VISIT

The bidders are advised to visit the site, its surroundings and obtain all information that may be necessary for preparing a bid. The cost of visiting the site shall be at the bidder's own expense.

8 LANGUAGE OF BID

The bid and all correspondence related to this tender shall be in English.

9 BID PRICE

Bidders shall quote rates for all items in the Bill of Quantities (BoQ) which shall be inclusive of taxes. The rate shall remain firm and shall not be subjected to any adjustment during the performance of the contract.

10 SUBMISSION AND OPENING OF BIDS

Bid must be received by the Executive Engineer, Contracts, PHPA-I, Bjimthangkha on or before 1300 hours of **31.07.2023** and shall be opened on the same day at 1500 Hours. Late bids shall be rejected.

11 EVALUATION AND COMPARISON OF THE BIDS

11.1 The bids will be evaluated & compared by the PHPA-I from the technical & financial points of view so as to make a selection for the complete Work covered under the bidding document.

11.2 Price bids of only techno-commercially responsive Bidders will be evaluated by the PHPA-I.

12 CORRECTION OF ERRORS

12.1 Any arithmetic errors in Price Bids shall be corrected by the PHPA-I as follow:

12.1.1 Where there is a discrepancy between the rate in figure and in words, the rate in words will govern; and

12.1.2 Where there is a discrepancy between the unit rate and the total amount derived from multiplying the unit rate and the quantity, the unit rate as quoted will govern and the total amount shall be corrected.

12.1.3 If the bidder does not accept the corrected amount of the bid, his bid will be rejected and the bid security will be forfeited.

13 RIGHT OF ACCEPTANCE

13.1 PHPA-I is not bound to accept the lowest bid and reserves the right to accept or reject any or all bids without assigning any reason thereof.

13.2 If PHPA-I decides to accept the abnormally low (20% below the estimate) bids after considering the detailed price analysis, PHPA-I may as appropriate:

13.2.1 may ask the successful bidder to deposit the differential amount between the departmental estimate and quoted amount in the form of a cash warrant/demand draft/BG

14 AWARD OF CONTRACT

PHPA-I will issue a Letter of Award (LoA) to the successful bidder before the expiration of the Bid validity.

15 PERFORMANCE SECURITY

15.1 Within 15 days of issuance of Letter of Award by PHPA-I, the successful bidder shall furnish Performance Security in the form of an irrevocable Bank Guarantee on the Proforma provided by PHPA-I (***Form-3***) for an amount equivalent to ***10%*** of the Contract Price.

15.2 The Performance Security shall be valid up to 30 days from the date of issue of the **Completion Certificate**.

16 SIGNING OF CONTRACT AGREEMENT

Within 30 days of issuance of the Letter of Award and after submission of Performance Security, on a date and time mutually agreed upon, the successful bidder or his authorized representative shall sign the Contract with PHPA-I.

17 COMMENCEMENT OF WORK

The work shall be commenced within 30 days from the date of issue of the Letter of Award.

18 TIME FOR COMPLETION

The works shall be completed in all respect within ***6 months*** or such extended time as may be allowed under clause 19. The period of completion shall be reckoned from the 30th day of issue of the Letter of Award.

19 EXTENSION OF TIME FOR COMPLETION

Should the amount of extra or additional work of any kind may or any cause of delay referred to in these conditions, or other special circumstances of any kind whatsoever which may occur, other than through the default of the Contractor, be such as fairly to entitle the Contractor to an extension of time for the completion of Work, the Engineer-in-Charge shall determine the period from the Hindrance Register to be maintained by the Contractor of such extension and shall notify the Contractor accordingly.

20 FORCE MAJEURE

20.1 If a Force Majeure situation arises, the Contractor shall promptly notify PHPA-I in writing of such condition and the cause thereof.

Force Majeure means any circumstances beyond the control of the parties i.e., the PHPA-I & the contractor including but not limited to acts of PHPA-I in its sovereign capacity, wars or revolution, pandemic or epidemic, fire, floods, earthquake affecting the contractor's work, except where solely restricted to employees of the contractor or his sub-contractor and fright embargoes.

20.2 Unless otherwise directed by the PHPA-I in writing, the Contractor shall continue to perform his obligations under the Contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event.

21 LIQUIDATED DAMAGES FOR DELAY

If the Contractor fails to complete the Work within the time prescribed by Clause 18, the Liquidated Damages at the rate of ***0.1%*** per day shall be imposed subject to a maximum of ***10%*** of the Final Executed Amount.

22 MEASUREMENT

All measurements shall be taken jointly by the Engineer-in-Charge and the Contractor from time to time during the progress of the work, and such measurements shall be signed by the parties as a token of acceptance.

23 CERTIFICATES AND PAYMENT

23.1 *Interim Payment Certificate*

23.1.1 The contractor shall submit an application for interim payment, in duplicate, to the Engineer-In-Charge.

23.1.2 No interim Payment certificate shall be issued for a sum less than **3** % of the Contract Price.

23.1.3 It may be noted that all the interim payments shall be treated as provisional payments.

23.2 *Mobilization advance*

23.2.1 An advance to the extent of **10% of the Contract Price**, if required by the contractor, will be granted for mobilization of labour, stores, and workshops including camps, labour sheds, and constructional plants.

23.2.2 The advance will be disbursed on production of the irrevocable Bank Guarantee (on the Proforma in **Form-4**) from any Financial Institution of Bhutan for an amount equivalent to the required advance and the BG shall valid till the advance is fully recovered.

23.2.3 The advance shall be free of interest

23.2.4 The advance is recoverable and the deduction of the advance shall be made on prorate percentage basis from the interim payment certified by the Engineer-in-Charge.

23.2.5 The entire amount of the advance paid to the Contractor shall be fully deducted by the time the total of all payments to the Contractor has reached 80% of the contract price.

23.3 *Final certificate*

23.3.1 Since all the interim payment certificates are issued provisionally, EIC may, by any interim payment certificate, make any corrections or modifications in any previous certificate (other than one purporting to be the final payment certificate) which shall have been issued by him and shall have the power to modify or withhold any interim certificate if the works or any part thereof are not being carried out to his satisfaction.

23.3.2 On receipt of the final bill, the EIC shall promptly prepare and issue to the contractor a final payment certificate certifying any further money due to the contractor in respect of the contract. Payment to the contractor of the amount due under the final payment certificate shall be made by PHPA-I within 60 days of such certificate being issued. In the event of non-payment within the said period, no interest shall accrue to the contractor.

24 RETENTION MONEY

24.1 The Employer shall retain ***10%*** from each payment due to the Contractor until completion of the whole of the Work.

24.2 The retention money shall be released to the Contractor within 30 days from the date of issue of the Maintenance Certificate.

25 VARIATIONS

25.1 The Engineer-in-Charge shall make any variation in the form, quality, or quantity of the Works or any part thereof or substitution for original specifications, design, drawings, and instructions that may, in his opinion be necessary and for that purpose, or if for any other reason it shall, in his opinion be appropriate, he shall have the power to order the Contractor to do and the Contractor shall do any or all of the following:

25.1.1 increase or decrease the quantity of any work included in the Contract;

25.1.2 omit or substitute any such work;

25.1.3 change the character or quality or kind of any such work;

25.1.4 change the levels, lines, positions, and dimensions of any part of the work;

25.1.5 execute, additional work of any kind necessary for the completion of the works, and

25.1.6 change any specified sequence or timing of construction of any part of the work.

25.2 No such variations shall in any way vitiate or invalidate the Contract, but the effect if any, of all such variations, shall be valued in accordance with Clause-26 hereof.

25.3 Provided that where the issue of an instruction to vary the Works is necessitated by some default of or breach of Contract by the Contractor or for which he is responsible, any additional cost attributable to such default shall be borne by the Contractor. Any altered, additional, and substituted work which the Contractor may be directed to do in the manner above specified as part of the Works, shall be carried out by the Contractor on the same conditions in all respects on which he agreed to do the main Works.

26 DETERMINATION OF PRICE VARIATION

26.1 Upon certified completion of the whole Works, if a reduction or increase in the total value of the work is found to be within 20% of the initial Contract price, then there shall be no change

in the Contract rates for individual items of work specified in the bill of quantities irrespective of the quantum of variation in individual items.

26.2 However, if a reduction or increase is found to be more than 20% of the initial Contract price, the increase in payment for minus variation or decrease in payment for plus variation shall be specified based on slabs of variation in the Contract value as specified below:

Variation in Value of Works	Increase in Payment for minus variation	Decrease in Payment for plus variation
Up to 20%	Nil	Nil
Above 20% and up to 35 %	6.00%	3.00%
Above 35% and up to 60%	8.00%	4.00%
Above 60 % and up to 100%	10.00%	5.00%
Above 100%	NA	5.00%

26.3 While working out the value of Works for the purpose of variation, the extra items for which new rates have been paid and payment towards price adjustment; and the adjustment towards statutory variations shall not be considered.

26.4 ***Illustration***

26.4.1 In case of variation in the value of Works by (plus) + 60 percent, the payment for (60-20) percent i.e., 40 percent of the Contract value of Works shall be decreased by 4 % (four percent.). The reduction in Contract rates shall commence as soon as the value of the Works executed reaches 120% of the Contract Price.

26.4.2 In case of variation in the value of Works by (minus) – 55 percent, the payment for (55-20) percent i.e., 35 percent of the Contract value of Works shall be increased by 8% (eight percent).

26.5 No variation limit for any individual BOQ item has been specified except for the payment due to the Contractor as detailed above. No claim for revision of rate(s) for any individual BOQ item shall be admissible irrespective of the extent to which the ordered quantity may get revised (+) or (-) during the actual execution of the Works.

26.6 Within 14 days of the date of instruction for executing varied Works and before the commencement of such Works, notice shall be given either (a) by the Contractor to the Employer of his intention to claim extra payment or a varied rate or price, or (b) by the Engineer-in-Charge to the Contractor of the intention to vary a rate or price.

26.7 The Contractor within 14 days from the receipt of an order to execute any extra item shall submit rate analysis to the Engineer-in-Charge supported by documentary evidence of basic rates adopted therein; having regard to the cost of materials, actual wages of labor, and other operational costs. The analysis so provided by the Contractor shall form the basis for the determination of rates for such extra items. Extra items of work/supply which are not provided in the Bill of Quantities shall be paid on the basis of the Bhutan Schedule of Rates (BSR) after adjusting such rates for the place of Works and cost index prevailing at the time of the award. If rates for such extra items are not available in BSR, the rates for such items shall be determined based on the actual expenditure relating to that item including the cost of materials, fabrication/machinery handling, and erection at the Site plus twenty percent

(20%) towards overheads including profits. The price of varied items determined by the Engineer-in-Charge shall be final and binding on the Contractor. No payment shall be made for the items of Works ordered to be omitted.

26.8 If there is a delay in the agreement between the Employer and the Contractor on the rate of varied Works, provisional rates @ 75% of the rates as determined by the Engineer In-charge shall be payable as a provisional payment till such time as the rates are finalized.

26.9 Under no circumstances, the Contractor shall at any stage suspend work on account of non-settlement of rates of such item(s).

27 CERTIFICATION OF COMPLETION OF WORK

When the whole of the Work has been completed, the Contractor may give notice to the Engineer-in-Charge. The Engineer-in-Charge shall, within 21 days from the date of delivery of such notice, issue a Certificate of Completion stating the date on which the Work is completed in accordance with the contract.

28 DEFECT LIABILITY/MAINTENANCE PERIOD

28.1 The Defect Liability/Maintenance Period shall be ***6 months*** from the date of issue of the Completion certificate.

28.2 All repair works shall be carried out by the Contractor at his own expense if the necessity shall be due to the use of materials or workmanship not in accordance with the contract or due to negligence or failure on the part of the Contractor to comply with any obligation, expressed or implied.

28.3 If the Contractor fails to do any such work aforesaid, PHPA-I shall arrange to carry out the same, and payment shall be recovered from the Contractor's due money.

29 MAINTENANCE CERTIFICATE

29.1 The Contract shall not be considered complete until a Maintenance Certificate shall have been issued by the EIC stating that the works have been completed and maintained to his satisfaction

29.2 The Maintenance Certificate shall be issued by the EIC within ***30 days*** after the expiry of the period of maintenance.

30 TERMINATION OF THE CONTRACT

30.1 The Contract can be terminated at any time by either party by serving ***14 days*** prior notice in writing if the other party causes any fundamental breach of the contract.

30.2 Notwithstanding the above, PHPA-I may terminate the contract for convenience.

31 PAYMENT AFTER TERMINATION

31.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the EIC shall issue a certificate for the value of the work done and materials ordered less advance payments received up to the date of the issue of the Certificate and ***20%*** less the percentage to apply to the value of work not completed. If the total amount due to the PHPA-I exceeds any payment due to the Contractor, the difference shall be a debt payable by the Contractor to PHPA-I.

31.2 If the Contract is terminated for PHPA-I's convenience or because of the fundamental breach of Contract by the PHPA-I, the EIC shall issue a certificate for the value of work done, materials ordered, the reasonable cost of removing the equipment, repatriation of the Contractors personal employed solely on this work, and the contractor's cost of protecting and securing the work, and less advance payments received up to the date of the certificate.

32 COMPLIANCE WITH TAX LAWS

32.1 Any Contractor, or sub-contractor recruited in connection with the Work will be liable for tax in Bhutan as per the Income Tax Act of the Kingdom of Bhutan, 2001. Further, such recruiting agency shall be responsible for deducting and remitting Tax Deducted at Source (TDS) as per the provision of the said Income Tax Act.

32.2 Contractor Tax of 2% shall be deducted from every bill of the Contractor.

33 CONTRACTOR'S RISKS

From the Start Date until the end of the Defect Liability period, the risks of personal injury, death, and loss of or damage to property (including, without limitation, the Work, Materials, and Equipment) are the liabilities of the Contractor.

34 LABOUR LAWS

The Contractor shall comply with all relevant labour laws/Acts of Bhutan applicable to the Contractor's Personnel, including Laws relating to their employment (including wages and working hours), health, safety, and welfare.

35 PRE-CONTRACT INTEGRITY PACT

As per the norms of the Anti-Corruption Commission, the Constitutional body of the Royal Government of Bhutan, the Contractor shall have to sign a Pre-Contract Integrity Pact as per format enclosed as ***Form-1***.

36 ENGINEER-IN-CHARGE

EIC(PH) shall be Engineer-in-Charge of this Work.

37 ARBITRATION

Any dispute, unless settled amicably, shall be settled in accordance with the Alternative Dispute Resolution Act of Bhutan, 2013.

EE, Contracts.

SECTION III

GENERAL TECHNICAL SPECIFICATIONS

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GENERAL TECHNICAL SPECIFICATIONS

1. GENERAL

The General Technical Specifications (hereinafter called GTS) shall give general information about execution of various items of works under the Contract and cover the specified stipulations for measurements and payment therefore included in the Bill of Quantities.

These specifications shall be the part of the requirements for various items of works, which shall be executed according to the stipulations of the Contract. Hence, the instructions given herein form an integral part of and are applicable to the bidding documents issued for the works. Addenda to these specifications may be issued, as required during bidding and construction phases.

These specifications shall be read in conjunction with Bill of Quantities (BOQ), drawings and the Conditions of Contract. While quoting the price, the Contractor shall comply with all provisions contained within the bidding documents with an objective to complete each item of work without any addition of cost thereof. In case Specifications, BoQ and Condition of Contract do not corroborate each other for completion of any particular item of work, the same as well as the assumptions made in quoting of price for such item(s) of Works shall be brought out clearly in the bid.

It is the intent of these specifications to establish acceptable standards of quality as specified in the technical specifications. Minor deviations in details due to manufacture's standard shop process for bought out items will be considered for acceptance provided that, in the opinion of the Engineer-in-Charge, the proposed substitutions are equal in quality to those specified.

The Contractor shall be required to preferably use locally manufactured Bhutan Standard Bureau (BSB) certified domestic construction materials. The material shall conform to latest BSB standards or in the absence of these standards, to the equivalent Indian Standard Codes. These materials must be cost effective as compared to the imported materials of certified quality standards.

All works shall comply with the quality requirements defined in the relevant sections of these specifications and other section of the bidding documents. Where no specifications have been laid down, the materials used and the Work done shall conform to the relevant Specifications for Building and Road Works: Royal Govt. of Bhutan, 2022/I.S. Code or as directed by the Engineer-in-Charge. The Contractor shall endeavor to provide all such necessary efforts in order to comply with the intent of these specifications to the satisfaction of the Engineer-in-Charge.

1.1 Scope of Work

The broader scope of work includes construction of about 450m RRM Fencing wall with GI Chain Link, 4 strand GI Barbed Wire, 610mm dia. helical concertina coil at the top with MS Angle sections at regular intervals for support around the Pothead Yard Area. The work

includes providing, supplying and installation/ fabrication of all the items as per approved design & drawing

2. WORKING FACILITIES

2.1 Scope of Work

The scope of works under this clause to design, provide, erect, operate and maintain all the working facilities as would be necessary for execution of the works within the specified time schedule, but not necessarily limited to the following:

- Camp and Facilities
- Plant and Equipment
- Electric Power Supply System
- Water Supply System
- Sewage & Waste Water and Garbage Disposal System
- Temporary Access and Construction Roads

Working Facilities shall be subject to the Engineer-in-Charge's approval. The Contractor shall comply with all applicable laws, regulations, and ordinances relating to the construction and operation of the working facilities in Bhutan.

2.2 Submissions

The Contractor shall submit basic plans of Working Facilities along with his bid. He shall attach to his bid documents drawings and operating descriptions for his proposed working facilities. At least **15 days** prior to commencing the work, the Contractor **shall submit** to the Engineer-in-Charge for approval the drawings of layout and details of Working Facilities.

Should the Engineer-in-Charge determine that the details of working facilities furnished does not meet all requirements, the deficiencies shall be made good by the Contractor before commencement of the work. Any cost incurred therefor or replacement shall be borne by the Contractor.

2.3 Camp and Facilities

The Camp and Facilities shall include but are not limited to

- Office for the Contractor / Engineer-in-Charge's Site office
- Accommodation for Staff and Workmen
- Miscellaneous Working Facilities like:
- Stores, Warehouses and sheds for the Contractor

Office for the Contractor shall be of sufficient size and fully furnished and equipped. All working facilities shall be equipped with proper light arrangement, water supply, telephone, sewage and waste water disposal system. Contractor shall make his own arrangement for all working facilities.

2.4 Plant and Equipment

2.4.1 General

The Contractor shall provide all construction plants and equipment necessary for the efficient execution of the work described in the Specifications and details supplied by the Contractor in the construction plant and equipment schedule. The Contractor shall also deploy additional equipment, if needed, at his own cost for timely completion of the Works.

The capacity and number of equipment shall conform to the specific minimum requirements for the works and the climatic conditions prevailing at the site. The Contractor shall maintain all his equipment, tools and plants with sufficient spare parts, special tools for repair work and complete standby units of vital parts to guarantee a continuous operation without untimely delays. The Contractor shall remain fully responsible for any delays due to disregard of said necessity.

2.4.2 Transportation and Storage Facilities for Cement

Transportation of cement shall be accomplished in adequately weather-tight trucks or other means which will protect the cement completely from exposure to moisture. Storage of cement at the Site shall be done in weather-tight and properly ventilated structures with adequate provisions for the prevention of absorption of moisture. Said structures shall be complete with all equipment for loading, unloading and weighing of cement. The cement storage structure on the site shall be at least **for 20-day capacity**, to be determined by the Contractor in consideration of supply capability.

2.5 Electric Power Supply System

i. PHPA-I will supply electricity at one point to the Contractor. The Contractor shall make all arrangement for distribution within his working area. The electric energy consumed by the Contractor shall be measured by a suitable Energy meter installed at the supply point and the cost thereof shall be paid by the Contractor at the prevailing rates.
ii. The power supply to the construction sites, camps and the entire project area shall be designed for continuous operation, 24 hours a day, with sufficient capacity to satisfy peak and emergency demands.

The Contractor shall also furnish, install and maintain the electrical distribution system to the Engineer-in-Charge's site office.

2.6 Water Supply System

The Contractor shall be fully responsible for the arrangement of necessary facilities for water supply. The Contractor shall design, construct, equip, operate and maintain two separate water installations at the Site necessary for the adequate supply of:

Raw water: for general construction use, treated to the extent necessary to meet specified requirements (e.g., for concrete)

Potable water: for supply to all camps, site offices and plants requiring high quality water meeting relevant requirements for drinking water.

The Contractor shall furnish, install, operate and maintain all pumps, piping, fittings, valves, storage tanks for the water supply and distribution systems, adequate in quantity and pressure. Raw water shall be used for construction purposes only if of adequate quality. There shall be no cross connections of any kind between the raw and potable water supply systems. Only potable water shall be piped for drinking purposes.

2.7 Sewage, Waste Water and Garbage Disposal System

The Contractor shall design, construct, equip, operate and maintain all the installation necessary to properly collect, treat and dispose of sewage from the camp office and other construction facilities. The Contractor shall not, under any circumstances, discharge sewage or contaminated water into natural streams or any open areas. Treatment and disposal of sewage shall be performed in accordance with the current related standards and laws in force in Bhutan and always subject to the Engineer-in-Charge's approval. The drainage systems shall be designed taking into account the rainfall /snowfall rate in the area and the disposal of rainwater/snow shall be accomplished in such a way that no erosion problems are caused which may alter the stability of the soil.

The Contractor shall provide necessary arrangements for disposal of waste and garbage disposal. The areas surrounding camps, offices, job facilities and the work sites shall be kept clean and free of refuse at all times. No waste shall be dumped in areas other than those approved by the Engineer-in-Charge for waste disposal. No waste of any kind shall be deposited in any watercourses. The Contractor shall observe the norms prescribed by the Government of Bhutan for keeping all areas clean.

2.8 Testing and Quality control

The Contractor shall collect the samples as specified or as directed by the Engineer-in-Charge, carryout the relevant test as approved by the Engineer-in-Charge and submit the test reports to the Engineer-in-Charge in time. All tests will be made according to the approved standards.

2.9 Medical Care Facilities

In the event of illness of an epidemic nature breaking out, the Contractor shall carry out and comply with all orders, arrangements or regulations, which may be issued by the

Government or local authorities. Basic Medical facilities are available at Wangdue. The Contractor shall provide and maintain minimum one first aid facilities at the work site.

2.10 Environmental Obligations

The Contractor shall, during the whole period of the Works comply fully with all applicable laws and regulations relating to environmental protection, mitigating measures for reducing environmental impacts and remedial works on completion of the Works. This obligation shall extend to the construction sites themselves, all the Contractor's site installations, and all quarries, borrow areas and tips.

2.11 Final Clean-up

Upon the Completion of Works, or when any plant has completed its functions, the Contractor shall dismantle and demobilize all temporary facilities and remove all refuse, debris, objectionable material, and fill, grade and dress all excavated areas in a clean and proper condition acceptable to the Engineer-in-Charge. All such areas, as far as possible, shall conform to the natural appearance of the landscape.

2.12 Measurement and Payment

No separate payment for establishing the working facilities shall be made. Cost of all such working facilities shall be included in the unit price of works. No separate payment shall be made for complying with any environmental obligations required by applicable laws and regulations, and all such costs incurred by the Contractor to this end shall be considered as being included in the Contractor's Unit Prices.

3. PREPARATION OF SITE/CLEARING & GRUBBING

3.1 Scope of Works

During clearing and grubbing the trees and shrubs, pole lines, fences, monuments, pipe lines etc. within or adjacent to the work site which are not be disturbed shall be protected properly at his own cost, from injury or damage by the Contractor. In case of Archaeological monuments within or adjacent to the area, the Contractor shall provide necessary fencing all around as per the direction of the Engineer-in-Charge and protect the same properly during execution.

Methods, tools and equipment to be adopted for the work shall be such which will not affect the property to be preserved. Only such methods, tools and equipment as approved by the Engineer-in-Charge shall be adopted in the work.

3.2 Submittals

At least ten (10) days before beginning of the works, the Contractor shall submit to the Engineer-in-Charge for his approval:

a. Program of works indicating schedule of the time and the area to be covered
b. The arrangements the Contractor intends to adopt to carry out the work

3.3 Execution

3.3.1 General

Operation for Site preparation shall be strictly limited to the area to be occupied by the indispensable works unless otherwise directed by the Engineer-in- Charge. Cleaning shall be extended to approximately three (3) meters beyond the limit of the works for permanent structures. For temporary works, such extension shall be as minimum as required.

During clearing and grubbing the trees and shrubs, pole lines, fences, monuments, pipe lines etc. within or adjacent to the work site which are not be disturbed shall be protected properly at his own cost, form injury or damage by the Contractor. In case of Archaeological monuments within or adjacent to the area, the Contractor shall provide necessary fencing all around as per the direction of the Engineer-in- Charge and protect the same properly during execution.

Methods, tools and equipment to be adopted for the work shall be such which will not affect the property to be preserved. Only such methods, tools and equipment as approved by the Engineer-in- Charge shall be adopted in the work.

3.3.2 Jungle Clearance

Jungle clearance shall comprise of cutting, removing and disposing of all materials such as vegetation, grass, brushwood, shrubs, stumps and trees and sapling of girth up to 300 mm or more measured at height of 1 m above ground level which in the opinion of Engineer-in-Charge is unsuitable for incorporation in the works, rubbish and other objectionable matters.

The roots of trees and saplings shall be removed to a depth of 600mm below ground level or 140mm below sub-grade level, whichever is lower. Trees and shrubs, etc. within or adjacent to the areas which are not required to be disturbed during jungle clearance shall be properly protected by the Contractor at his own cost.

No trees shall be cut from outside areas designated unless absolutely warranted and approved by the Engineer-in-Charge and all trees designated outside the areas shall be protected carefully from any damage and cleared areas shall be maintained free of vegetable growth during the progress of the works.

3.3.3 Cutting /Felling of Trees

After clearance of the grass, vegetation, shrubs and bushes, etc., trees having girth of (i) 300mm to 600mm and (ii) above 600mm, measured at the height of one meter about ground level) shall be grouped separately and shall be numbered suitable at the site. These

trees shall be cut after approval of the Engineer-in-Charge. Filling trees shall include taking out roots out to 600mm below ground level or 140mm below sub-grade level whichever is low.

The trunks and branch of trees shall be cleared of limps and tops and cut to suitable place as direct by the Engineer-in-Charge. Woods, branch, twits of trees and other useful materials shall be the property PHPA. The serviceable materials shall be stacked in the manner as directed by Engineer-in-Charge.

As unserviceable materials shall be disposed of as per the direction of the Engineer-in-Charge. All excavation below ground level arising out of removal trees, stumps, etc., shall be filled with suitable materials in 400cm layer and compacted thoroughly so that the surface at these points conform to the surrounding area.

3.3.4 Protection of Other Areas

The contractor shall ensure that trees and other vegetation outside the areas of the permanent works and the minimal areas required for temporary works including access are protected and the preserved from damage.

Any clearing required by the Contractor for Construction of temporary works, or for any other purpose shall be at the Contractor's expense and shall not be carried out without the approval of the Engineer-in-Charge unless otherwise specified.

The Engineer-in-Charge reserved the right to reinstate any damage to vegetation and the surface of the ground beyond the areas of the works (including temporary works) at the expense of the Contractor.

3.3.5 Disposal of Stripped Materials

All useful materials obtained from clearing operation shall be stacked in the manner as direct by the Engineer-in-Charge. Trunks and branch of trees shall be cleared of limbs and tops stacked neatly at place indicated by the Engineer-in-Charge. The materials shall be the property of the Engineer-in-Charge. All unserviceable materials which in the opinion of the Engineer-in-Charge cannot be used or auctioned shall be removed from and disposed of as per the direction of the Engineer-in-Charge. Care shall be taken to see that unserviceable materials are disposed of in such manner that there is no like likelyhood of getting mixed up with the materials meant for construction. When materials are to be buried, they shall be disposed of in horizontal layers alternatively with earth layer and shall be compacted to the maximum extent practicable by routine the haulage traffic over area. The maximum height of these spoil materials will be 3m with slope less than 4:1 (4 horizontal to 1 vertical) in adequate conditionals in regard of safety for the stability of the deposit. Vegetal matter shall be covered with 1 m of earth material.

Disposal of waste materials by burning will be permitted only at times and conditions are considered favourable for burning and at location approved by the Engineer-in-Charge. Materials to be burnt shall be piled neatly in such a manner and in such location as to cause the least fire risk. Burning shall be thorough so that the burnt materials reduced ashes. No logs, branches are churched pieces shall be permitted to be remain. The Contractor shall

at all times take special precaution to prevent fire from spreading to areas beyond the limits of the cleared areas and shall have available at the times suitable equipment and supplied for use preventing and suppressing fires. Care shall be taken to see that the burning of such materials doesn't destroy or damage public of private property adjacent vegetation and the Contractor shall be fully responsible for destruction, damage, or nuisance, if any.

3.3.6 Auxiliary Works

The Auxiliary works comprise, but are not necessary limit to, the following:

- Removing and storing of boundary or stones, protections of surveying points; benchmarks, etc. and protection of all secondary survey points, etc.
- Difficulties to be overcome where excavation may have to be carried out on steps in slopes.
- Difficulties in transport due to exiting access condition.
- Sorting of excavated material which, if necessary, is to be use for special purposes.
- Conveying and damping equipment that might be required.

3.4 Measurement & Payment

3.4.1 Measurement

Only the area over which the grass and rubbish has been removed shall be measured. The length and breadth shall be measured and the area shall be calculated correct to two places of decimals.

3.4.2 Payment

The rate shall cover the cost of carrying out all the required operations including cost of labour, materials, equipment hired/owned, tools and plants, and incidentals necessary to complete the work. Where necessary, the rate shall also include handling; salvaging, piling and disposing of the cleared materials with all lift and lead up to 150m.

4. EARTH WORKS

4.1 Scope of Work

The scope of works under this clause covers excavation and filling in and around foundation trenches, pits and similar works including all activities for proper setting out works, stripping / storing of top soil wherever necessary. It also covers filling areas and plinths with selected materials, conveyance and disposal of surplus soils and /or stacking them properly as directed by the Engineer-in-Charge.

The Scope of works shall also cover to provide and maintain all equipment and machinery, skilled and auxiliary personnel and materials as may be necessary for various tasks and requirements associated with all types of excavation / filling along with installation of all temporary and / or permanent supports as necessary or as directed by the Engineer-in-Charge to protect excavated surface from collapse, damage or any mishap.

The Scope of works shall also cover for protection from damage of the existing trees, shrubs and any other plants, pole lines, fences, signs, monuments, buildings, pipelines, drains, sewers, or other surface or sub-surface systems / drains / facilities within or adjacent to the works being carried out. The Contractor shall provide and install suitable safeguards approved by the Engineer-in-Charge for this purpose and carry out all works within the intent of this specification even if not explicitly mentioned herein.

4.2 General Requirements

The Contractor shall make his own arrangements for locating the co-ordinates and positions of all work and establishing the reduced levels (RLs) at these locations based on two reference grid lines and one Bench Mark, before earth work is taken up in hand. The Contractor shall also provide at site all required instruments, materials and man-power, to carry out the work accurately and according to the Specifications and Drawings.

The Contractor shall also provide all safety measures for the workmen and others as per standard practices and requirements and / or direction of the Engineer-in-Charge during all types of excavation /filling at his own cost and responsibility. However, approval given by the Engineer-in-Charge to the Contractor's methods and equipment shall not relieve the Contractor of his full responsibility for a proper and safe execution of excavations, or of liability for injuries to, or death of persons, or any obligations under this Contract.

All excavation shall be carried out in the dry. The Contractor shall take all necessary precautions including supplying and operation all necessary pumping plant to remove all water from any source whatsoever which may enter the excavations whether these are in progress or completed.

If excavations are carried out within 5m of building or other constructions, the Contractor shall execute the work in a way that will minimize damage and disturbance. In general, vertically sided excavation will be required in such places and all necessary timbering or other support shall be provided. Undercutting of excavations sides will not be permitted.

In the case where, in the opinion of the EIC, the works are likely to cause interference to the public, the Contractor shall organize his operations in such a way as to reduce to a minimum the interval between opening up and back-filling the excavations. No further work shall commence until the EIC has inspected and approved the completed excavation.

All excavation operation shall include excavation and "getting out" the excavated material. "Getting out" shall include throwing the excavated material; as directed by the Engineer-in-Charge.

The excavation shall conform to the lines, grades, side slopes and levels shown on the drawing or as directed by the Engineer-in-Charge. The contractor shall not excavate

outside the limits of excavation. Subject to the permitted tolerances, any excess depth/ width excavated beyond the specified levels/dimensions on the drawings shall be made good at the cost of the contractor with suitable material of characteristics similar to the removed and compacted to the requirements.

All debris and loose material on the slopes of cutting shall be removed. No backfilling shall be allowed to obtain required slopes excepting that when boulder or soft materials are encountered in cut slopes, these shall be excavated to approved depth on instructions of the Engineer-in-Charge and the resulting cavities filled with suitable material and thoroughly compacted in an approved manner.

After excavation the sides of excavated area shall be trimmed and the area contoured to minimize erosion and ponding, allowing for natural drainage to take place. If trees were removed, new trees shall be planted, as directed by the Engineer-in-Charge. The cost of planting new trees shall be deemed to be incidental to the work.

All materials obtained from excavation shall remain Owner's property. All salvaged materials of archaeological importance or of value in the opinion of the Engineer-in-Charge shall be segregated from the excavated materials and stacked separately in a regular manner at locations as directed by the Engineer-in-Charge. Within **fifteen (15) days** of taking over of the site, the Contractor shall submit to the Engineer-in-Charge for approval, his proposal for excavation together with pertinent data for each stage of excavation in each work area. The Contractor shall furnish the following details in his proposal:

a. Details of the proposed setting-out methods before commencing the work.
b. Descriptions of working methods and sequences of excavation.
c. Proposals for controlling ground water and details of associated plant and equipment proposed to be deployed, where dewatering is felt necessary.
d. Preliminary design and procedures for blasting and blast monitoring if proposed to be necessary, including name and qualifications of Blasters [**copies of valid Blaster's Certificates for Blasting Supervisor and Blasters to be attached**], commercial description and technical information for the blasting products (explosive, detonator, fuses, etc.) proposed, capacity of explosives and detonator magazines, elements of drilling, charging, delay patterns and weight of explosive to be detonated per day, etc.

4.3 Specifications and Standards

The methods and practices for all types of excavation shall conform to the Specifications for Building and Road Works, 2021: Royal Govt. of Bhutan and / or latest editions of the Indian Standards, subject to the approval of the Engineer-in-Charge.

4.4 Classification of Excavation

Excavation shall be classified depending upon the type of soil encountered during excavation from ground surface or below the finished stripped level and also for purpose of payment. The type of soil in excavation shall be classified as follows:

a. Excavation in Soil

b. Excavation in Rock

4.4.1 Excavation in Soil

Excavation in soil includes excavation in all kinds of soil such as vegetable or organic soil, turf gravel, sand, silt loam, clay, peat, gravel; cobble stone, boulders up to one man size etc., which requires close application of picks or jumpers or scarifies to loosen.

Excavation in soil also includes excavation in soft rock like lime stone, sand stone, hard laterite, hard conglomerate and un-reinforced cement concrete below ground level, which can be excavated by splitting with crow bars or picks and does not require blasting, wedging or similar means of excavation.

4.4.2 Excavation in Rock

Rock when encountered in excavation shall be removed up to the formation level or as otherwise indicated on the drawings. Where, however, unstable shales or other unsuitable material are encountered at the formation level, these shall be excavated to the extent of 500mm below the formation level or as otherwise specified. In all cases, the excavation operation shall be so carried out that at no point on cut formation the rock protrudes above the specified levels. Rock and large boulder which are likely to cause differential settlement and also local drainage problems should be removed to the extent of 500 mm below the formation level in full formation width including drains and cut through the side drains.

Where excavation is done to levels lower than those specified, the excess excavation shall be made good to the satisfaction of the Engineer-in-Charge.

Slopes in rock cutting shall be finished to uniform lines corresponding to slope line shown on the drawing or as directed by the Engineer-in-Charge. Notwithstanding the foregoing, all loose pieces of rock on excavated slope surface shall be removed.

When blasting is to be resorted to the same shall be carried out to clause 4.5 and all precautions indicated therein observed.

4.5 Blasting

Where hard rock is met with and blasting operations are considered necessary, the Contractor shall obtain the approval of the Engineer-in-Charge. For an ordinary rock, in general, blasting operation shall not be carried out unless permitted by the Engineer-in-Charge. All blasting operations including the depth and size of holes and the size and characteristics of charges shall be subject to the approval of the Engineer-in-Charge. The Contractor shall submit all such information to the Engineer-in-Charge for approval **at least 14 days** prior to starting blasting operation.

The Contractor shall obtain a license from the competent authority for obtaining and storing the explosives. The Contractor shall procure the explosives, fuses, detonators, etc from the Government of Bhutan (RGoB) or as per the provision in terms and conditions of the Contract. The Engineer-in-Charge or his authorized Representatives shall have the right

to check the Contractor's store and accounts of explosives. The Contractor shall provide all facilities for this. The Contractor shall also comply strictly with the regulations as required by the concerned authorities of RGoB, regarding purchase, storage, issue and use of explosives and detonators and transport of same to and from site.

Blasting shall be carried out at specified times to be agreed upon between the Contractor and the Engineer-in-Charge. Contractor shall take all precautions as per rules for blasting operations as per latest RGoB blasting manuals and shall be responsible for any damage done to the Work or any damage arising out of accident to the workmen, public or property due to storage, transportation and use of explosives during blasting.

4.6 Disposal and Stockpiling of Materials from Excavation

All the excavated material shall be the property of the employer. The material obtained from the excavation of benches & foundations of buildings, roadway, shoulders, verges, drains, cross-drainage works etc., shall be used for filling up of (i) roadway embankment, (ii) the existing pits in the right-of-way and (iii) for landscaping of the road as directed by the Engineer-in-Charge, including leveling and spreading and disposal of surplus soil at the designated dumping area or as directed by the Engineer-in-Charge and no extra payment shall be made for the same.

4.7 Excavation Tolerances

The following tolerances shall apply for all excavations

Description	Excavation Tolerance (cm)
a. bed or formation levels for construction	+0, -10
b. side slope (perpendicular to slope)	+4, -10
c. top elevation	+10, -0

The Engineer-in-Charge may require that the Contractor repair or remove at his own expense, any material that exceeds the limits above specified.

4.8 Dewatering

The contractor shall construct, operate and maintain drainage systems, including drainage trenches pumps, pump, sumps, pipe lines etc., to sufficiently dewatering for appearing water, service water and underground water encountered during excavation, in order to allow for the workman like execution of all excavation works. All cost for dewatering systems including drainage trenches pumps sumps, pumps, pipe line, etc., shall be included in the unit price in the schedule of quantities excavation and construction of foundation specified in sub- clause- 4.11.2.3.

4.9 Slides

If slips, slides, over-breaks or subsidence occur in cutting during the process of construction, they shall be removed at the cost of the contractor as ordered by the Engineer-in-Charge. Adequate precautions shall be taken to ensure that during construction, the slopes are not rendered unstable or given rise to recurrent slides after construction. If finished slopes slide into the roadway subsequently, such slides shall be removed and paid for at the contract rate, provided the slides are not due to any negligence on the part of the contractor.

4.10 Slopes Support and Protection

The Contractor is responsible for all necessary safety measures. From the commencement of work until certificate of completion, the Contractor shall strictly follow the safety regulations in order to prevent accidents. Proper strutting, including rearrangements of the struts, when necessary, protection of slopes, methods of excavation to reduce risk of slides, etc. shall be deemed to be included in the unit prices. In the event of soil slides occurring during earth and rockwork, all damage will be to the Contractor's account. All additional work from such damage will not be paid for. Where the nature of the soil gives reason to fear of any movement, initial excavation operations shall be carried out with special care. All planking, strutting and supports necessary to retain the sides of the excavations shall be provided, erected and maintained in a safe condition by the Contractor.

Excavation shall not be carried out below foundations of any structure without prior approval of the Engineer-in-Charge, until underpinning and shoring etc. to be performed by the Contractor, have been completed. All existing structures, pipes and foundations, if any, which are to be incorporated into the final work, shall be adequately protected or replaced by the Contractor.

4.11 Measurement and Payment

4.11.1 Measurement

Measurement for excavation will be made according to the volume of solid mass, actually excavated in its natural state by measuring the length, breadth and depth of cutting corrected up to 1 mm. The volume computations shall be based on surveys of the original ground surface and / or rock surface after completion of final excavation. Excavation in soil and rock shall be measured separately.

Excavation work for Working Facilities, e.g., access and temporary service roads, camps, etc., will not be measured. The Contractor shall include the costs of such works in the respective pay-items.

4.11.2 Payment

4.11.2.1 General

Payment for excavation in soil or rock shall be made at the unit prices tendered in the Bill of Quantities. The unit prices shall include the all costs required for carrying out all operations including labor, materials, equipment, tools and plants, drilling and blasting, protection, drainage and dewatering, and cleaning of excavation surface, stockpiling, transportation and disposing the excavated materials and incidentals necessary to complete the work.

Damages or alterations caused by wrong blasting or due to any other incorrect operation by the Contractor shall be repaired at his own expense in a manner acceptable to the Engineer-in-Charge.

4.11.2.2 Payment for Over-Excavation

1) Over - excavation due to Geological Conditions

The cost incurred in connection with cave-ins and rock falls due to geological conditions will be reimbursed to the Contractor, subject to the approval of the Engineer-in-Charge, at the reduced rate only in case of unexpected and unavoidable occurrences, which could not be avoided by proper excavation and support methods.

2) Over-excavation due to Contractor's Fault

Where over-excavation is caused by inappropriate working methods or negligent work (e.g. wrong location of drill holes, careless blasting operations, excessive pulls, etc.), no payment will be made either for the over-excavation / over-break beyond the pay line or for the additional concrete required for filling. The Contractor shall be responsible for all cave-ins, erosion and over-break due to the Contractor's fault. He shall take all necessary measures at his own cost, to control the excavation and make all the repairs ordered by the Engineer-in-Charge.

3) Extra Excavation Required for Operational Reasons

Extra excavation not described in the Bill of Quantities or not shown on the Drawings, but considered necessary by the Contractor for his operations in excavation or for supply facilities and the like may be made only if approved by the Engineer-in-Charge. The cost of such excavation including supporting work and of the concrete required to fill them shall be included in the unit prices of excavation in the Bill of Quantities and shall not be paid separately even though their construction has been approved by the Engineer-in-Charge.

4.11.2.3 Payment for Dewatering

No measurement and payment for dewatering shall be made extra. All cost of dewatering during excavation and construction of foundation of any structure shall be included in the Unit Rates in the respective Bill of Quantities.

4.12 Geotechnical Investigation

The safe bearing capacity of foundation strata of buildings is taken as 15 T/m^2 based on bouldary soil strata expected to be encountered. After completion of excavation, the soil conditions need to be evaluated by client geologist and Engineer-in-charge before proceeding construction. Based on observations, bearing capacity test may be recommended by the Engineer-in-Charge. The investigation should be carried out prior to taking up of construction of the respective buildings. The test results are required to be submitted to the Engineer-in- Charge for approval of taking up construction of buildings.

The bearing capacity strata less than 15 T/m^2 may necessitate revision in design /drawings, if found necessary.

4.13 Definition of Fill

The expression 'fill' shall be taken to mean backfill as well as fill in trenches and is deemed to include excavation from trenches / borrow area or stockpile, loading/ unloading, transport up to 2 km radius, spreading / placing, compaction and trimming to final profile and any moisture control measures required to bring the fill to within specified moisture content whether drying or wetting measures.

4.14 Fill Material

Materials to be used for filling purposes shall be obtained in general, from the excavated earth. The fill materials shall be clean and free from shingle, organic matters, roots and excessive amount of sand, lumps, concrete or any other foreign substances which could harm or impair the strength of the sub-structure in any manner. Fines less than 74microns shall not be more than 20%. In any case, materials to be used for filling shall have the prior written approval of the Engineer-in-Charge.

Filling in trenches, retaining wall foundation and planters shall be done using selected excavated earth or otherwise as directed by the Engineer-in-Charge. Materials required for filling / banking in the Works, if not available from the required excavation shall be obtained from the Designated Borrow Area. Some degree of selection may be required by the Engineer-in-Charge within the Designated Borrow Area. Where access to suitable material within the borrow area is not possible, the borrow area's site shall be cleared and/ or grubbed at the Contractor's expense.

4.15 Execution of Filling

After completion of foundation for trenches, retaining walls, and other construction below the elevation of the final grades and prior to filling, all temporary shoring, timber, etc. shall be sequentially removed and the excavation cleaned of all trash, debris and perishable materials. If anti-termite treatment is required to be done, the same should be done as directed by the EIC. Filling shall begin only with the written approval of the Engineer-in-Charge. Also, area identified for filling shall be cleared of all soft pockets, vegetation, bushes, slush, etc. In case of foundation and similar filling, the ground shall be dressed and consolidated by ramming and light rolling by portable mechanical compacter.

Filling for paver block foundation shall be with clean sand and free from dust, organic and foreign matter and its grading shall be as approved by the Engineer-in-Charge. Sand filling in the pavement shall be in a manner similar to earth filling as specified above except that consolidation shall be done by flooding with water. The surface of the consolidated sand filling shall be dressed to the required level or slope and shall not be covered till inspected and approved by the Engineer-in-Charge.

Fill adjacent to pipes shall be free of stones, concrete, etc. and shall be hand placed and compacted uniformly on both sides of the pipes and where practicable up to a minimum depth of 400mm over the top of pipes. While tamping around the pipes, care should be taken to avoid unequal pressure.

Filling shall be accurately finished to the line, slope, cross section and grade as shown on the Drawings. Finished surface shall be free of irregularities and depressions and shall be within 20mm of the specified level.

4.16 Measurement and Payment

4.16.1.1 Measurement

For filling sides of the foundations, the cubical contents of bed concrete leveling course and masonry / concrete in foundations up to the ground level shall be worked out and the same shall be deducted from the cubical contents of earth work in excavation for foundations already measured under the respective item of earth work to arrive at the quantity of filling the sides of foundations.

Filling in plinth and under floors shall be measured by cubical contents of the filling after consolidation.

4.16.1.2 Payment

Payment for filling either from excavated earth or borrowed earth or sand shall be made as per the Unit Rates tendered in the Bill of Quantities. The unit rates shall cover the cost of all the required filling operations including cost of labor, materials, equipment, tools and plants, watering, consolidation, etc. and incidentals necessary to complete the work. No additional payment will be made for preparation of the borrow area.

4.17 Trenches Excavation

4.17.1.1 Excavation

All excavation operation shall include excavation and getting out the excavated matter. Getting out shall include throwing the excavated earth at least one meter or half the depth of excavation whichever is more, clear off the edge of excavation. The subsequent disposal of the excavated material shall either be as directed by the Engineer under a separate item or as included in this item disposal up to 50 meters lead. Excavation shall be dug out to the exact dimensions as shown in the drawing or as directed by the Engineer.

Care shall be taken to cut the sides and bottom exactly to the required shape, slope and gradient, while carrying out excavation for drains work. The surface shall be dressed properly. If the excavation is done to a depth greater than that shown in the drawings or greater than that required by the Engineer, the excess depth shall be made good at the cost of the contractor with stiff clay puddle at places where the drains are required to be pitched and with ordinary earth, properly watered and rammed, where the drains are not required to be pitched. In case the drain is required to be pitched, the back filling with clay puddle shall be done side by side as the pitching work proceeds. The brick pitched storm water drains shall be avoided as far as possible in filled up areas.

Excavation in ordinary rock shall be carried out by crowbars, pickaxes or pneumatic drills. Blasting operations are generally not required in this case. If the contractor wishes to resort to blasting, he can do so with the permission of Engineer, but nothing extra will be paid to him on this account.

Excavation in hard rock shall be done by chiseling where blasting operation is prohibited or is not applicable. In trenches or drains where blasting is not otherwise prohibited, the excavation in hard rock shall be carried out by blasting in the first instance and finally by chiseling so as to obtain the correct section of the trench as per drawing. The blasting operation shall be strictly as per latest RGoB blasting manuals

Where water is met within excavation due to stream flow, seepage, springs or other reasons, the contractor shall take adequate measures such as bailing, pumping, construction of diversion channels, drainage channels, bunds, coffer dam and other necessary works to keep the foundation trench dry when necessary and to protect the green concrete/masonry against damage by erosion, or sudden rising of water level. The steady water level in the trial pits prior to the start of pumping operations shall be considered to be the subsoil water level in that area.

4.17.1.2 Measurements

The length, breadth and depth shall be measured correct to 10mm. The cubical contents shall be worked out to the nearest two places of decimal in cubic meters.

4.17.1.3 Rates

The rates shall cover the cost for carrying out all the required excavation and banking operations including cost of labor, materials, equipment hired/owned, tools and plants, and incidentals necessary to complete the work. In case of rock, the rate shall also include the cost of all operations of blasting with explosive and accessories as mentioned above.

Protection and supporting of existing services i.e. pipes, water mains, cables met within the course of excavation. Care shall be taken not to disturb electric and communication cables, and, if necessary for removal it shall be arranged by the Engineer.

4.18 Filling of Trenches

4.18.1.1 Filling

Earth used for filling shall be free from stone, shingle or boulder larger than 75 mm in any direction and salts, organic or other foreign matter. Normally excavated earth from the same area shall be used for filling. However, if such earth contains deleterious material, it shall not be used. All clods of earth shall be broken or removed. Filling in trenches for pipes and drains shall be commenced as soon as the joints of the pipes and drains have been tested and passed.

The spaces around the foundations pipes and drains in trenches shall be cleared of all debris, brick bats etc. The filling shall be done in layers, not exceeding 200mm in each layer. Each layer shall be watered, rammed and consolidated before the succeeding one is laid. Earth shall be rammed with iron rammers where feasible and with the butt-ends of crowbars where rammer cannot be used. Special care shall be taken that no damage is caused to the pipes, drains and masonry or concrete in the trenches, under floor, etc.

4.18.1.2 Measurement

The cubical contents of foundation concrete and masonry in foundation up to ground level shall be worked out and the same deducted from the cubical contents of earthwork in excavation for foundations to arrive at the quantity for filling sides of foundation. For filling in plinths and under floors, depth shall be the consolidated depth.

4.18.1.3 Rates

The rates shall cover the cost for carrying out all the required filling operations including cost of labour, materials, equipment hired/owned, tools and plants, and incidentals necessary to complete the work.

4.19 Sand

Sand filling shall be done similar to earth filling in plinth as specified above except that the consolidation shall be done by flooding with water. The surface of the consolidated sand shall be dressed to required level or slope. Concreting of floor shall not be started until the sand filling is inspected and approved by the engineer.

4.19.1.1 Measurements

Volume of consolidated filling shall be measured. The dimensions shall be measured correct to 10mm and cubical contents worked out in cubic meter correct to two places of decimal.

4.19.1.2 Rates

The rates shall cover the cost for carrying out all the required filling operations including cost of labor, materials, equipment hired/owned, tools and plants, and incidentals necessary to complete the work.

5. MASONRY WORKS

5.1 Scope of Works

The Scope of Works covered under this clause shall comprise of stone masonry works including supply of all construction materials, equipment, tools and plants, labor (skilled or un-skilled), etc. as would be required for construction of all types of masonry as shown in the Drawings and as specified herein and / or as directed by the Engineer-in-Charge.

The Scope of Works shall also include to provide all structural parts, scaffolding, transportation, loading, unloading, inspection, test and quality control, preparation of foundation surfaces, adjustment of surfaces adjacent to the walls, linings, pavements, including curing and protection, etc. and all other incidentals and operations required to complete the masonry works in all respects.

5.2 General Requirements

All materials and structural parts incorporated in the permanent work shall be new and unused. Quality and dimensions of materials as well as works shall comply with these Specifications and approved Standards.

All masonry shall be carried out in a workman like manner at the highest standards and all works shall be coordinated with the other works carried out at the site to allow the performance of all works simultaneously without causing any hindrance to other works.

The Contractor shall also provide all safety measures for the workmen and others as per standard practices and requirements and / or direction of the Engineer-in-Charge during all masonry works at his own cost and responsibility. However, approval given by the Engineer-in-Charge to the Contractor's methods and equipment shall not relieve the Contractor of his full responsibility for a proper and safe execution of masonry, or liability for injuries to, or death of persons, or any obligations under this Contract.

5.3 Submission

At least **fifteen (15)** days prior to commencement of the masonry work, the Contractor shall submit the details of schedule of works to the Engineer-in-Charge for approval. Submission shall also include details of source of supply of Stones, Cement and Sand for mortar, indicating the estimated quantity to be obtained from each source and all other requisite materials.

Approval of plant and equipment or their operation or of any construction procedure will not waive or modify any provisions or requirements contained in this Specification governing the quality of the materials or the finished work.

5.4 Classification of Masonry

The masonry works shall be classified as mentioned in **Table -5.1.** The required works shall be **executed** as per drawing, specifications and / or as directed by the Engineer-in-Charge

Table -5.1

Classification of Masonry

Type of masonry	Classification	Cement-mortar Mix
Random Rubble Masonry	RRM	1 (Cement) :4 (Sand)

5.5 Execution

5.5.1.1 General

The mortar for all masonry works shall consist of cement, sand as specified above and water with or without admixtures as approved by the Engineer-In-Charge, each complying with its specifications. The quantity of water shall be as necessary to obtain a satisfactory workability regarding the use of the mortar. Quality of mortar shall in general, meet the requirements specified in IS: 2250 (Code of Practice and Use of Masonry mortar).

5.5.2 Mixing, Transporting and Placing

The unit of measurement for cement shall be a bag of cement weighing 50kg and this shall be taken as 0.035 cubic meter. Sand in specified proportion shall be measured in boxes of size: 35 x 25 x 40 cm. It shall be measured on the basis of its dry volume. In case of damp sand, its quantity shall be increased suitably to allow for bulking.

Mortar for masonry shall invariably be produced in a mechanical mixture by volume batching. The mortar shall be mixed in small batches such that the quantity of mortar so prepared at a time could be completely used up in masonry **within 30 minutes of mixing**. Mortar that has remained longer than this period or that has become stiff or set on account of delay in consumption or otherwise shall be rejected at the Contractor's cost.

Cement and sand in the specified proportions shall be mixed dry thoroughly in a mixer. Water shall then be added gradually and wet mixing continued for at least two minutes. Care shall be taken not to add more water than that which shall bring the mortar to the consistency of a stiff paste. Only the quantity of mortar, which can be used within 30 minutes of its mixing shall be prepared at a time. The drum shall be totally emptied before a new batching cycle is started. The drum shall be kept free from hardened mortar and shall be thoroughly cleaned prior to change of mix or on cessation of mixing.

Hand-mixing for small batches may be approved by the Engineer-in-Charge. However, the mortar shall be mixed up to the degree obtained with a mechanically operated mixer. Prior to adding water to the mix, sand, cement and admixture (if required) shall be mixed dry

thoroughly in a leveled platform until the mixture has a uniform color. The quantity of dry mix, which can be used within 30 minutes, shall then be mixed in masonry trough with just sufficient quantity of water to bring the mortar to the consistency of a stiff paste.

The equipment and tools used for transporting and placing of mortar shall ensure that contamination or loss of ingredients do not take place. Mortar shall be stirred or worked at frequent intervals to prevent separation. In case, the mortar has stiffened because of evaporation of water from the mortar, it may be re-tampered by adding water frequently as needed to restore the requirements of consistency but this re-tampering shall be permitted only up to 2 hours from the time of original addition of water. Mortar unused for more than two hours shall be rejected and removed from the site of work.

5.6 Random Rubble Masonry (1:4)

5.6.1 Dressing

Stones shall be hammer dressed, on the face, the sides and the beds, to enable it to come into close proximity with the neighboring stone. The bushing in the face shall not project more than 4 cm in an exposed face, and one cm on a face to be plastered. The hammer dressed stone shall have a rough tooling for a minimum width of 2.5 cm along the four edges of the face of stone.

5.6.2 Laying

Every stone shall be carefully fitted to the adjacent stones, so as to form neat and close joints. Stones may be brought to level courses at plinth, windowsills and roof level. Leveling up at plinth level, window sills and roof level shall be done with concrete comprising of one part of the mortar as used for the masonry and two parts of graded stone aggregate of 20mm nominal size and shall be-included in the items. The bond shall be obtained by fitting in closely, the adjacent stones and by using bond-stones. Face stones shall extend and bond well into the backing. These shall be arranged to-break joints as much as possible, and to avoid long vertical lines of joints. The hearting or interior filling of the wall shall consist of rubble stones, which may be of any-shape but shall not pass through a circular ring of 15 cm inner diameter; thickness of these stones in any direction shall not be less than 10 cm. These shall be carefully laid, hammered down with a wooden mallet into position and solidly bedded in mortar, chips and spalls of stone being used wherever necessary to avoid thick mortar beds or joints and at the same time ensuring that no hollow spaces are left anywhere in the masonry. The hearting will be laid nearly level with facing and backing, except that at about one-meter intervals, vertical 'Plumb' projecting about 15 cm to 20 cm shall be firmly embedded to form a bond between successive courses.

5.6.3 Bond Stones

Bond or through stones running right through the thickness of walls, shall be provided in walls upto 60 cm thick and in case of walls above 60 cm thickness, a set of two or more bond stones overlapping each other by at least 15 cm shall be provided in a line from face to back. At least one bond stone or a set of bond stones shall be provided for every 0.5

sq.m of the wall surface. All bond stones in stone masonry shall be marked suitably as directed by the Engineer-in-charge.

5.6.4 Quoins or corner stone

The quoins shall be of selected stones neatly dressed with the hammer and / or chisel to form the required angle, and laid header and stretcher alternately. The length of these stones shall be 45cm or more and at least 25% of the stones shall be 50cm or more in length.

5.6.5 Jambs

Stones used in jambs shall be similar to those in quoin, excepting the length of the stem, which shall be 45cm, or thickness of the wall whichever is less.

5.6.6 Joints

Stones shall be so laid that all joints are fully packed with mortar and chips. Face joints shall not be thicker than 20 mm.

When plastering or pointing is not required to be done, the joints shall be struck flush and finished at the time of laying. Otherwise, the joints shall be raked to a minimum depth of 20 mm by raking tool during the progress of work, when the mortar is still green.

5.6.7 Curing

Masonry work in cement or composite mortar shall be kept constantly moist on all face for a minimum period of seven days. In case of masonry with fat-lime mortar, curing shall commence two days after laying of masonry and shall continue for at least seven days thereafter.

5.6.8 Protection

Green work shall be protected from rain by suitable covering. The work shall also be suitably protected from damage, mortar dropping and rain during construction.

5.6.9 Scaffolding

Single scaffolding having one set of vertical support shall be allowed. The supports shall be sound and strong, tied together by horizontal pieces, over which the scaffolding planks shall be fixed. The inner end of the horizontal scaffolding member may rest in a hole provided in the masonry. Such holes, however, shall not be allowed in pillars less than one meter in width or immediately near the skew back of arches.

The holes left in masonry work for supporting scaffolding shall be filled and made good with cement concrete 1:3:6 (1 cement: 3 coarse sand: 6 stone aggregate 20mm nominal size).

5.6.10 Measurements

The length, height and thickness shall be measured correct to 1 cm. The thickness of wall shall be measured at joints, excluding the bushings. Only specified dimensions shall be allowed anything extra shall be ignored. The quality shall be calculated in cubic meter nearest to two places of decimal.

5.6.11 Rate

The rate shall include the cost of materials, labor and all lead and lift required for all the operations described above.

6. CONCRETE WORKS

6.1 Scope of Work

The Scope of works under this clause covers plain cement concrete (PCC) works which shall consist of:

- Supply of all concrete constituents including, cement, sand, aggregate, labor, equipment, tools and plants, joint materials etc.
- Manufacturing, cooling, transporting, placing, consolidating, protecting and curing of concrete
- Constructing, erecting and dismantling of form work
- Placing materials for expansion and construction joints

The Contractor shall also provide all safety measures for the workmen and others as per standard practices and requirements and / or direction of the Engineer-in-Charge in execution of concrete works at his own cost and responsibility. However, approval given by the Engineer-in-Charge to the Contractor's methods and equipment shall not relieve the Contractor of his full responsibility for a proper and safe execution of concreting, or of liability for injuries to, or death of persons, or any obligations under this Contract.

6.2 Definitions

a. Fine aggregate (Sand)

Fine aggregate is defined as the part of aggregate having a maximum dimension of 4.8 mm.

b. Coarse aggregate

Coarse aggregate is defined as the part of aggregate having a minimum dimension of 4.8 mm and maximum of 40 mm.

c. Construction Joint

Concrete surfaces, upon or against which concrete is to be placed or where new concrete is to be adhered, that have become so rigid that the new concrete cannot be incorporated integrally with that previously placed are defined as construction joints.

d. Expansion or Contraction joint

All joints allowing relative movement of concrete structures with respect to an adjacent one, due to expansion, shrinkage, settlement of foundations etc. are to be considered expansion or contraction joints.

6.3 Submission

The Contractor shall perform the concrete works in accordance with the Specifications, the Drawings and the instructions of the Engineer-in-Charge. At **least seven (7) days** prior to commencement of the concrete work, the Contractor shall submit the details of materials of concrete and schedule of concreting to the Engineer-in-Charge for approval.

The approval given by the Engineer-in-Charge to the Contractor's plants and equipment or their operation or any construction method shall not relieve the Contractor of his full responsibility for the proper and safe execution of concrete work or any obligations under the Contract.

6.4 Materials

All materials like cement, aggregates, water, admixture, etc. as would be required for production of concrete shall conform to the Specifications for Building & Road works, 2021, RGoB / IS Codes

6.5 Execution of Concrete Works

6.5.1 General Requirement

The works should be carried out in accordance with IS: 456 (latest edition). The concrete to be produced and placed according to the Specifications shall be of highest quality and uniformity. In all phases of operations, the Contractor shall be subject to strict inspection and tests to assure concrete of the best quality. Special emphasis shall be made on the uniformity of the concrete aggregates, water-cement ratio, consistency, air content and the temperature control of the concrete at the time of placement in the formwork, as well as the density and finishing when placed.

The Contractor shall be fully responsible for producing and maintaining the quality of concrete with especially compressive strength not inferior to the specified one, except if different instructions are given by the Engineer-in-Charge.

The Engineer-in-Charge shall have the right to reject concrete in any of the following events:

When mixing operations have not been started within thirty (30) minutes after the cement is added to the aggregates or,

when more than fifteen (15) minutes have elapsed between the discharging of the mixer and the actual placing of the concrete, without agitating the concrete mix or,

When more than one (1) hour has elapsed between the adding of the cement to the aggregates, and the actual placing of the concrete.

The Engineer-in-Charge reserves the right to specify a lesser time, if hot weather or other conditions cause quick stiffening of the concrete.

None of the concrete rejected by the Engineer-in-Charge shall be utilized in any of the permanent works. The re-tempering of concrete, which has partially hardened, that is, remixing with or without additional cement, aggregate or water shall not be permitted.

6.5.2 Execution of Plain Concrete Works (PCC)

6.5.2.1 Mixing of Concrete

Mixing of concrete shall be done by volume measure in the proportion as specified in the drawing and /or as directed by the Engineer-in-Charge. Boxes of suitable size shall be used for measuring sand and aggregates. The internal dimensions of the boxes shall be generally 35x25x40 cm deep or as otherwise approved by the Engineer-in-Charge. The unit of measurement for cement shall be a bag of 50 kg and this shall be taken as 0.035cum.

While measuring the aggregates, shaking ramming or heaping shall not be done. The proportioning of sand shall be on the basis of its dry volume and in case of damp sand, allowance for bulkage shall be made by adopting the method prescribed under "Mandatory tests".

Mixing shall be done in mechanical mixers. Mixing by hand shall be employed only in special cases with the specific prior permission of the Engineer-in-Charge. Stone aggregate shall be washed with water to remove dirt, dust or any other foreign materials, where necessary before putting into the mixer.

a. Machine Mixing

Before starting mixing in a mixer, the mixer drum shall be flushed clean with water. Measured quantity of dry coarse aggregate shall be placed in the skip followed by measured quantity of fine aggregate and then cement. In case damp sand is used, add half of the quantity of coarse aggregate followed by cement and sand. Finally add balance quantity of the coarse aggregate. The skip shall be raised and dry materials slipped into the drum. The dry materials shall be mixed for at least four turns of the drum, after which the correct quantity of water shall be added gradually while the drum is in motion, to ensure even distribution with the dry material. The total quantity of water for mixing shall be introduced before 25% of mixing time has elapsed and shall be regulated to achieve the specified water- cement ratio. The materials shall be mixed for a period of not less than 2

minutes and until a uniform colour consistency is obtained. The time shall be counted from the moment at all the materials have been put into the drum.

The complete contents of the mixed concrete shall be emptied before recharging. When the mixer closed down for the day or at any time exceeding 20 minutes, the drum shall be flushed clean.

b. Hand Mixing

Hand mixing shall be done on a smooth, clean and water-right platform of suitable size in the following manner.

i. Measured quantity of sand shall be spread only
ii. The cement shall be dumped on the sand and distributed evenly
iii. The sand and cement shall be mixed intimately with spade, turning the mixture over and over again, until it is of even colour throughout and free from streaks.
iv. The sand cement mixture shall be spread out and measured quantity of coarse aggregate shall be spread on its top. Alternatively, the measured quantity of coarse aggregate shall be spread out and the same cement mixture shall be spread on its top.
v. The above materials shall be mixed at least three times by shoveling and turning over by twist from center to side, then back to the centre and again to the sides.
vi. A hollow shall be made in the middle of the mixed pile.
vii. Three quarters of the total quantity of water required shall be added while the material is turned in towards the centre with spades. The remaining water shall be added by water can fitted with rose head, slowly turning the whole mixture over and again until a uniform colour and consistency is obtained throughout the pile.
viii. The mixing platform shall be washed at the end of the day.

6.5.2.2 Consistency and Slump of Concrete

Concrete shall be of a consistency and workability suitable for the conditions on the job. For most concrete a "plastic" mix is required, which will not crumble, but will flow sluggishly when vibrated, without segregation.

The quantity of water to be used for each mix of 50 kg cement, to give the required consistency shall not be more than 35 litres for 1:3:6 mix, 30 litres for 1:2:4 mix, 27 litres for 1:1.5:3 mix and 25 litres for 1:1:2 mix. In the case of vibrated concrete, such limits specified may be suitably reduced to avoid segregation. The quantity of water shall be regulated by carrying out regular slump tests.

Slump tests shall be performed in accordance with the "Standard Method of Slump Test for Consistency of Portland Cement Concrete"- **IS-515**. The Engineer-in-Charge may require to adopt a stiffer consistency than that specified wherever concrete of such consistency can be poured and be compacted easily by vibrators.

Wherever the limits for consistency and/ or slump are exceeded, the concrete shall be rejected and removed at the Contractor's expense. The slumps as given in the Table 6.1 shall be adopted for different kinds of work:

Table -6.1

Limit of Slump for Plain Concrete

Works	Slump (in mm)	
	Vibrator Used	Vibrator not used
Mass concrete in foundation, etc.	10-25	50-75
Thin sections of flooring less than 75 mm thickness	25-40	75-100

6.5.2.3 Strength of concrete

The compressive strength on work tests for different mixes shall be as given in the table 6.2

Table - 6.2
Compressive Strength of Concrete

Grade of concrete	Mix	Compressive strength in N/m m.sq	
		At 7 days	At 28 days
M20	1:1.5:3	13.5	20
M15	1:2:4	10	15
M10	1:3:6	7	10

6.5.2.4 Placing of concrete

The entire concrete to be used in the work shall be laid gently (not thrown) in layers not exceeding 170 mm and shall be thoroughly vibrated by means of mechanical vibrators till a dense concrete is obtained. The Engineer-in-Charge may however relax the condition specifying use of mechanical vibrators at his discretion for certain items depending upon the thickness of the members and feasibility of vibrating the same and permit hand compaction.

Hand compaction shall be done with the help of tamping rods so that the concrete is thoroughly compacted and completely worked into the corners of the formwork. The layers of concrete shall be so placed that the bottom layer does not finally set before the top layer is placed.

Compaction shall be completed before the initial setting starts i.e., within 30 minutes of addition of water to the dry mixture. For items where the vibrators are not to be used, it shall be the duty of the Contractor to take the permission of the Engineer-in-Charge before the start of work.

During cold weather, concreting shall not be done when the temperature falls below 4.7° C. The concrete placed shall be protected against frost by suitable covering. Concrete damaged by frost shall be removed and work redone. During hot weather, precaution shall be taken to see that the temperature of wet concrete does not exceed 38° C.

When the placing of concrete is suspended, necessary removal of laitance and roughening the surface for jointing future work shall be done before the concrete sets. When the work is resumed the previous work must be thoroughly cleaned, roughened, watered and a grout of neat cement slurry of the proportion, 1 kg of cement per liters of water applied uniformly.

6.5.2.5 Form Work

i. Centering and Strutting

Props used for centering shall be steel, timber posts, ballies or any other material approved by Engineer-in-Charge. In no case ballies shall be of diameter less than 100 mm measured at mid length and 80 mm at thin end. Maximum permissible spacing shall be 1.2 m center to center. Ballies shall rest squarely on wooden sole plates of 40mm thickness and minimum bearing area of 0.1 sqm. laid either on ground or on 40x40 cm brick masonry pillars in mud mortar of height not exceeding 40 cm. Double wedges shall further be provided between the sole plates and the wooden props so as to facilitate tightening and easing of shuttering without jarring the concrete. In case brick masonry pillar of adequate section are used instead of props, wooden sole plates shall be provided at the top of pillars and double wedges inserted between the sole plate and the bottom of shuttering.

ii. Shuttering

The shuttering shall have smooth and even surface and the joints shall not permit leakage of cement grout. Timber used shall be well seasoned, free from loose knots, projecting nails, splits or other defects that may mar the cement surface of concrete. It shall not be so dry as to absorb water from the concrete and swell and bulge, or so green or wet as to shrink after erection. Species of timber that are not affected appreciable by its contact with water shall be used. The timber shall be accurately sawn and planned on the sides and the surface coming in contact with concrete. For exposed concrete faces, timber for shuttering shall be wrought on all faces in contact with concrete.

Wooden formwork with metal sheet lining of steel plates stiffened by steel angles shall also be permitted. Where metal forms are used, all bolts and nuts shall be countersunk and well ground to provide a smooth plane surface. The chamfers, beveled edges and molding shall be made in the formwork itself. Opening for clamps and other fittings connected with services shall be provided in the shuttering as directed by the Engineer-in-Charge. As for as practicable, clamps shall be used to hold the forms together. Where use of nails is unavoidable minimum number of nails shall be used and these shall be left projecting so that they can be easily withdrawn. Use of double head nails shall be performed.

iii. Surface Treatment for Shuttering

The surfaces of timber shuttering that would come in contact with concrete shall be well wetted and coated with soap solution, raw linseed oil, form oil of approved manufacturer or any other approved material (such as polythene/polyethylene sheets), to prevent adhesion of concrete to form work. Soap solution, for the purpose shall be prepared by dissolving yellow soap in water to get the consistency of paint. Inside surface of forms shall be thoroughly cleaned before application or any of the materials mentioned above. Release agents shall be applied strictly in accordance with the manufacturer's instruction and shall not be allowed to come in contact with any reinforcement. Re-use of the shuttering shall be permitted only after the inside surface has been thoroughly cleaned in the manner described above.

Contractor shall give the Engineer-in-Charge due notice before placing any concrete in the forms to permit him to inspect and accept the form work as to its strength alignment and general fitness, but such inspection shall not relieve the Contractor of his responsibility for safety of workman, machinery, materials and for results obtained.

iv. Removal of Form Work

No formwork of any part thereof shall be removed without prior approval of the Engineer-in-Charge. The formwork shall be so removed as not to cause any damage to concrete due to shock or vibration. In a slab and beam construction, sides of beam shall be stripped first, then the under sides of slab and lastly the underside of the beam. Formwork must be so designed that they can be stripped in the order required i.e.

a) Shutters to vertical (non load bearing) faces e.g., column boxes, beam sides, wall forms,
b) Shutters forming soffits to slab, horizontal and inclined which carry only light load, e.g., slab, roofs, floors and canopies etc.
c) Soffit shutters carrying heavy load e.g., beam and girder bottoms.

The whole of the formwork should be planned and a definite scheme of operation worked out. In no circumstances should forms be struck until the concrete reaches strength of at least twice the stress of which the concrete may be subjected at the time of striking. Where possible the formwork should be left longer as it would assist curing. Forms should be eased carefully in order to prevent the load being suddenly transferred to concrete. The period that shall elapse after the concrete has been laid, before easing and removal of centering and shuttering is undertaken shall be as given in **Table -6.3**.

Table -6.3

Minimum period of Removal of Form works

Type of formwork	Minimum period before striking formwork
Vertical formwork to columns, walls and beams	15-24 h
Sofit formwork to slabs (props to be refixed immediately after removal of formwork)	3 days
Sofit formwork to beams (props to be refixed immediately after removal of formwork	7 days

Props to slab spanning upto 4.7m	7 days
Props to slab spanning over 4.7 m	14 days
Props to beam and arches spanning upto 7 m.	14 days
Props to beams and arches spanning over 7 m	21 days

Notes:

1. For rapid hardening cement, 3/7 of the above period will be sufficient in all cases except for vertical sides of slabs, beams and columns which should be retained for at least 24 hours.
2. In case of cantilever slabs and beams, the centering shall remain till structures for counter acting or bearing down have been erected and have attained sufficient strength.
3. Proper precautions should be taken to allow for the decrease in the rate of hardening that occurs with all cements in cold weather.
4. Work damaged through premature or careless removal of forms shall be reconstructed.

6.6 Measurements and Payment

6.6.1 Measurements and Payment for Concrete

6.6.1.1 Measurement

The concrete work under the following categories shall be measured separately:

a) From foundation to plinth level
b) From plinth level to all heights
c) Concrete work at the parapet shall be measured together with the corresponding work in the wall of the storey next below.

The consolidated cubical contents shall be calculated net nearest to 0.01 cu.m. Concrete laid in excess, of the sections shown in the drawing unless directed by the Engineer-in-Charge shall not be measured.

Pre-cast cement concrete solid articles shall be measured separately and shall include use of moulds, finishing the top surfaces even and smooth with wooden trowel, before setting in position in cement mortar (1 cement: 3 coarse sand).

No deduction shall be made for:

a) Ends of dissimilar materials (e.g., joists, beams, posts, girders, rafters, purlins, trusses, corbels, step etc.) up to 500 sq.cm in section.
b) Opening up to 0.1 m^2 or as specified.

c) Volume occupied by pipes, conduits, sheathing etc. not exceeding 100 sq. cm each in cross sectional area.
d) Volume occupied by reinforcements

6.6.1.2 Payment for Concrete

Payment for concrete works shall be made at Unit Rates tendered in the Bill of Quantities. The Unit rate shall include the cost for carrying out all the required operations including the cost of labour, materials equipment, tools and plants, and incidentals, etc, but excluding reinforcement and form work, necessary to complete the work.

6.6.2 Measurement & Payment for Formwork

6.6.2.1 Measurement for Formwork

Form work shall be measure separately (i) Up to foundation and plinth and (ii) above for each of the items as per Bill of Quantities. All measurement shall be taken of the area shuttering in contact with the concrete surface dimension of Form work shall be measure correct to 10mm.

No deduction from shuttering due to the opening /obstruction shall be made in area of such opening/ obstruction does not exceed 0.1 sq.m. Nothing extra shall be paid for forming.

6.6.2.2 Payment for Formwork

Payment for Form work which includes entering shuttering for all heights shall be paid separately Unit Rates tendered for the items specified in Bill of Quantities. Where it is not specially stated in the description of the item that form work shall be paid for separately, the rate of the R.C.C. item shall be deemed to include the cost of form work.

The Unit Rate for form work shall include the cost of labour, materials, tools and plants and all incidentals required for all operation including supporting members until the concrete is cured, set and hardened as required. No separate payment shall be made for items such as from form releasing agent, connections provision for openings and other items required for completion of the works unless specified otherwise.

7. STEEL WORK

7.1 G. I chain-link

7.1.1 Scope of Work:

This clause shall include all works in connection with providing & fixing G.I chain-link excluding the cost of posts, struts, earthwork excavation, concrete which is to be paid for separately - 4mm (8 SWG) x 50mm.

7.1.2 Fencing with RCC or iron angle posts:

The spacing of posts shall be 3.0m centre to centre of the posts, unless otherwise specified. The minimum length of posts shall be 1.8 m or as specified in the description of the item and that of struts being minimum 2.0 m.

7.1.3 Spacing of struts: Every 15th, last but one end post and corner post shall be strutted on both sides and end post on one side only.

7.1.4 Fixing of posts and struts: Pits 45 x 45 cm and 75 cm deep or as directed shall first be excavated, true to line and level to receive the posts. In case of struts pits 70 x 45 x 75 cm deep or as directed shall be excavated to suit the inclination of the strut so that it is surrounded by concrete by not less than 15 cm at any point. The portion of the posts and struts to be embedded in concrete shall be coal tarred two coats before fixing while the visible portion shall also be coal tarred two coats unless otherwise specified after fixing barbed wire. Struts shall be fixed to posts by means of spikes of suitable size. The pits shall be filled with a layer of 15 cm thick cement concrete 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size). The posts and struts shall then be placed in the pits, the posts projecting 1.2 m or to the specified height above ground, true to line and position and cement concrete 1:5:10 filled in up to 15 cm for posts and 25 cm for struts below ground level to the top of the concrete so that the posts are embedded in the cement concrete block of size 45 x 45 x60 cm and struts in block of size 70 x 45x 50 cm. The concrete in foundations shall be watered for at least 7 days to ensure proper curing. The

remaining portions of pits shall be filled up with excavated earth and the surplus earth disposed off as directed by the Engineer and site cleared.

7.1.5 **Fixing of mesh:** The mesh shall be stretched and fixed to posts by means of G.I. staples in case of R.C.C posts and to the iron angle posts it shall be fixed by appropriate welding. The mesh shall be fixed at every 30 cm or as directed by the Engineer. The mesh shall be painted with aluminium paints unless otherwise specified or directed. Before the paint is applied the mesh shall cleaned off any rust, etc.

7.1.6 **Measurement:** The length and breadth of the mesh shall be measured correct to a cm for the finished work and area calculated correct to two places of decimal from centre to centre of the posts.

7.1.7 **Rate:** The rate shall be in sq.m of the wire mesh fixed to post including fixing of post, staples etc. complete but excluding the cost of posts, struts, and excavation, concrete in foundations for which separate payments shall be made under respective item.

7.2 G. I Barbed Wire

7.2.1 Scope of Work:

Fencing with barbed wire and ballies posts: The minimum girth of ballies shall be 30 cm, the length of posts being 1.8 m or as specified in the description of the item and that of struts being minimum 2.0 m. The spacing of posts shall be 2.50m centre to centre of the posts, unless otherwise specified or as directed by the Engineer to suit the dimensions of the area to be fenced.

7.2.2 Fencing with barbed wire and RCC posts:

The spacing of posts shall be 3.0m centre to centre of the posts, unless otherwise specified. The minimum length of posts shall be 1.8 m or as specified in the description of the item and that of struts being minimum 2.0 m.

7.2.3 **Spacing of struts:** Every 15th, last but one end post and corner post shall be strutted on both sides and end post on one side only.

7.2.4 Fixing of posts and struts:

Pits 45 x 45 cm and 75 cm deep or as directed shall first be excavated, true to line and level to receive the posts. In case of struts pits 70 x 45 x 75 cm deep or as directed shall be excavated to suit the inclination of the strut so that it is

surrounded by concrete by not less than 15 cm at any point. The portion of the posts and struts to be embedded in concrete shall be coal tarred two coats before fixing while the visible portion shall also be coal tarred two coats unless otherwise specified after fixing barbed wire. Struts shall be fixed to posts by means of spikes of suitable size. The pits shall be filled with a layer of 15 cm thick cement concrete 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size). The posts and struts shall then be placed in the pits, the posts projecting 1.2 m or to the specified height above ground, true to line and position and cement concrete 1:5:10 filled in up to 15 cm for posts and 25 cm for struts below ground level to the top of the concrete so that the posts are embedded in the cement concrete block of size 45 x 45 x60 cm and struts in block of size 70 x 45x 50 cm. The concrete in foundations shall be watered for at least 7 days to ensure proper curing. The remaining portions of pits shall be filled up with excavated earth and the surplus earth disposed of as directed by the Engineer and site cleared.

7.2.5 Fixing of barbed wire:

The barbed wire shall be stretched and fixed in number of rows as specified and diagonals, the bottom row shall be 15 cm above ground and the rest at 20 cm centre to centre. The diagonals, if any shall be stretched between adjacent posts from top wire of one post to the bottom wire of the 2nd post. The barbed wire shall be fixed to posts by means of G.I. staples.

7.2.6 Measurement:

The length of each wire shall be measured correct to a cm for the finished work, from centre to centre of the posts.

7.2.7 Rate:

The rate shall be in running metres of barbed wire fixed, longitudinal/diagonal including fixing of post, coal tarring but excluding the cost of posts, struts, and excavation, concrete in foundations for which separate payments shall be made under respective items.

7.3 Material for other Steel Works

Except as otherwise specified, all materials in general, for the work under this clause shall be new, free from defects and imperfections and conform to the following standards or equivalent (Table-7.1):

Table-7.1

Relevant Standards for Steel Structural Materials

Material	Standards codes

Angle, steel, channel steel, H-steel	IS 808, IS 3954
Steel plate	IS 808, IS 3954, IS 5986
High strength bolt	IS 3757
Medium finished bolt	BIS 1363
Welding rod	IS 6419
Stud bolt	IS 1862
Ready mixed red oxide paint	IS 2074

8. PLASTERING

8.1 Raised Band

8.1.1 Scope of Work

The Scope of works under this clause covers providing and laying 20mm plain cement mortar band in CM 1:4 - Raised band. Plain band is a plaster strip of uniform width not exceeding 30 cm and of uniform thickness, provided for decorative or other purposes flush with, sunk below or projecting beyond, the wall plaster. A flush band is one where due to the difference in mix or shade of the mortar, the band is executed as a separate and distinct operation from the wall plaster.

8.1.2 Thickness:

The thickness of a raised band is the thickness of the projection beyond the plane of the wall plaster. In the case of a flush or a sunk band, the thickness will be the thickness of the wall plaster measured from the untreated wall-surface.

8.1.3 Preparation of Surfaces and Application:

In the case of flush or sunk bands the joints shall be raked out properly. Dust and loose mortar shall be brushed out.

Efflorescence if any shall be removed by brushing and scraping. The surface shall then be thoroughly washed with water, cleaned and kept wet before plastering is commenced. In case of concrete surface if a chemical retarder has been applied to the form work, the surface shall be roughened by wire brushing and all the resulting dust and loose particles cleaned of and care shall be taken that none of the retarders is left on the surface. In case of raised band, the surface shall be prepared as specified for plastering works. The surface of the wall plaster behind the band shall be left rough and furrowed 2 mm deep with a scratching tool, diagonally both ways to form key for the band. No reduction in the rate for the above backing wall plaster shall, however, be made for not finishing the same smooth.

8.1.4 Mortar:

Mortar of the mix and type of sand specified in the description of the item shall be used.

8.1.5 Finish:

The bands shall be finished exactly to the size as shown in the drawings. The horizontal or vertical lines of bands shall be truly parallel and straight and the surfaces shall be finished truly plane and smooth. The lines and surfaces shall be checked with fine threads for straightness and accuracy.

Scaffolding, Curing and Precaution shall be as described in plastering items.

8.1.6 Measurements:

Length will be measured in running metres correct to 10 mm. The length shall be taken along the finished face. The width shall not be measured by girthing. For width of band 30 cm or below, the width shall be measured in cm correct to 25 mm. The quantity shall be calculated in metre in 2.5 cm units.

8.1.7 Rate:

The rate shall include the cost of the labour and materials involved in all the operations described above. Nothing extra shall be paid for meters, stops or for bands on curved surfaces of whatever radius, they maybe. The rate is also inclusive of all rounding or chamfering at corners, arises etc.

SECTION IV

FORMS

Form 1

Pre-Contract Integrity Pact

Note: This Proforma is included in the Bidding Documents for information of Bidders and shall be signed by the successful Bidder when the work(s) is awarded. Signing authorities will be the head of the client (agency) or the authorized representative of the bidder.

1. General:

Whereas the Punatsangchhu-I Hydroelectric Project Authority (PHPA-I) hereinafter referred to as the "Employer" on one part, and .....(Name of bidder or his/her authorized representative, with power of attorney) representing M/s. ....., (Name of firm), hereinafter referred to as the "Bidder" on the other part hereby execute this agreement as follows:

This agreement shall be a part of the standard bidding document, which shall be signed by both parties at the time of purchase of bidding documents and submitted along with the tender document. This IP is applicable only to "large" scale works, goods and services, the threshold of which will be announced by the government from time to time. The signing of the IP shall not apply to framework Contracting such as annual office supplies etc.

2. Objectives:

Whereas, the Employer and the Bidder agree to enter into this agreement, hereinafter referred to as IP, to avoid all forms of corruption or deceptive practice by following a system that is fair, transparent and free from any influence/unprejudiced dealings in the Bidding process and Contract Administration, with a view to:

2.1 Enabling the Employer to obtain the desired Contract at a reasonable and competitive price in conformity to the defined specifications of the works or goods or services; and

2.2 Enabling bidders to abstain from bribing or any corrupt practice in order to secure the Contract by providing assurance to them that their competitors will also refrain from bribing and other corrupt practices.

3. Scope:

The validity of this IP shall cover the bidding process and Contract Administration period.

4. Commitments of the Employer:

The Employer Commits itself to the following: -

4.1 The Employer hereby undertakes that no officials of the Employer, connected directly or indirectly with the Contract, will demand, take a promise for or accept, directly or through intermediaries, any bribe, consideration, gift, reward, favor or any material or immaterial benefit or any other advantage from the Bidder, either for themselves or for any person,

organization or third party related to the Contract in exchange for an advantage in the bidding process and Contract Administration.

4.2 The Employer further confirms that its officials shall not favor any prospective bidder in any form that could afford an undue advantage to that particular bidder in the bidding process and Contract Administration and will treat all Bidders alike.

4.3 Officials of the Employer, who may have observed or noticed or have reasonable suspicion shall report to the head of the employing agency or an appropriate government office any violation or attempted violation of clauses 4.1 and 4.2.

4.4 The Following report on violation of clauses 4.1 and 4.2 by the official(s), through any source, necessary disciplinary proceedings, or any other action as deemed fit, including criminal proceedings shall be initiated by the Employer and such a person shall be debarred from further dealings related to the bidding process and Contract Administration.

5. Commitments of Bidders

The Bidder commits himself/herself to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of the bidding process and Contract administration in order to secure the Contract or in furtherance to secure it and in particular commits himself/herself to the followings:-

5.1 The Bidder shall not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favor, any material or immaterial benefit or other advantages, commission, fees, brokerage or inducement to any official of the Employer, connected directly or indirectly with the bidding process and Contract Administration, or to any person, organization or third party related to the Contract in exchange for any advantage in the bidding process and Contract Administration.

5.2 The Bidder shall not collude with other parties interested in the Contract to manipulate in whatsoever form or manner, the bidding process, and Contract Administration.

5.3 If the bidder(s) have observed or noticed or have reasonable suspicion that the provisions of the IP have been violated by the procuring agency or other bidders, the bidder shall report such violations to the head of the procuring agency.

6. Sanctions for Violation:

The breach of any of the aforesaid provisions shall result in administrative charges or penal actions as per the relevant rules and laws.

6.1 The breach of the IP or commission of any offense (forgery, providing false information, misrepresentation, providing false/fake documents, bid rigging, bid steering, or coercion) by the Bidder, or anyone employed by him, or acting on his/her behalf (whether with or without the knowledge of the Bidder), shall be dealt with as per the terms and conditions of the Contract and other provisions of the relevant laws, including De-barment Rules.

6.2 The breach of the IP or commission of any offense by the officials of the procuring agency shall be dealt with as per the rules and laws of the land in vogue.

7. Monitoring and Administration:

7.1 The respective procuring agency shall be responsible for the administration and monitoring of the IP as per the relevant laws.

7.2 The bidder shall have the right to appeal as per the arbitration mechanism contained in the relevant rules.

We, hereby declare that we have read and understood the clauses of this agreement and shall abide by it.

The parties hereby sign this Integrity Pact at (place) _____ on (date) _____

EMPLOYER BIDDER

Witness: Witness:

_____ _____

Form 2

Proforma for Bank Guarantee for Bid Security

To

The Punatsangchhu-I Hydroelectric Project Authority (PHPA-I)

_____

_____

(Address of PHPA-I)

WHEREAS, (Name of Bidder)_____ (hereinafter called "the BIDDER") has submitted his bid dated (_____ for the construction of (Name of Contract) _____ (hereinafter called "the Bid")).

KNOW ALL MEN by these presents that we (Name of Bank) _____ of (Name of Country)_____ having our registered office at _____ (hereinafter called "the Bank") are bound unto the Punatsangchhu-I Hydroelectric Project Authority (PHPA-I) in the sum of _____ for which payment well and truly to be made to the PHPA-I the Bank binds himself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this _____ day of _____.

1. **THE CONDITIONS of this obligation are;**

1.1 If the Bidder withdraws his Bid during the period of bid validity specified in the Proforma of Bid; or

1.2 If the Bidder has been notified of the acceptance of his Bid by the PHPA-I during the period of bid validity;

1.2.1 fails or refuses to execute the Proforma of Agreement in accordance with the Instructions to Bidders, if required; or

1.2.2 fails or refuses to furnish the Performance Security, in accordance with the Instructions to Bidders,

We undertake to pay to the PHPA-I up to the above amount upon receipt of its first written demand, provided that in its demand the PHPA-I will note that amount claimed by it is due to it owing to the occurrence of one or both of the two conditions, specifying the occurred condition or conditions.

This Guarantee shall remain valid for **120 days** from the bid's opening date as stated in the Invitation to Bid or as extended by you at any time prior to this date, a notice of which extends the Bank is hereby waived, and any demand in respect thereof should reach the Bank not later than the above date.

DATE …….

WITNESS ……..

(Signature, Name and Address)

SIGNATURE OF THE BANK ……..

SEAL ……..

Form 3

Proforma for Bank Guarantee for Performance Security

To

The Punatsangchhu-I Hydroelectric Project Authority,

_____

_____

(Address of PHPA-I)

WHEREAS (Name and Address of Contractor) _____(hereinafter called "the Contractor") has undertaken, in pursuance of Contract No. _____ dated _____ to execute (Name of Contract and Brief Description of Works) _____ (hereinafter called "the Contract").

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligations in accordance with the Contract;

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

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Contractor, up to a total of Nu. _____ (Amount of Guarantee in words to be inserted by the Guarantor), representing the percentage of the Contract Price, specified in the Contract, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of Nu. _____ (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 is valid until the date 30 days from the date of issue of the Completion Certificate.

SIGNATURE AND SEAL OF THE GUARANTOR

Name of Bank

Address

Date

Form 4

Proforma for Bank Guarantee for Mobilization Advance

In consideration of the Punatsangchhu-I Hydroelectric Project Authority (PHPA-I) (which expression shall unless repugnant to the subject or context include its administrators, successors and assigns), (hereinafter called the "Principal") having agreed to make advance payment to (Name and full address of the Contractor) _____ (hereinafter called "the Contractor(s)", (which expression shall unless repugnant to the subject or context or meaning thereof include its successors, administrator, executors and permitted assigns), whose bid for (Name of the Contract) _____ has been accepted and to whom the acceptance of the bid has been communicated by a Letter of Award and who is required to execute a formal agreement on conditions of production of a Bank Guarantee for Rs……(Both in figures and words) _____ we, the _____ Bank (any financial institutions in Bhutan) hereinafter referred to as "the Bank") do hereby undertake promise and guarantee payment to the Principal on demand all the amounts advanced by the Principal to the said Contractor.

1. The Bank further agrees that;

   1.1. The Principal shall have the fullest liberty without affecting in any way the liability of the Bank under the Guarantee or Indemnity, from time to time, to vary any of the terms and conditions of the said Contract or to extend time for performance by the said Contractor or to postpone for any time and from time to time any of the powers exercisable by it against the said Contractor and either to enforce or forbear from enforcing any of the terms and conditions governing the said Contract or the securities available to the Principal and the Bank shall not be released from its liability under these presents by any exercise by the Principal of the Liberty with reference to the matters aforesaid or by reason of time being given to the said Contractor or any other forbearance, act or omission on the part of the Principal or any indulgence by the Principal to the said Contractor or of any other matter or thing whatsoever which under the law relating to sureties would but for this provision have the effect of a releasing the Bank from its such liability.

   1.2. These presents shall be governed by and constructed in accordance with Bhutanese laws.

   1.3. The Bank hereby declares that it has the power to issue this Guarantee and the undersigned has full power to do so.

   1.4. It shall not be necessary for the Principal to proceed against the Contractor before proceeding against the Bank and the Guarantee herein contained shall be enforceable against the Bank, notwithstanding any other security which the Principal may have obtained or obtain from the Contractor, shall at the time when proceedings are taken against the Bank hereunder, be outstanding or unrealized.

   1.5. The Guarantee herein contained shall remain in full force and effect, during the period that would be taken for the performance of the terms and conditions of the said Contract, Letter of Award and the Agreement which is to be executed as aforesaid and that it shall continue to be enforceable until all the dues of the Principal have been duly paid and its

claims satisfied and discharged and till the Principal discharges the Guarantee in writing or until _____ whichever is earlier.

2. The Bank lastly undertakes not to revoke this Guarantee until all the dues of the Principal have been duly paid except with the previous consent of the Principal in writing.

Dated the _____ Day of _____2021

Here affix the Common Seal of the

Bank for _____ Bank Ltd.

Note: The Bidders are not required to fill this Proforma.

SECTION V

BILL OF QUANTITIES

Name of Work: Construction of Fencing, Septic Tank and Soak Pit in Pothead Yard, PHPA-I (NIT No. PHPA-I/CE(C&P)/146-05/2023)

BILL OF QUANTITIES (BoQ)

Sl#	Item Description	Unit	Qty.	Rate (Nu.)		Amount (Nu.)
				In Figures	In Words	
1	**Concrete work**					
1.1	Providing and laying in position plain cement concrete 1:2:4 (1 cement : 2 sand : 4 graded crushed rock 20 mm nominal size)excluding the cost of centering and shuttering - All work upto plinth level.	cu. m	22.00			
2	**Steel work**					
2.1	Steel work in single section including cutting, hoisting, fixing and applying priming coat of red lead paint - In Tees, angles and channels	Kg	3,200.00			
3	**Fencing work**					
3.1	Excavation in foundation trenches or drains not exceeding 1.5m in width or area 10 sq.m on plan, including dressing & ramming, disposal of surplus soil within 50m lead & 1.5m lift - Hard soil	cu. m	55.00			
3.2	Filling of trenches, sides of foundations etc. in layers <200mm using selected excavated earth, ramming etc. within lead 50 m & lift 1.5m	cu. m	25.00			
3.3	Providing and laying Hand packed stone soling with stones	cu. m	4.00			
3.4	Providing & laying Random Rubble Masonry with hard stone in foundation & plinth in cement mortar 1:4	cu. m	100.00			

3.5	Providing & fixing G.I chain-link mesh including fixing of post or struts, G.I staples (excluding the cost of posts/struts, earthwork, concrete etc.) - 4mm (8 SWG) x 50mm	sq. m	550.00			
3.6	Providing & fixing G.I barbed Wire Netting including fixing of post or struts, G.I staples, coal tarring in case of ballies complete (posts/struts, earthwork, concrete paid separately) - 2.5mm , (12 SWG), 4 barbs form by twisting two point wires, each two turns, pitch of barbs 75mm	m	1,800.00			
3.7	Providing & laying 20mm plain cement mortar band in C.M 1:4 - Raised band	sq. m	110.00			
3.8	Providing and fixing concertina coil 610 mm dia (min. 2.5 mm thick SS - total length 445 m), having 50 nos rounds per 6 metre length, upto 3 m height of wall with existing angle iron 'Y' shaped placed 2.5 m apart alongside 4 horizontal GI barbed wire, stud tied with G.I. staples and G.I. clips to retain horizontal, tied to angle iron, all complete as per direction of Engineer-in-charge, (cost of M.S. angle, GI barbed wire shall be paid separately)	m	445.00			
3.9	P&F 40x3mm M.S. hold fast 100mm long, fixing to frame with 10mm bolts & nuts, plugs, concrete blocks 300x100x150mm or PCC of RRM post with 1:3:6, 20mm aggregate as per instructions of the Engineer-in-Charge.	L/S	1.00			

3.10	Providing & fixing bolts of various sizes including nuts & washers to fix GI Chain link mesh to ISA sections as per instructions of the Engineer-in-Charge	L/S	1.00			
4	**Soak pit & Septic tank**					
4.1	Constructing Soak Pit of Size 1200x1200x1200mm, filled with brick bats including 100mm SW drain pipe X 1200mm long	each	1.00			
4.2	Constructing Septic Tanks, in R.R Masonry in cement mortar 1:6, including fittings, C.I cover with frame, 40mm thick concrete flooring (40mm aggregates) cement plaster concrete base in C.C 1:4:8 etc. complete as per standard design - 15 user	each	1.00			
5	**OHS at Construction site**					
5.1	Incorporation of Occupational Health and Safety measures at construction sites as per the attached requirements list. The standards and specifications for the Insurance, OHS materials and (or) equipment shall be in compliance with the Labour and Employment Act - 2007, Regulation on Occupational Health, Safety and Welfare 2012, and other relevant national documents. All OHS items will remain as the property of the bidder upon completion of the project.	L/S	1.00			

6	**Temporary Living Accommodation**					
6.1	Providing temporary living accommodation which includes bed room, kitchen, and toilet cum bathroom including proper water supply and electricity as per the drawing and temporary living accommodation standards. The accommodation facilities must be dismantled and cleaned upon the completion of project. All reusable materials of the accommodation facilities will remain as the property of the bidder upon completion of the project.	L/S	1.00			
	Total Amount (Nu.)					
	Rebate, if any					
	Final Amount (Nu.)					

SECTION VI

DRAWINGS