NED UNIVERSITY OF ENGINEERING & TECHNOLOGY
PROCUREMENT CELL
Phone # 99261261– 68, (Ext. 2471 & 2501) Fax # 99261255, e-mail: dp@neduet.edu.pk

"Say No to Corruption"

1921-2021

Director Procurement

No. DP/RGT-172285/8379/ 992
February 12, 2024

Notice Inviting Tender

1. NEDUET invites sealed bids from interested Bidders having adequate experience in carrying out projects of similar nature for following work:

S#	Name of Work	Estimated Cost	Time of Completion
1.	Construction of External Water Supply & External Sewerage Work of (Civil Department, Mechanical Department, Main Gate & Project Office) Thar Institute of Engineering Sciences & Technology, Mithi, Tharparkar, Sind. Tender No. PC/NED/RGT/Sewerage/8379 /2024	Rs 36.227 million	09 Months

2. **Eligibility:**

- Registration with Pakistan Engineering Council in Category C-5 or above and at least in specialization codes CE-09 (I, II), and CE-11 (I, VII). The contractor should enclose PEC Registration Certificate valid up to June 2024.
- The Bidder should be registered with FBR and Sindh Revenue Board - SRB for both Income and Sales Tax, with company name appearing on the active taxpayer list (ATL). The contractor should also submit copy of Registration Certificate of NTN and SNTN and print from ATL.
- The bidder shall submit affidavit of no litigation history, affidavit of non-blacklisting, affidavit of never indulge in any corrupt, fraudulent and collusive practices. The bidder shall also submit affidavit that the information and documents provided with this pre-qualification document is correct.
- Having an experience for execution and completion of projects of similar nature in remote areas particularly in desert area or far-flung destinations.

3. **Method of Procurement:**
Single Stage - One Envelope Procedure under SPPRA Rules

Tender Documents Issuance Schedule:

The tender documents can be collected from office of Assistant Director Procurement - II, NEDUET upon payment of **Rs 5,000/-** (Non-Refundable) from **16.02.2024** up to **04.03.2024** during office hours. Payments are to be made in favour of **"Director Finance-NEDUET, Karachi"** in the shape of Pay Order / Bank Draft.

4. **Tender Documents Submission Schedule:**
All bids must be accompanied by a Bid Security equivalent to 2% of the total bid price in the form of pay order/bank guarantee from the scheduled bank. Interested firms are requested to submit their duly completed bids on or before 11:00 A.M. on 05.03.2024 at office of Assistant Director Procurement - II, NEDUET. The bids will be opened on the same day at 11:30 A.M. at the same venue in the presence of representatives of bidders.

5. The bids received after the prescribed time and date shall not be entertained. Incomplete bids will be rejected as per provision of SPPRA Rules. If the opening date is declared as holiday then the proposals will be opened on next working day at same time and venue.

6. NEDUET reserve the right to accept or reject any or all bids in pursuance to provisions under of SPPRA Rules. Bidders are requested to give their Best and Final Price as "No Negotiations" is permitted. Bidding Documents containing detailed terms and conditions are available at Websites: https://www.neduet.edu.pk and http://www.ppms.pprasindh.gov.pk.

Director Procurement
12.02.2024

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY KARACHI

Establishment of Thar Institute of Engineering, Sciences and Technology-TIEST, Islamkot
(Constituent College of NED University)

BIDDING DOCUMENTS

VOLUME-I (TENDER)

CONSTRUCTION OF EXTERNAL WATER SUPPLY & EXTERNAL SEWERAGE WORK OF (CIVIL DEPARTMENT, MECHANICAL DEPARTMENT, MAIN GATE & PROJECT OFFICE) AT THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY

JANUARY, 2024

ESS.I.AAR
Planning, Engineering & Serives Consultants

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TABLE OF CONTENTS

INVITATION
FOR
BIDS

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY
PROCUREMENT CELL
Phone # 99261261– 68, (Ext. 2471 & 2501) Fax # 99261255, e-mail: dp@neduet.edu.pk

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Director Procurement
12.02.2024

INSTRUCTIONS
TO
BIDDERS

INSTRUCTIONS TO BIDDERS

(Note: These Instructions to Bidders along with Bidding Data Sheet will not be part of the Contract and will cease to have effect once the contract is signed.)

A. GENERAL

IB.1 Scope of Bid

1.1 The Employer as defined in the Bidding Data Sheet hereinafter called "the Employer" wishes to receive bids for the construction and completion of works as described in these Bidding Documents, and summarized in the Bidding Data Sheet hereinafter referred to as the "Works".

1.2 The successful bidder will be expected to complete the Works within the time specified in Appendix-A to Bid.

IB.2 Source of Funds

2.1 The employer had got approved scheme under title "Establishment of Thar Institute of Engineering, Sciences and Technology-TIEST, Tharparkar" from PDWP Government of Sindh in ADP 2023-2024 and had sufficient allocations for CFY 2023-2024 under ADP No. 1129 and intends to spend proportions of cost for execution of this work.

IB.3 Eligible Bidders

3.1 This Invitation for Bids is open to all bidders meeting the following requirements:

a. Duly licensed by the Pakistan Engineering Council (PEC) in the category relevant to the value of the Works.

IB.4 One Bid per Bidder

4.1 Each bidder shall submit only one bid either by himself, or as a partner in a joint venture. A bidder who participates in more than one bid (other than alternatives pursuant to Clause IB.16) will be disqualified.

IB.5 Cost of Bidding

5.1 The bidders shall bear all costs associated with the preparation and submission of their respective bids and the Employer will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

IB.6 Site Visit

6.1 The bidders are advised to visit and examine the Site of Works and its surroundings and obtain for themselves on their own responsibility all information that may be necessary for preparing the bid and entering into a contract for construction of the Works. All cost in this respect shall be at the bidders own expense.

6.2 The bidders and any of their personnel or agents will be granted permission by the Employer to enter upon his premises and lands for the purpose of such inspection, but only upon the express condition that the bidders, their personnel and agents, will release and indemnify the Employer, his personnel and agents from and against all liability in respect thereof and will be responsible for death or personal injury, loss of or damage to property and any other loss, damage, costs and expenses incurred as a result of such inspection.

B. BIDDING DOCUMENTS

IB.7 Contents of Bidding Documents

7.1 The Bidding Documents, in addition to invitation for bids, are those stated below and should be read in conjunction with any Addenda issued in accordance with Clause IB.9.

1. Instructions to Bidders.
2. Bidding Data Sheet.
3. General Conditions of Contract, Part-I(GCC).
4. Particular Conditions of Contract, Part-II(PCC).
5. Specifications – Special Provisions.
6. Specifications – Technical Provisions.
7. Form of Bid & Appendices to Bid.
8. Bill of Quantities (Appendix-D to Bid).
9. Form of Bid Security.
10. Form of Contract Agreement.
11. Forms of Performance Security and Mobilization Advance Guarantee/Bond and Form of Indemnity Bond for Secured Advance
12. Drawings.

7.2 The bidders are expected to examine carefully the contents of all the above documents. Failure to comply with the requirements of bid submission will be at the Bidder's own risk. Pursuant to Clause IB.26, bids which are not substantially responsive to the requirements of the Bidding Documents will be rejected.

IB.8 Clarification of Bidding Documents

8.1 Any prospective bidder requiring any clarification (s) in respect of the Bidding Documents may notify the Employer in writing at the Employer's address indicated in the Invitation for Bids. The Employer will respond to any request for clarification which he receives earlier than 28 days prior to the deadline for submission of bids.
Copies of the Employer's response will be forwarded to all purchasers of the Bidding Documents, including a description of the enquiry but without identifying its source.

IB.9 Amendment of Bidding Documents

9.1 At any time prior to the deadline for submission of bids, the Employer may, for any reason, whether at his own initiative or in response to a clarification requested by a prospective bidder, modify the Bidding Documents by issuing addendum.

9.2 Any addendum thus issued shall be part of the Bidding Documents pursuant to IB 7.1 hereof and shall be communicated in writing to all purchasers of the Bidding Documents. Prospective bidders shall acknowledge receipt of each addendum in writing to the Employer.

9.3 To afford prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer may extend the deadline for submission of bids in accordance with Clause IB.20

C. PREPARATION OF BIDS

IB.10 Language of Bid

10.1 The bid and all correspondence and documents related to the bid exchanged by a bidder and the Employer shall be in the bid language stipulated in the Bidding Data Sheet and Particular Conditions of Contract. Supporting documents and printed literature furnished by the bidders may be in any other language provided the same are accompanied by an accurate translation of the relevant parts in the bid language, in which case, for purposes of evaluation of the bid, the translation in bid language shall prevail.

IB.11 Documents Comprising the Bid

11.1 Each bidder shall:

a) submit a written power of attorney authorizing the signatory of the bid to act for and on behalf of the bidder;

b) update the information indicated and listed in the Bidding Data and previously submitted with the application for prequalification, and continue to meet the minimum criteria set out in the prequalification documents which as a minimum, would include the following:

I. Evidence of access to financial resources along with average annual construction turnover;
II. Financial predictions for the current year and the two following years including the effect of known commitments;
III. Work commitments since prequalification;
IV. Current litigation information; and
V. Availability of critical equipment

And

c) furnish a technical proposal taking into account the various Appendices to Bid specially the following:
Appendix-E to Bid Proposed Construction Schedule
Appendix-F to Bid Method of Performing the Work

Appendix-G to Bid List of Major Equipment
Appendix-K to Bid Organization Chart for Supervisory Staff
and other pertinent information such as mobilization programme etc.

11.2 Bids submitted by a JV shall include a copy of the Joint Venture Agreement entered into by all partners. Alternatively, a Letter of Intent to execute a Joint Venture Agreement in the event of a successful bid shall be signed by all partners and submitted with the bid, together with a copy of the proposed agreement. The role to be played by each partner to be specified therein. Bids submitted by a joint venture of two (2) or more firms shall comply with the following requirements:

(a) In case of a successful bid, the Form of JV Agreement shall be signed so as to be legally binding on all partners within 7 days of the receipt of letter of acceptance failing which the contract and the letter of acceptance shall stand void and redundant.
(b) One of the joint venture partners shall be nominated as being in charge; and this authorization shall be evidenced by submitting a power of attorney signed by legally authorized signatories of all the joint venture partners;
(c) The partner-in-charge shall always be duly authorized to deal with the Employer regarding all matters related with and/or incidental to the execution of Works as per the terms and Conditions of JV Agreement and in this regard to incur any and all liabilities, receive instructions, give binding undertakings and receive payments on behalf of the joint venture;
(d) All partners of the joint venture shall at all times and under all circumstances be liable jointly and severally for the execution of the Contract in accordance with the Contract terms and a statement to this effect shall be included in the authorization mentioned under Sub-Para (b) above as well as in the Form of Bid and in the Form of JV Agreement (in case of a successful bid); and
(e) A copy of JV agreement shall be submitted before signing of the Contract, stating the conditions under which JV will function, its period of duration, the persons authorized to represent and obligate it and which persons will be directly responsible for due performance of the Contract and can give valid receipts on behalf of the joint venture, the proportionate participation of the several firms forming the joint venture, and any other information necessary to permit a full appraisal of its functioning. The JV Agreement shall be made part of the contract. No amendments / modifications whatsoever in the joint venture agreement shall be agreed to between the joint venture partners without prior written consent of the Employer.

11.3 The Bidder shall furnish, as part of the Technical Bid, a Technical Proposal including a statement of work methods, equipment, personnel, schedule and any other information as stipulated Bidding Forms, in sufficient detail to demonstrate the adequacy of the Bidders‟ proposal to meet the work requirements and the completion time referred to in Sub-Clause 1.2 hereof.

IB.12 Bid Prices

12.1 Unless stated otherwise in the Bidding Documents, the Contract shall be for the whole of the Works as described in IB 1.1 hereof, based on the unit rates and / or prices submitted by the bidder.

12.2 The bidders shall fill in rates and prices for all items of the Works described in the Bill of Quantities. Items against which no rate or price is entered by a bidder will not be paid for by the Employer when executed and shall be deemed covered by rates and prices for other items in the Bill of Quantities.

12.3 All duties, taxes and other levies payable by the Contractor under the Contract, or for any other cause, as on the date 28 days prior to the deadline for submission of bids shall be included in the rates and prices and the total Bid Price submitted by a bidder.
Additional / reduced duties, taxes and levies due to subsequent additions or changes in legislation shall be reimbursed / deducted as per Sub-Clause 70.2 of the General Conditions of Contract Part-I.

12.4 The rates and prices quoted by the bidders are subject to adjustment during the performance of the Contract in accordance with the provisions of Clause 70 of the Conditions of Contract. The bidders shall furnish the prescribed information for the price adjustment formulae in Appendix C to Bid and shall submit with the bids such other supporting information as required under the said clause.

IB.13 Currencies of Bid and Payment

13.1 The unit rates and the prices shall be quoted by the bidder entirely in Pak rupees. A bidder expecting to incur expenditures in other currencies for inputs to the Works supplied from outside the Employer's country (referred to as the "Foreign Currency Requirements") shall indicate the same in Appendix-B to Bid. The proportion of the Bid Price (excluding Provisional Sums) needed by him for the payment of such Foreign Currency Requirements either (i) entirely in the currency of the Bidder's home country or, (ii) at the bidder's option, entirely in Pak rupees provided always that a bidder expecting to incur expenditures in a currency or currencies other than those stated in (i) and (ii) above for a portion of the foreign currency requirements, and wishing to be paid accordingly, shall indicate the respective portions in his bid.

13.2 The rates of exchange to be used by the bidder for currency conversion shall be the TT & OD Selling Rates published or authorized by the State Bank of Pakistan prevailing on the date 28 days prior to the deadline for submission of bids. For the purpose of payments, the exchange rates used in bid preparation shall apply for the duration of the Contract.

IB.14 Bid Validity

14.1 Bids shall remain valid for the period stipulated in the Bidding Data Sheet after the Date of Bid Opening specified in Clause IB.23.

14.2 In exceptional circumstances, prior to expiry of the original bid validity period, the Employer may request that the bidders extend the period of validity for a specified additional period which shall in no case be more than the original bid validity period. The request and the responses thereto shall be made in writing. A bidder may refuse the request without forfeiting his Bid Security. A bidder agreeing to the request will not be required or permitted to modify his bid, but will be required to extend the validity of his Bid Security for the period of the extension, and in compliance with Clause IB.15 in all respects.

IB.15 Bid Security

15.1 Each bidder shall furnish, as part of his bid, a Bid Security in the amount stipulated in the Bidding Data Sheet in Pak Rupees or an equivalent amount in a freely convertible currency.

15.2 The Bid Security shall be, at the option of the bidder, in the form of Deposit at Call or a Bank Guarantee issued by a Scheduled Bank in Pakistan or from a foreign bank duly counter guaranteed by a Scheduled Bank in Pakistan in favor of the Employer valid for a period 28 days beyond the Bid Validity date.

15.3 Any bid not accompanied by an acceptable Bid Security shall be rejected by the Employer as non-responsive.

15.4 The bid securities of unsuccessful bidders will be returned as promptly as possible, but not later than 28 days after the expiration of the period of Bid Validity.

15.5 The Bid Security of the successful bidder will be returned when the bidder has furnished the required Performance Security and signed the Contract Agreement.

15.6 The Bid Security may be forfeited:

(a) If the bidder withdraws his bid except as provided in IB 22.1;
(b) If the bidder does not accept the correction of his Bid Price pursuant to IB 27.2 hereof; or
(c) In the case of successful bidder, if he fails within the specified time limit to:
  (i) Furnish the required Performance Security;
  (ii) Sign the Contract Agreement, or
  (iii) Furnish the required JV agreement within 7 days of the receipt of letter of acceptance.

IB.16 Alternate Proposals by Bidder

16.1 Should any bidder consider that he can offer any advantages to the Employer by a modification to the designs, specifications or other conditions, he may, in addition to his bid to be submitted in strict compliance with the Bidding Documents, submit any Alternate Proposal(s) containing (a) relevant design calculations; (b) technical specifications; (c) proposed construction methodology; and (d) any other relevant details / conditions, provided always that the total sum entered on the Letter of Price Bid shall be that which represents complete compliance with the Bidding Documents. The technical details and financial implication involved are to be submitted in two separate sealed envelopes as to be followed in main bid proposals.

16.2 Alternate Proposal(s), if any, of the lowest evaluated responsive bidder only may be considered by the Employer as the basis for the award of Contract to such bidder.

IB.17 Pre-Bid Meeting

17.1 The Employer may, on his own motion or at the request of any prospective bidder(s),

hold a pre-bid meeting to clarify issues and to answer any questions on matters related to the Bidding Documents. The date, time and venue of pre-bid meeting, if convened, is as stipulated in the Bidding Data Sheet. All prospective bidders or their authorized representatives shall be invited to attend such a pre-bid meeting.

17.2 The bidders are requested to submit questions, if any, in writing so as to reach the Employer not later than seven (7) days before the proposed pre-bid meeting.

17.3 Minutes of the pre-bid meeting, including the text of the questions raised and the replies given will be transmitted without delay to all purchasers of the Bidding Documents. Any modification of the Bidding Documents listed in IB 7.1 hereof, which may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of an Addendum pursuant to Clause IB.9 and not through the minutes of the pre-bid meeting.

17.4 Absence at the pre-bid meeting will not be a cause for disqualification of a bidder.

IB.18 Format and Signing of Bid

18.1 Bidders are particularly directed that the amount entered on the Letter of Price Bid shall be for performing the Contract strictly in accordance with the Bidding Documents.

18.2 All appendices to Bid are to be properly completed and signed.

18.3 No alteration is to be made in the Letters of Price and Technical Bids nor in the Appendices thereto except in filling up the blanks as directed. If any such alterations be made or if these instructions be not fully complied with, the bid may be rejected.

18.4 The Bidder shall prepare one original of the Technical Bid and one original of the Price Bid comprising the Bid as described in Bidding Data Sheet against IB 11 and clearly mark it "ORIGINAL - TECHNICAL BID" and "ORIGINAL - PRICE BID". In addition, the Bidder shall submit two (2) copies of the Bid and clearly mark each of them "COPY." In the event of any discrepancy between the original and the copies, the original shall prevail.

18.5 The original and all copies of the Bid shall be typed or written in indelible ink and shall be signed by a person duly authorized to sign on behalf of the Bidder. This authorization shall consist of a written confirmation as specified in the Bidding Data Sheet and shall be attached to the bid. The name and position held by each person signing the authorization must be typed or printed below the signature. All pages of the Bid, except for unamended printed literature, shall be signed or initialed by the person signing the bid.

18.6 Any amendments such as interlineations, erasures, or overwriting shall be valid only if they are signed or initialed by the person signing the bid.

18.7 Bidders shall indicate in the space provided in the Letter of Technical and Price Bids, their full and proper addresses at which notices may be legally served on them and to which all correspondence in connection with their bids and the Contract is to be sent.

18.8 Bidders should retain a copy of the Bidding Documents as their file copy.

D. SUBMISSION OF BIDS FOR SINGLE STAGE SINGLE ENVELOPE BIDDINGPROCEDURE

IB.19 Sealing and Marking of Bids

19.1 Each bidder shall submit his bid as under:

(a) ORIGINAL and each copy of the Bid shall be separately sealed and put in separate envelopes and marked as such.

(b) The envelopes containing the ORIGINAL and copies will be put in one sealed envelope and addressed / identified as given in IB 19.2 hereof.

(c) The technical bid should comprise of documents listed in IB11.1 (A) & the price bid should comprise of documents listed in IB 11.1 (B) which shall be placed in single envelopes in accordance with IB 11.1.

19.2 The inner and outer envelopes shall:

(a) Be addressed to the Employer at the address provided in the Bidding Data Sheet;

(b) Bear the name and identification number of the contract as defined in the Bidding Data Sheet; and

(c) Provide a warning not to open before the time and date for bid opening, as specified in the Bidding Data Sheet.

19.3 In addition to the identification required in IB 19.2 hereof, the inner envelope shall indicate the name and address of the bidder to enable the bid to be returned unopened in case it is declared “late” pursuant to Clause IB.21

19.4 If the outer envelope is not sealed and marked as above, the Employer will assume no responsibility for the misplacement or premature opening of the Bid.

IB.20 Deadline for Submission of Bids

20.1 (a) Bids must be received by the Employer at the address specified no later than the time and date stipulated in the Bidding Data Sheet.

(b) Bids with charges payable will not be accepted, nor will arrangements be undertaken to collect the bids from any delivery point other than that specified above. Bidders shall bear all expenses incurred in the preparation and delivery of bids. No claims will be entertained for refund of such expenses.

(c) Where delivery of a bid is by mail and the bidder wishes to receive an acknowledgment of receipt of such bid, he shall make a request for such acknowledgment in a separate letter attached to but not included in the sealed bid package.

(d) Upon request, acknowledgment of receipt of bids will be provided to those making delivery in person or by messenger.

20.2 The Employer may, at his discretion, extend the deadline for submission of Bids by issuing an amendment in accordance with Clause IB.9, in which case all rights and obligations of the Employer and the bidders previously subject to the original deadline will thereafter be subject to the deadline as extended.

IB.21 Late Bids

21. (a) Any bid received by the Employer after the deadline for submission of bids prescribed in Clause IB.20 will be returned unopened to such bidder.

(b) Delays in the mail, delays of person in transit, or delivery of a bid to the wrong office shall not be accepted as an excuse for failure to deliver a bid at the proper place and time. It shall be the bidder's responsibility to determine the manner in which timely delivery of his bid will be accomplished either in person, by messenger or by mail.

IB.22 Modification, Substitution and Withdrawal of Bids

22.1 Any bidder may modify**,** substitute or withdraw his bid after bid submission provided that the modification, substitution or written notice of withdrawal is received by the Employer prior to the deadline for submission of bids.

22.2 The modification, substitution, or notice for withdrawal of any bid shall be prepared, sealed, marked and delivered in accordance with the provisions of Clause IB.19 with the outer and inner envelopes additionally marked "MODIFICATION", "SUBSTITUTION" or "WITHDRAWAL" as appropriate.

22.3 No bid may be modified by a bidder after the deadline for submission of bids except in accordance with IB 22.1 and 27.2.

22.4 Withdrawal of a bid during the interval between the deadline for submission of bids and the expiration of the period of bid validity specified in the Form of Bid may result in forfeiture of the Bid Security in pursuance to Clause IB.15.

E BID OPENING AND EVALUATION FOR SINGLE STAGE SINGLE ENVELOPEBIDDING PROCEDURE

IB. 23 Bid Opening

23.1 The Employer will open the bids, including withdrawals, substitution and modifications made pursuant to Clause IB.22, in the presence of bidders" representatives who choose to attend, at the time, date and location stipulated in the Bidding Data. The bidder's representatives who are present shall sign a register evidencing their attendance.

23.2 Envelopes marked "MODIFICATION", "SUBSTITUTION" or "WITHDRAWAL" shall be opened and read out first. Bids for which an acceptable notice of withdrawal has been submitted pursuant to Clause IB.22 shall not be opened.

23.3 The bidder's name, total Bid Price and price of any Alternate Proposal(s), any discounts, bid modifications, substitution and withdrawals, the presence or absence of Bid Security,

and such other details as the Employer may consider appropriate, will be announced by the Employer at the opening of bids.

23.4 Employer shall prepare minutes of the bid opening, including the information disclosed to those present in accordance with the Sub-Clause 23.3.

IB.24 Process to be Confidential

24.1 Information relating to the examination, clarification, evaluation and comparison of bid and recommendations for the award of a contract shall not be disclosed to bidders or any other person not officially concerned with such process before the announcement of bid evaluation report which shall be done at least ten 10 days prior to issue of Letter of Acceptance. The announcement to all Bidders will include table(s) comprising read out prices, discounted prices, price adjustments made, final evaluated prices and recommendations against all the bids evaluated. Any effort by a bidder to influence the Employer's processing of bids or award decisions may result in the rejection of such bidder's bid. Whereas any bidder feeling aggrieved may lodge a written complaint not later than fifteen (15) days after the announcement of the bid evaluation report. However mere fact of lodging a complaint shall not warrant suspension of the procurement process.

IB.25 Clarification of Bids

25.1 To assist in the examination, evaluation and comparison of bids, the Employer may, at his discretion, ask any bidder for clarification of his bid, including breakdowns of unit rates. The request for clarification and the response shall be in writing but no change in the price or substance of the bid shall be sought, offered or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the bids in accordance with Clause IB.28.

25.2 If a Bidder does not provide clarifications of its Bid by the date and time set in the Employer's request for clarification, its bid may be rejected.

IB.26 Examination of Bids and Determination of Responsiveness

26.1 Prior to the detailed evaluation of bids, the Employer will determine whether each bid is substantially responsive to the requirements of the Bidding Documents.

26.2 A substantially responsive bid is one which (i) meets the eligibility criteria; (ii) has been properly signed; (iii) is accompanied by the required Bid Security; (iv) Includes signed Integrity Pact where required as per clause IB.35 and (v) conforms to all the terms, conditions and specifications of the Bidding Documents, without material deviation or reservation. A material deviation or reservation is one (i) which affect in any substantial way the scope, quality or performance of the Works; (ii) which limits in any substantial way, inconsistent with the Bidding Documents, the Employer's rights or the bidders obligations under the Contract; (iii) adoption/rectification whereof would affect unfairly the competitive position of other bidders presenting substantially responsive bids. Only substantially responsive bid shall be considered for further evaluation.

26.3 If a bid is not substantially responsive, it may not subsequently be made responsive by correction or withdrawal of the non-conforming material deviation or reservation. The Employer may, however, seek confirmation/ clarification in writing which shall be

responded in writing.

IB.27 Correction of Errors

27.1 Bids determined to be substantially responsive will be checked by the Employer for any arithmetic errors. Errors will be corrected by the Employer as follows:

(a) Where there is a discrepancy between the amounts in figures and in words, the amount in words will govern; and

(b) Where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern, unless in the opinion of the Employer there is an obviously gross misplacement of the decimal point in the unit rate, in which case the line item total as quoted will govern and the unit rate will be corrected.

27.2 The amount stated in the Letter of Price Bid will be adjusted by the Employer in accordance with the above procedure for the correction of errors and with the concurrence of the bidder, shall be considered as binding upon the bidder. If the bidder does not accept the corrected Bid Price, his Bid will be rejected, and the Bid Security shall be forfeited in accordance with IB.15.6 (b) hereof.

IB.28 Evaluation and Comparison of Bids

DETAILED TECHNICAL EVALUATION CRITERIA

S.No.	Category	Weightage/ Marks/ Points	
		Maximum	**Minimum A**
1.	Professional Experience Record	35	25
2.	Financial Soundness	30	21
3.	Personnel Capabilities	15	10
4.	Equipment Capabilities	20	14
	Total:	**100**	**70**

Note: To qualify, applicants must receive not less than an aggregate 70% points of maximum 100 points.

If two or more than two bidders quote the same price and the situation of tie up has arisen then work shall be awarded to the bidder having higher technical soundness.

1. Mandatory Requirements

All the applicants shall be subjected to initial scrutiny using the following criteria:

- Registration with Pakistan Engineering Council in Category C-5 or above and at least in specialization codes CE-09(I, II), and CE-11(I, VII). The contractor should enclose PEC Registration Certificate, valid up to June 2024

- The Bidder should be registered with FBR and Sindh Revenue Board - SRB for both Income and Sales Tax, with company name appearing on the active taxpayer list (ATL). The contractor should also submit copy of Registration Certificate of NTN and SNTN and print from ATL
- The bidder shall submit affidavit of no litigation history, affidavit of non-blacklisting, affidavit of never indulge in any corrupt, fraudulent and collusive practices. The bidder shall also submit affidavit that the information and documents provided with this pre-qualification document is correct.
- Having an experience for execution and completion of projects of similar nature in remote areas particularly in desert area or far-flung destinations.

2. Professional Experience Record

Experience for Projects Completed will be evaluated as below.

General

(Information regarding similar / comparable projects completed is to be supported by documents such as Taking over / Completion Certificate, Maintenance / Defects Liability Certificate and any other relevant document).

Sr. No.	Description	Maximum Points
1.	*General Experience of Water supply, sewerage and related Infrastructure Works.* Projects executed of over Rs. 25.00 Million *(05 Marks for one Projects and 05 Marks for each additional project)*	10
2.	*Projects of Similar Nature Executed With Universities* *(05 Marks for each project)*	10
3.	*Projects of Similar Nature in Hand Preferably With Universities* *(05 Marks for each project)*	10
4.	*Experience of working with NED University as a Contractor / Supplier Etc.* *(2.5 Marks for each project)*	5
	Sub Total:	**35**

3. Financial Soundness

Tendering Capability of an applicant will be taken as follows:

- The Audited Balance Sheets and Annual Turn Over for the last three years from Chartered Accountant firm must be submitted and should demonstrate the soundness of the applicant's financial position, showing long term profitability. Where necessary, the Employer will make inquiries with the applicant's bankers.
- Points shall be awarded under this category based on the following criteria:

Sr. No.	Description	Marks Assigned	Criteria for Marks Obtained
a)	Average Annual Turnover for Last three (03) Years	10	• Five (05) Point is given if the available bank credit line limit is equal to Rs. 25.00 Million • One (01) additional point is given for every Rs. 5.00 Million increase in the credit line. • Full Points are given in case of limit exceeding Rs. 50.00 Million
b)	Working Capital in last 3 Years	10	• Five (05) Points are given if the average working capital for last three years is equal to Rs. 30.00 Million • One (01) additional point is given for every Rs. 5.00 Million increase in the working capital. • Full Points are given in case of working capital exceeding Rs.55 Million
c)	Years Available Bank Credit Line	10	• Five (05) Points are given if the available bank credit line is equal to Rs. 25.00 Million • One (01) additional point is given for every Rs. 5.00 Million increase in the available bank credit line. • Full Points are given in case of available bank credit line exceeding Rs.50 Million
Total Marks Allocated			**30**

4. Personnel Capabilities

- **<u>Brief Discussion of Personnel Capabilities</u>**

  Personnel deputed on site will be evaluated on the basis of following points:

  (Information regarding education qualification, total work experience and specific work experience is to be supported by documents such as copy of education qualification certificate / degree and CVs of concerned personnel proposed position, duly signed and, any other relevant documents).

Sr. No.	Description	Maximum Points
1.	Project Manager (At least B.E Civil with 10 years relevant experience)	5
2.	Site Engineer (2 in nos with each having 2 points), (At least B.Tech Civil with 7 years	4

	relevant experience)	
3.	Quantity Surveyor (D.A.E Civil with 10 years relevant experience)	2
4.	Surveyor (D.A.E Civil with 15 years relevant experience)	2
5.	Site Supervisor (D.A.E Civil with 10 years relevant experience)	2
	Sub Total:	**15**

* *All Safety measures will be the responsibility of Project Manager and Site Engineer.*

5. Equipment Capabilities

The applicant should own, or have assured access to (through rented, lease, purchase agreement or other means), the following key equipment (limited to only major items of equipment) in full working order, and must demonstrate that, based on known commitments, these will be available for deployment on the proposed contract or works. The applicant may also list alternative equipment which he would propose for the contract together with an explanation of the alternate proposal.

Points will be given on the basis of the following criteria:

Sr. No.	**Description**	**Max. Points**
1	Concrete Mixer Machine	2
2	HDPE Pipe Butt Fusion Jointing Machine	2
3	Concrete Vibrator	2
4	Tractor Trolley	2
5	Excavator	2
6	Rebar / Steel Cutting and Bending Machine	2
7	Wooden Formwork *0.5 mark for each lot of 30,000 sft*	2
8	Earth Rammer	2
9	Electric Generator *(Minimum capacity 5 KVA)*	2
10	Survey Equipment	2
	Total Maximum Points	**20**

28.1 The Employer will evaluate and compare only the Bids determined to be substantially responsive in accordance with Clause IB.26.

28.2 In evaluating the Bids, the Employer will determine for each Bid the evaluated Bid Price by adjusting the Bid Price as follows:

(a) Making any correction for errors pursuant to Clause IB.27;

(b) Excluding Provisional Sums and the provision, if any, for contingencies in the Summary Bill of Quantities, but including competitively priced Day work; and

(c) Making an appropriate adjustment for any other acceptable variation or deviation.

28.3 The estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the Contract, shall not be taken into account in Bid evaluation.

28.4 If the Bid of the successful bidder is seriously unbalanced in relation to the Employer's estimate of the cost of work to be performed under the Contract, the Employer may require the bidder to produce detailed price analyses for any or all items of the Bill of Quantities to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, the Employer may require that the amount of the Performance Security set forth in Clause IB.32 be increased at the expense of the successful bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful bidder under the Contract.

F. AWARD OF CONTRACT

IB.29 Award

29.1 Subject to Clauses IB.30 and IB.34, the Employer will award the Contract to the bidder whose bid has been determined to be substantially responsive to the Bidding Documents and who has offered the lowest evaluated Bid Price, provided that such bidder has been determined to be eligible in accordance with the provisions of Clause IB.3 and qualify pursuant to IB 29.2.

29.2 The Employer, at any stage of the bid evaluation, having credible reasons for or prima facie evidence of any defect in bidder's capacities, may require the bidders to provide information concerning their professional, technical, financial, legal or managerial competence whether already pre-qualified or not:

Provided that such qualification shall only be laid down after recording reasons in writing. They shall form part of the records of that bid evaluation report.

IB.30 Employer's Right to Accept any Bid and to Reject any or all Bids

30.1 Notwithstanding Clause IB.29, the Employer reserves the right to accept or reject any Bid, and to annul the bidding process and reject all bids, at any time prior to award of Contract, without thereby incurring any liability to the affected bidders or any obligation except that the grounds for rejection of all bids shall upon request be communicated to any bidder who submitted a bid, without justification of grounds. Rejection of all bids shall be notified to all bidders promptly.

IB.31 Notification of Award

31.1 Prior to expiration of the period of bid validity prescribed by the Employer, the Employer will notify the successful bidder in writing ("Letter of Acceptance") that his Bid has been accepted. This letter shall name the sum which the Employer will pay the Contractor in consideration of the execution and completion of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Conditions of Contract

called the "Contract Price").

31.2 No Negotiation with the bidder having evaluated as lowest responsive or any other bidder shall be permitted.

31.3 The notification of award and its acceptance by the bidder will constitute the formation of the Contract, binding the Employer and the bidder till signing of the formal Contract Agreement.

31.4 Upon furnishing by the successful bidder of a Performance Security, the Employer will promptly notify the other bidders that their Bids have been unsuccessful and return their bid securities.

IB.32 Performance Security

32.1 The successful bidder shall furnish to the Employer a Performance Security in the form and the amount stipulated in the Bidding Data Sheet and the Conditions of Contract within a period of 14 days after the receipt of Letter of Acceptance.

32.2 Failure of the successful bidder to comply with the requirements of IB.32.1 or IB.33 or IB.35 shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Security.

IB.33 Signing of Contract Agreement

33.1 Within 14 days from the date of furnishing of acceptable Performance Security under the Conditions of Contract, the Employer will send the successful bidder the Contract Agreement in the form provided in the Bidding Documents, incorporating all agreements between the parties.

33.2 The formal Agreement between the Employer and the successful bidder shall be executed within 14 days of the receipt of the Contract Agreement by the successful bidder from the Employer.

IB. 34 General Performance of the Bidders

The Employer reserves the right to obtain information regarding performance of the bidders on their previously awarded contracts/works. The Employer may in case of consistent poor performance of any Bidder as reported by the employers of the previously awarded contracts, interalia, reject his bid and/or refer the case to the Pakistan Engineering Council (PEC). Upon such reference, PEC in accordance with its rules, procedures and relevant laws of the land take such action as may be deemed appropriate under the circumstances of the case including black listing of such Bidder and debarring him from participation in future bidding for similar works.

IB.35 Integrity Pact

The Bidder shall sign and stamp the Integrity Pact provided at Appendix-L to Bid in the Bidding Documents for all Federal Government procurement contracts exceeding Rupees ten million. Failure to provide such Integrity Pact shall make the bidder non-responsive.

IB.36 Instructions not Part of Contract

Bids shall be prepared and submitted in accordance with these Instructions which are provided to assist bidders in preparing their bids, and do not constitute part of the Bid or the Contract Documents.

BIDDING DATA SHEET

BDS-1

Bidding Data Sheet

1.1 Name and address of the Employer:

1.1 Name of the Project & Summary of the Works:

Construction of External Water Supply & External Sewerage Work for Civil Department, Mechanical Department, Main Gate & Project Office at Tharparkar

2.1 Name of the Borrower/Source of Financing/Funding Agency:

The Procuring Agency has arranged funds from PDWP Government of Sindh under ADP No. 1129 of CFY 2023-2024 with sufficient allocations.

10.1 Bid language:

English

11.1 (A) The Bidder shall submit with its Technical Bid the following documents:

(a)	Letter of Technical Bid	
(b)	Bid Security	(IB.15)
(c)	Pending litigation information	
(d)	Special Stipulations (as filled by the Employer)	(appendix –A)
(e)	Proposed Construction Schedule	(appendix –E)
(f)	Availability of Critical Equipment	(appendix –G)
(g)	Organization Chart for Supervisory Staff	(appendix –K)
(h)	Integrity Pact	(appendix –L)
(i)	Financial Competence and Access to financial Resources	(appendix –M)
(j)	Past Performance, Current Commitment, Qualification and Experience	(appendix –N)

11.1(B) The Bidder shall submit with its Price Bid the following documents:

(a)	Letter of Price Bid	
(b)	Foreign Currency Requirements (If required and only in case of International Bidding)	(appendix –B)
(c)	Price Adjustment under Clause 70	(appendix –C)
(d)	Bill of Quantities	(appendix –D)
(e)	Estimated Progress Payments	(appendix –J)

413.1 Bidders to quote entirely in Pak. rupees but specify the percentages of foreign currency they require.

14.1 Period of Bid Validity:

Period of Bid Validity is 90 days after the date of bid opening.

15.1 Amount of Bid Security:

Amount of Bid Security shall be 2% of the Bid Price in Pak Rupees.

18.4 Number of copies of the Bid to be completed and returned:
One Original plus Two Copies

19.2(a) Employer's address for the purpose of Bid submission:

Office of the Director Procurement, NED University of Engineering & Technology, Karachi

20.1(a) Deadline for submission of bids:

As mentioned in the Notice Inviting Tender-NIT

23.1 Venue, time, and date of Bid opening:

As mentioned in the Notice Inviting Tender-NIT

Letters of Technical Bid/ Price Bid,
And
Appendices to Bid

LTB-1

Letter of Technical Bid

Date: .....

Bid Reference No: .....

(Name of Contract/Works)

To: .....

We, the undersigned, declare that:

(a) We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders (IB) 9;

(b) We offer to execute and complete in conformity with the Bidding Documents the following Works:

(c) Our Bid consisting of the Technical Bid and the Price Bid shall be valid for a period of …… days from the date fixed for the bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

(d) As security for due performance of the under takings and obligations of our bid, we submit here with a Bid security, in the amount specified in Bidding Data Sheet, which is valid (at least) 28 days beyond validity of Bid itself.

(e) We are not participating, as a Bidder or as a subcontractor, in more than one bid in this bidding process, other than alternative offers submitted in accordance with IB16 (as applicable) .

(f) We agree to permit Employer or its representative to inspect our accounts and records and other documents relating to the bid submission and to have them audited by auditors. This permission is extended for verification of any information provided in our Technical Bid which comprises all documents enclosed herewith in accordance with IB.11.1 of the Bidding Data Sheet.

Name .....

In the capacity of .....

Signed .....

.....

Duly authorized to sign the Bid for and on behalf of .....

Date .....

.....

Address……..

LPB-1

Letter of Price Bid

Date: .....

Bid Reference No: .....
(Name of Contract/Works)

To: .....

We, the undersigned, declare that:

(a) We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders (IB)9;

(b) The total price of our Bid, excluding any discounts offered in item (c) below is:

(c) The discounts offered and the methodology for their application are:

(d) Our Bid shall be valid for a period of …….. days from the date fixed for the bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

(e) If our Bid is accepted, we commit to obtain a performance security in accordance with the Bidding Documents;

(f) We understand that this bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal contract is prepared and executed and we do hereby declare that the Bid is made without any collusion, comparison of figures or arrangement with any other bidder for the Works.

(g) We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive.

(h) We agree to permit Employer or its representative to inspect our accounts and records and other documents relating to the bid submission and to have them audited by auditors. This permission is extended for verification of any information provided in our Technical Bid which comprises all documents enclosed herewith in accordance with IB.11.1 of the Bidding Data Sheet.

(i) If awarded the contract, the person named below shall act as Contractor's Representative.

Name .....

In the capacity of .....

Signed .....

Duly authorized to sign the Bid for and on behalf of .....

Date .....

Address……..

SPECIAL STIPULATIONS
Clause
Conditions of Contract

1.	Employer's name and address	1.1.2.2 & 1.3	Office of The Director Procurement, NED University of Engineering & Technology, Karachi. Phone: 92-21-99261261-8 Ext: 2460
2	Engineer's name and address	1.1.2.4 & 1.3	Not Applicable
3.	Law applicable	5.1(b)	The law to be applied is the law of Islamic Republic of Pakistan
4.	Amount of Performance Security	10.1	5% of Contract Price stated in the Letter of Acceptance.
5.	Time for Furnishing Programme	14.1	Within 28 days from the date of receipt of Letter of Acceptance.
6.	Time for Commencement	41.1	Within 14 days from the date of receipt of Engineer's Notice to Commence which shall be issued within fourteen (14) days after signing of Contract Agreement.
7.	Time for Completion	43.1, 48.2	9 months (270days) from the date of receipt of Engineer's Notice to Commence.
9.	Defects Liability Period	49.1	9 months (270days) Days from the effective date of Taking Over Certificate.
10.	Percentage of Retention Money	60.2	5 % of the amount of Interim Payment Certificate.
11.	Limit of Retention Money	60.2	5 % of Contract Price stated in the Letter Of Acceptance.
12.	Minimum amount of Running Account Bills	60.2	As per actual progress of work
13.	Mobilization Advance * (Interest Free)	60.12	10-15% of Contract Price as stated in the Letter of Acceptance. Mobilization advance shall be interest free.

FOREIGN CURRENCY REQUIREMENTS
(If required and only in case of International Bidding)

1. The Bidder may indicate here in below his requirements of foreign currency (if any), with reference to various inputs to the Works.

2. Foreign Currency Requirement as percentage of the Bid Price excluding Provisional Sums _____%.

3. Table of Exchange Rates

Unit of Currency	Equivalent in Pak. Rupees
Australian Dollar	----------
Euro	----------
Japanese Yen	----------
U.K. Pound	----------
U.S. Dollars	----------
----------	----------
----------	----------

BC-1
Appendix-C to Bid

COST ESCALATION-DIFFERENCE OF COST UNDER CLAUSE 70 OF CONDITIONS OF CONTRACT

The Price Escalation-Difference of Cost shall be payable to the contractor under the contract provisions in accordance to time to time notifications of office of the Chief Engineer Highways, Hyderabad, Government of Sindh or any other concerned office of GOS as per policy for ADP works.

BILL OF QUANTITIES

A. Preamble

1. The Bill of Quantities shall be read in conjunction with the Conditions of Contract, Specifications and Drawings.

2. The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work executed and measured by the Contractor and verified by the Engineer and valued at the rates and prices entered in the priced Bill of Quantities, where applicable, and otherwise at such rates and prices as the Engineer may fix in accordance with provisions of the Contract.

3. The rates and prices entered in the priced Bill of Quantities shall, except insofar as it is otherwise provided under the Contract include all costs of Contractor's plant, labour , supervision, materials, execution, insurance, profit, taxes and duties, together with all general risks, liabilities and obligations set out or implied in the Contract. Furthermore all duties, taxes and other levies payable by the Contractor under the Contract, or for any other cause, as on the date 28 days prior to deadline for submission of Bids, shall be included in the rates and prices and the total Bid Price submitted by the Bidder.

4. A rate or price shall be entered against each item in the priced Bill of Quantities, whether quantities are stated or not. The cost of items against which the Contractor will have failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities.

5. The whole cost of complying with the provisions of the Contract shall be included in the items provided in the priced Bill of Quantities, and where no items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related items of the Works.

6. General directions and description of work and materials are not necessarily repeated nor summarized in the Bill of Quantities. References to the relevant sections of the Bidding Documents shall be made before entering prices against each item in the priced Bill of Quantities.

7. Provisional sums included and so designated in the Bill of Quantities shall be expended in whole or in part at the direction and discretion of the Engineer in accordance with Sub-Clause 58.2 of Part I, General Conditions of Contract.

BD-2

Appendix-D to Bid

BILL OF QUANTITIES

B. Work Items

1. As per attached Bill of Quantities

PROPOSED CONSTRUCTION SCHEDULE (If Required by the Employer)

Pursuant to Sub-Clause 43.1 of the General Conditions of Contract, the Works shall be completed on or before the date stated in Appendix-A to Bid. The Bidder shall provide as Appendix-E to Bid, the Construction Schedule in the bar chart (CPM, PERT or any other to be specified herein) showing the sequence of work items and the period of time during which he proposes to complete each work item in such a manner that his proposed programme for completion of the whole of the Works and parts of the Works may meet Employer's completion targets in days noted below and counted from the date of receipt of Engineer's Notice to Commence (Attach sheets as required for the specified form of Construction Schedule):

	Description	**Time for Completion**
a)	Whole Works	_____days
b)	Part-A	_____days (If applicable)
c)	Part-B	_____days (If applicable)
d)	_____	_____days
e)	_____	_____days

BF-1

Appendix-F to Bid

METHOD OF PERFORMING THE WORK

The Bidder is required to submit a narrative outlining the method of performing the Work. The narrative should indicate in detail and include but not be limited to:

1. Organization Chart indicating head office and field office personnel involved in management and supervision, engineering, equipment maintenance and purchasing.

2. Mobilization in Pakistan, the type of facilities including personnel accommodation, office accommodation, provision for maintenance and for storage, communications, security and other services to be used.

3. The method of executing the Works, the procedures for installation of equipment and machinery and transportation of equipment and materials to the site.

4. Quality control / Quality assurance measures to be adopted including procedures to be followed for carrying out all tests required under specifications.

BG-1

Appendix-G to Bid

LIST OF MAJOR EQUIPMENT – RELATED ITEMS

The Bidder will provide a list of all major equipment and related items, under separate heading for items owned, to be purchased or to be arranged on lease by him to carry out the Works. The information shall include make, type, capacity, and anticipated period of utilization for all equipment which shall be in sufficient detail to demonstrate fully that the equipment will meet all requirements of the Specifications.

LIST OF MAJOR EQUIPMENT

Owned Purchased or Leased	Description of Unit (Make, Model, Year)	Capacity HP Rating	Condition	Present Location or Source	Date of Delivery at Site	Period of Work on Project
1	2	3	4	5	6	7
a. Owned						
b. To be Purchased						
c. To be arranged on Lease						

BG-2

Appendix-G to Bid

Equipment:

The Bidder must demonstrate that it has the key equipment listed hereafter:

No.	PLANT/EQUIPMENT				
	Equipment Type and Characteristics	**Total Nos. available**	**Under Utilization on other projects, if applicable**	**Nos. waiting to be shifted to new project(s)**	**Min. Number Required for this Project**
1					
2					
3					
4					
5					
6					

CONSTRUCTION CAMP AND HOUSING FACILITIES

The Contractor in accordance with Clause 34 of the Conditions of Contract shall provide description of his construction camp's facilities and staff housing requirements.

The Contractor shall be responsible for pumps, electrical power, water and electrical distribution systems, and sewerage system including all fittings, pipes and other items necessary for servicing the Contractor's construction camp.

The Bidder shall list or explain his plans for providing these facilities for the service of the Contract as follows:

1. Site Preparation (clearing, land preparation, etc.).

2. Provision of Services.

   a) Power (expected power load, etc.).

   b) Water (required amount and system proposed).

   c) Sanitation (sewage disposal system, etc.).

3. Construction of Facilities

   a) Contractor's Office. Workshop and Work Areas (areas required and proposed layout, type of construction of buildings, etc.).

   b) Warehouses and Storage Areas (area required, type of construction and layout).

   c) Housing and Staff Facilities (Plans for housing for proposed staff, layout, type of construction, etc.).

4. Construction Equipment Assembly and Preparation (detailed plans for carrying out this activity).

5. Other Items Proposed (Security services, etc.). The Contractor should mention here what are his proposed environmental measures for the project as per EPA rules like treatment of wastewater and water quality etc. The Contractor shall submit a detailed EMP (Environmental Management Plan) to describe how materials are removed from site and disposed off at a safe location, prevention for the contamination of ground and surface water in neighboring areas etc. including remedial measures for adoption.

6. Detail of testing Lab with testing equipment etc.

BI-1

Appendix-I to Bid

LIST OF SUBCONTRACTORS

I/We intend to subcontract the following parts of the Work to subcontractors. In my/our opinion, the subcontractors named hereunder are reliable and competent to perform that part of the work for which each is listed.

Enclosed are documentation outlining experience of subcontractors, the curriculum vitae and experience of their key personnel who will be assigned to the Contract, equipment to be supplied by them, size, location and type of contracts carried out in the past.

Part of Works (Give Details)	**Subcontractor (With Complete Address)**
1	2
Not Applicable	

BJ-1

Appendix-J to Bid

ESTIMATED PROGRESS PAYMENTS

Bidder's estimate of the value of work which would be executed by him during each of the periods stated below, based on his Programme of the Works and the Rates in the Bill of Quantities, expressed in thousands of Pakistani Rupees:

Quarter/ Year/ Period	**Amounts (1,000 Rs.)**
1	**2**
Ist Quarter	
2nd Quarter	
3rd Quarter	
4th Quarter	
…….	
…….	
…….	
…….	
…….	
Bid Price	

BK-1

Appendix-K to Bid

ORGANIZATION CHART

FOR THE
SUPERVISORY STAFF AND LABOUR

BL-1
Appendix-L to Bid

(INTEGRITY PACT)

DECLARATION OF FEES, COMMISSION AND BROKERAGE ETC. PAYABLE BY THE SUPPLIERS OF GOODS, SERVICES & WORKS IN CONTRACTS WORTH RS. 10.00 MILLION OR MORE

Contract No._____Dated_____
Contract Value: _____
Contract Title: _____

…… [Name of Supplier] hereby declares that it has not obtained or induced the procurement of any contract, right, interest, privilege or other obligation or benefit from Government of Pakistan (GoP) or any administrative subdivision or agency thereof or any other entity owned or controlled by GoP through any corrupt business practice.

Without limiting the generality of the foregoing, [name of Supplier] represents and warrants that it has fully declared the brokerage, commission, fees etc. paid or payable to anyone and not given or agreed to give and shall not give or agree to give to anyone within or outside Pakistan either directly or indirectly through any natural or juridical person, including its affiliate, agent, associate, broker, consultant, director, promoter, shareholder, sponsor or subsidiary, any commission, gratification, bribe, finder‟s fee or kickback, whether described as consultation fee or otherwise, with the object of obtaining or inducing the procurement of a contract, right, interest, privilege or other obligation or benefit in whatsoever form from GoP, except that which has been expressly declared pursuant hereto.

[Name of Supplier] certifies that it has made and will make full disclosure of all agreements and arrangements with all persons in respect of or related to the transaction with GoP and has not taken any action or will not take any action to circumvent the above declaration, representation or warranty.

[Name of Supplier] accepts full responsibility and strict liability for making any false declaration, not making full disclosure, misrepresenting facts or taking any action likely to defeat the purpose of this declaration, representation and warranty. It agrees that any contract, right, interest, privilege or other obligation or benefit obtained or procured as aforesaid shall, without prejudice to any other rights and remedies available to GoP under any law, contract or other instrument, be voidable at the option of GoP.

Notwithstanding any rights and remedies exercised by GoP in this regard, [name of Supplier] agrees to indemnify GoP for any loss or damage incurred by it on account of its corrupt business practices and further pay compensation to GoP in an amount equivalent to ten time the sum of any commission, gratification, bribe, finder‟s fee or kickback given by [name of Supplier] as aforesaid for the purpose of obtaining or inducing the procurement of any contract, right, interest, privilege or other obligation or benefit in whatsoever form from GoP.

Name of Employer: ……	Name of Contractor: ……
Signature: ……..	Signature: ……
[Seal]	[Seal]

FORMS

BID SECURITY
PERFORMANCE SECURITY
CONTRACT AGREEMENT
MOBILIZATION ADVANCE GUARANTEE/BOND
AND
INDEMNITY BOND FOR SECURED ADVANCE

BS-1

BID SECURITY
(Bank Guarantee)

Security Executed on _____
(Date)

Name of Surety (Bank) with Address: _____
(Scheduled Bank in Pakistan)

Name of Principal (Bidder) with Address _____

_____

Penal Sum of Security Rupees._____(Rs._____)

Bid Reference No. _____

KNOW ALL MEN BY THESE PRESENTS, that in pursuance of the terms of the Bid and at the request of the said Principal (Bidder) we, the Surety above named, are held and firmly bound unto

_____

(hereinafter called the 'Employer') in the sum stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Bidder has submitted the accompanying Bid dated_____for Bid No._____for_____(Particulars of Bid) to the said Employer; and

WHEREAS, the Employer has required as a condition for considering said Bid that the Bidder furnishes a Bid Security in the above said sum from a Scheduled Bank in Pakistan or from a foreign bank duly counter-guaranteed by a Scheduled Bank in Pakistan, to the Employer, conditioned as under:

(1) that the Bid Security shall remain in force up to and including the date 28 days after the deadline for validity of bids as stated in the Instructions to Bidders or as it may be extended by the Employer, notice of which extension(s) to the Surety is hereby waived;

(2) that the Bid Security of unsuccessful Bidders will be returned by the Employer after expiry of its validity or upon signing of the Contract Agreement; and

(3) that in the event of failure of the successful Bidder to execute the proposed Contract Agreement for such work and furnish the required Performance Security, the entire said sum be paid immediately to the said Employer pursuant to Clause 15.6 of the Instruction to Bidders for the successful Bidder's failure to perform.

NOW THEREFORE, if the successful Bidder shall, within the period specified therefore, on the prescribed form presented to him for signature enter into a formal Contract with the said Employer in accordance with his Bid as accepted and furnish within twenty eight (28) days of his being requested to do so, a Performance Security with good and sufficient surety, as may be required, upon the form prescribed by the said Employer for the faithful performance and proper fulfillment of the said Contract or in the event of non-withdrawal of the said Bid within the time specified for its validity then this obligation shall be void and of no effect, but otherwise to remain in full force and effect.

PROVIDED THAT the Surety shall forthwith pay the Employer, the said sum upon first written demand of the Employer (without cavil or argument) and without requiring the Employer to prove or to show grounds or reasons for such demand, notice of which shall be sent by the Employer by registered post duly addressed to the Surety at its address given above.

PROVIDED ALSO THAT the Employer shall be the sole and final judge for deciding whether the Principal (Bidder) has duly performed his obligations to sign the Contract Agreement and to furnish the requisite Performance Security within the time stated above, or has defaulted in fulfilling said requirements and the Surety shall pay without objection the said sum upon demand from the Employer forthwith and without any reference to the Principal (Bidder) or any other person.

IN WITNESS WHEREOF, the above bounden Surety has executed the instrument under its seal on the date indicated above, the name and seal of the Surety being hereto affixed and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

SURETY (Bank)

WITNESS:

Signature _____

1. _____

Name _____

_____

Title _____

Corporate Secretary (Seal)

Corporate Guarantor (Seal)

2. _____

_____

Name, Title & Address

PS-1

FORM OF PERFORMANCE SECURITY
(Bank Guarantee)

Guarantee No._____
Executed on _____
Expiry date _____

[Letter by the Guarantor to the Employer]

Name of Guarantor (Bank) with address:_____
(Scheduled Bank in Pakistan)
Name of Principal (Contractor) with address:_____
_____
Penal Sum of Security (express in words and figures)_____
_____
Letter of Acceptance No._____Dated _____

KNOW ALL MEN BY THESE PRESENTS, that in pursuance of the terms of the Bidding Documents and above said Letter of Acceptance (hereinafter called the Documents) and at the request of the said Principal we, the Guarantor above named, are held and firmly bound unto the _____ (hereinafter called the Employer) in the penal sum of the amount stated above for the payment of which sum well and truly to be made to the said Employer, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has accepted the Employer's above said Letter of Acceptance for _____ _____ (Name of Contract) for the _____ _____(Name of Project).

NOW THEREFORE, if the Principal (Contractor) shall well and truly perform and fulfill all the undertakings, covenants, terms and conditions of the said Documents during the original terms of the said Documents and any extensions thereof that may be granted by the Employer, with or without notice to the Guarantor, which notice is, hereby, waived and shall also well and truly perform and fulfill all the undertakings, covenants terms and conditions of the Contract and of any and all modifications of said Documents that may hereafter be made, notice of which modifications to the Guarantor being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue till all requirements of Clause 49, Defects Liability, of Conditions of Contract are fulfilled.

Our total liability under this Guarantee is limited to the sum stated above and it is a condition of any liability attaching to us under this Guarantee that the claim for payment in writing shall be received by us within the validity period of this Guarantee, failing which we shall be discharged of our liability, if any, under this Guarantee.

PS-2

We,_____(the Guarantor), waiving all objections and defences under the Contract, do hereby irrevocably and independently guarantee to pay to the Employer without delay upon the Employer's first written demand without cavil or arguments and without requiring the Employer to prove or to show grounds or reasons for such demand any sum or sums up to the amount stated above, against the Employer's written declaration that the Principal has refused or failed to perform the obligations under the Contract which payment will be effected by the Guarantor to Employer's designated Bank & Account Number.

PROVIDED ALSO THAT the Employer shall be the sole and final judge for deciding whether the Principal (Contractor) has duly performed his obligations under the Contract or has defaulted in fulfilling said obligations and the Guarantor shall pay without objection any sum or sums up to the amount stated above upon first written demand from the Employer forthwith and without any reference to the Principal or any other person.

IN WITNESS WHEREOF, the above-bounden Guarantor has executed this Instrument under its seal on the date indicated above, the name and corporate seal of the Guarantor being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

_____
Guarantor (Bank)

Witness:

1. _____ Signature _____

_____ Name_____
Corporate Secretary (Seal)

Title _____

2. _____

_____ _____
Name, Title & Address Corporate Guarantor (Seal)

CA-1

FORM OF CONTRACT AGREEMENT

THIS CONTRACT AGREEMENT (hereinafter called the "Agreement") made on the _____ day of_____(month) 20_____ between _____ (hereafter called the "Employer") of the one part and _____ (hereafter called the "Contractor") of the other part.

WHEREAS the Employer is desirous that certain Works, viz_____should be executed by the Contractor and has accepted a Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein.

NOW this Agreement witnesseth as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.

2. The following documents after incorporating addenda / Clarification as agreed or otherwise, if any, except those parts relating to Instructions to Bidders shall be deemed to form and be read and construed as part of this Contract, viz:

   (a) The Contract Agreement;
   (b) The Letter of Acceptance;
   (c) The completed Form of Bid;
   (d) Special Stipulations (Appendix-A to Bid);
   (e) The Particular Conditions of Contract – Part II;
   (f) The General Conditions – Part I;
   (g) The priced Bill of Quantities (Appendix-D to Bid);
   (h) The completed Appendices to Bid (B, C, E to O);
   (i) The Drawings;
   (j) The Specifications.
   (k) _____(any other)

3. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy defects therein in conformity and in all respects with the provisions of the Contract.

4. The Employer hereby covenants to pay the Contractor, in consideration of the execution and completion of the Works as per provisions of the Contract, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS WHEREOF the parties hereto have caused this Agreement to be executed on the day, month and year first before written in accordance with their respective laws.

Signature of the Contactor	Signature of Employer
_____	_____
(Seal)	(Seal)
Signed, Sealed and Delivered in the presence of:	
Witness:	Witness:
_____	_____
(Name, Title and Address)	(Name, Title and Address)

MG-1

MOBILIZATION ADVANCE GUARANTEE/BOND

Guarantee No._____Date _____

WHEREAS_____(hereinafter called the 'Employer') has entered into a Contract for _____
(Particulars of Contract)
with_____(hereinafter called the "Contractor').

AND WHEREAS, the Employer has agreed to advance to the Contractor, at the Contractor's request, an amount of Rupees_____(Rs_____) which amount shall be advanced to the Contractor as per provisions of the Contract.

AND WHEREAS, the Employer has asked the Contractor to furnish Guarantee to secure the mobilization advance for the performance of his obligations under the said Contract.

AND WHEREAS, _____
(Scheduled Bank in Pakistan or Insurance Company acceptable to the Employer)
(hereinafter called the "Guarantor") at the request of the Contractor and in consideration of the Employer agreeing to make the above advance to the Contractor, has agreed to furnish the said Guarantee.

NOW, THEREFORE, the Guarantor hereby guarantees that the Contractor shall use the advance for the purpose of above mentioned Contract and if he fails and commits default in fulfillment of any of his obligations for which the advance payment is made, the Guarantor shall be liable to the Employer for payment not exceeding the aforementioned amount.

Notice in writing of any default, of which the Employer shall be the sole and final judge, on the part of the Contractor, shall be given by the Employer to the Guarantor, and on such first written demand, payment shall be made by the Guarantor of all sums then due under this Guarantee without any reference to the Contractor and without any objection.

This Guarantee shall remain in force until the advance is fully adjusted against payments from the Interim Payment Certificates of the Contractor or until _____whichever is earlier.
(Date)
The Guarantor's liability under this Guarantee shall not in any case exceed the sum of Rupees _____(Rs_____).

This Guarantee shall remain valid up to the aforesaid date and shall be null and void after the aforesaid date or earlier if the advance made to the Contractor is fully adjusted against payments from Interim Payment Certificates of the Contractor provided that the Guarantor agrees that the aforesaid period of validity shall be deemed to be extended if on the above mentioned date the advance payment is not fully adjusted.

GUARANTOR

1. Signature _____
2. Name _____
3. Title _____

WITNESS

1. _____

_____
Corporate Secretary (Seal)

2. _____ _____
(Name Title & Address) Corporate Guarantor (Seal)

IB-1

INDEMNITY BOND

FOR SECURED ADVANCE

AGAINST MATERIALS BROUGHT AT SITE

(ON RS.40 NONJUDICIAL STAMP PAPER)

This Deed of Indemnity is issued by M/s. _____ _____ *(Name* of *the Contractor)* in favor of *M/s.*_____*(Name* of *the Employer).*

Whereas_____(hereinafter called the Employer) has paid the Secured Advance against the cost of material through any Bank or like agency by any other method by virtue of the terms of the contract existing between the parties. The details of the material and their price for which secured advance is being sought for the period _____till consumption of the material is as under: -

1. _____ at Rs._____ per_____= Rs.
2. _____ at Rs._____ per_____= Rs.
3. _____ at Rs._____ per_____= Rs.
4. _____ at Rs._____ per_____= Rs.

THEREFORE THIS DEED OF INDEMNITY WITHNESSETH AS FOLLOWS:

I/We_____of M/s. _____
do hereby indemnify M/s_____for all losses due to thefts, arson, pilferage, loss due to flood and inundation, shortage, deterioration and depreciation etc. through any act of Man or God or slump in the Market of any or all the materials financed or paid by the Employer on our request for financing payment against material.

I/We_____shall indemnify_____against any or all claims, action damages arising out of or resulting to the said material.

I/We_____further declare that we will faithfully abide by the above declaration and solemnly affirm that we will not remove, sell, pilferage any of the materials against which M/s_____has paid us such a secured advance and will not pledge the same with any Bank, Finance Corporation, Firm, Company, Individual or the like agency or create any change whereon in any from what so ever.

I/We_____ do hereby also declare that in the event of my/our infringement of the declaration made above _____ will be entitled to forfeit all such material and also proceed against me/us according to the relevant clause pertaining to breach of contract and further invoke the power or seek any remedies secured of _____ under the contract Agreement signed with us or otherwise available under law.

Place_____Dated _____

Contractor _____

[Notes on the Conditions of Contract]

The Conditions of Contract comprise two parts:

(a) Part I - General Conditions of Contract
(b) Part II - Particular Conditions of Contract

Over the years, a number of "model" General Conditions of Contract have evolved. The one used in these Standard Bidding Documents was prepared by the International Federation of Consulting Engineers (Federation International des Ingenieurs-Conseils, or FIDIC), and is commonly known as the FIDIC Conditions of Contract. (The used version is the fourth edition, 1987, reprinted in 1992 with further amendments).

The FIDIC Conditions of Contract have been prepared for an ad measurement (unit price or unit rate) type of contract, and cannot be used without major modifications for other types of contract, such as lump sum, turnkey, or target cost contracts.

The standard text of the General Conditions of Contract chosen must be retained intact to facilitate its reading and interpretation by bidders and its review by the Client. Any amendments and additions to the General Conditions, specific to the contract in hand, should be introduced in the Particular Conditions of Contract.

The use of standard conditions of contract for all civil Works will ensure comprehensiveness of coverage, better balance of rights or obligations between Employer and Contractor, general acceptability of its provisions, and savings in time and cost for bid preparation and review, leading to more economic prices.

The FIDIC Conditions of Contract are copyrighted and may not be copied, faxed, or reproduced. Without taking any responsibility of its being accurate, Pakistan Engineering Council with prior consent of FIDIC Secretariat, has reproduced herein the FIDIC General **Conditions of Contract for reference purpose only which cannot be used by the users** for preparing their bidding documents. The bidding document may include a purchased copy, the cost of which can be retrieved as part of the selling price of the bidding document. Alternatively, the FIDIC Conditions of Contract can be referred to in the bidding documents, and the bidders are advised to obtain copies directly from FIDIC.*

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* Add the following text if the bidding documents, as issued, do not include a copy:
"Copies of the FIDIC Conditions of Contract can be obtained from:
FIDIC Secretariat
P.O. Box 86
1000 Lausanne 12
Switzerland
e-mail: fidic.pub@fidic.org – FIDIC.org/book

FEDERATION INTERNATIONAL DES INGENIEURS-CONSEILS

CONDITIONS OF CONTRACT FOR WORKS OF CIVIL ENGINEERING CONSTRUCTION

PART I GENERAL CONDITIONS
WITH FORMS OF TENDER AND AGREEMENT

FOURTH EDITION 1987
Reprinted 1988 with editorial amendments
Reprinted in 1992 with further amendments

TABLE OF CONTENTS

PART II - PARTICULAR CONDITIONS OF CONTRACT

TABLE OF CONTENTS

PART II - PARTICULAR CONDITIONS OF CONTRACT

PART II - PARTICULAR CONDITIONS OF CONTRACT
(Mandatory Provisions not to be Amended / Substituted except as instructed by PEC)

1.1 Definitions

(a) (i) The Employer is **Director Procurement, NED University of Engineering & Technology**

(a) (iv) The Engineer is **ESS-I-AAR Planning, Engineering and Services Consultant**.

The following paragraph is added:

(a) (vi) "Bidder or Tenderer" means any person or persons, company, corporation, firm or Joint venture submitting a Bid or Tender.

(b) (v) The following is added at the end of the paragraph:

The word "Tender" is synonymous with "Bid" and the word "Tender Documents" with "Bidding Documents".

The following paragraph is added:

(b) (ix) "Programme" means the programme to be submitted by the Contractor in Accordance
Accordance with Sub-Clause 14.1 and any approved revisions thereto.

(e) (i) The text is deleted and substituted with the following:

"Contract Price" means the sum stated in the Letter of Acceptance as payable to the Contractor for the execution and completion of the Works subject to such additions thereto or deductions there from as may be made and remedying of any defects therein in accordance with the provisions of the Contract.

2.1 Engineer's Duties and Authority

With reference to Sub-Clause 2.1(b), the following provisions shall also apply:
The Engineer shall obtain the specific approval of the Employer before carrying out his duties in accordance with the following Clauses. The Employer may further vary according to need of the project;

(i) Consenting to the sub-letting of any part of the Works under Sub-Clause 4.1 "Subcontracting".

(ii) Certifying additional cost determined under Sub-Clauses 12.2 "Not Foreseeable Physical Obstructions or conditions"

(iii) Any action under Clause 10 "Performance Security" and Clauses 21,23,24 & 25 " Insurance" of sorts.

(iv) Any action under Clause 40 "Suspension"

(v) Any action under Clause 44 "Extension of Time for Completion"

(vi) Any action under Clause 47 "Liquidated Damages for Delay" or payment of Bonus for Early Completion of Works (PCC Sub-Clause 47.3)

(vii) Issuance of "Taking over Certificate" under Clause 48.

(viii) Issuing a Variation Order under Clause 51 except:

a) in an emergency* situation, as stated here below, or

b) if such variation would increase the Contract Price by the amount stated in the Appendix-A to Bid.

(ix) Fixing rates or prices under Clause 52.

(x) Extra payment as a result of Contractor"s claims Clause

(xi) Release of Retention Money to the Contractor under Sub-Clause 60.3 "Payment of Retention Money".

(xii) Issuance of "Final Payment Certificate" under Sub-Clause 60.8.

(xiii) Issuance of "Defect Liability Certificate" under Sub-Clause 62.1.

(xiv) Any change in the ratios of Contract currency proportions and payments thereof under clause 72 "Currency and Rate of Exchange".

(Note: Employer may further vary according to need of the project)

* (If in the opinion of the Engineer an emergency occurs affecting the safety of life or of the Works or of adjoining property, the Engineer may, without relieving the Contractor of any of his duties and responsibilities under the Contract, instruct the Contractor to execute all such work or to do all such things as may, in the opinion of the Engineer, be necessary to abate or reduce the risk. The Contractor shall forthwith comply with any such instruction of the Engineer. The Engineer shall determine an addition to the Contract Price, in respect of such instruction, in accordance with Clause 52 and shall notify the Contractor accordingly, with a copy to the Employer.)

2.2 Engineer's Representative

Add the following paragraph:
The Employer shall ensure that the Engineer"s Representative is a professional engineer as defined in the Pakistan Engineering Council Act 1975 (V of 1976).

The following Sub-Clauses 2.7 and 2.8 are added:

2.7 Engineer Not Liable

Approval, reviews and inspection by the Engineer of any part of the Works does not relieve the Contractor from his sole responsibility and liability for the supply of materials, plant and equipment for construction of the Works and their parts in accordance with the Contract and neither the Engineer's authority to act nor any decision made by him in good faith as provided for under the Contract whether to exercise or not to exercise such authority shall give rise to any duty or responsibility of the Engineer to the Contractor, any Subcontractor, any of their representatives or employees or any other person performing any portion of the Works.

2.8 Replacement of the Engineer

"If the Employer intends to replace the Engineer, the Employer shall, not less than 14 days before the intended date of replacement, give notice to the Contractor, of the name, address and relevant experience of the intended replacement Engineer. The Employer shall not replace the Engineer with a person against whom the Contractor raises reasonable objection by notice to the Employer, with supporting particulars."

5.1 Language(s) and Law

(a) The Contract Documents shall be drawn up in the English language.
(b) The Contract shall be subjected to the Laws of Islamic Republic of Pakistan

5.2 Priority of Contract Documents

The documents listed at (1) to (6) of the Sub-Clause are deleted and substituted with the following:

(1) The Contract Agreement (if completed);
(2) The Letter of Acceptance;
(3) The completed Form of Bid;
(4) Special Stipulations (Appendix-A to Bid);
(5) The Particular Conditions of Contract – Part II;
(6) The General Conditions – Part I;
(7) The priced Bill of Quantities (Appendix-D to Bid);
(8) The completed Appendices to Bid (B, C, E to L);
(9) The Drawings;
(10) The Specifications; and
(11)____(any other).

In case of discrepancies between drawings, those of larger scale shall govern unless they are superseded by a drawing of later date regardless of scale. All Drawings and Specifications shall be interpreted in conformity with the Contract and these

Conditions. Addendum, if any, shall be deemed to have been incorporated at the appropriate places in the documents forming the Contract.

The following Sub-Clauses 6.6 and 6.7 are added

6.6 Shop Drawings

The Contractor shall submit to the Engineer for review 3 copies of all shop and erection drawings applicable to this Contract as per provision of relevant Sub-Clause of the Contract.
Review and approval by the Engineer shall not be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory and that the Engineer‟s review or approval shall not relieve the Contractor of any of his responsibilities under the Contract.

6.7 As-Built Drawings

At the completion of the Works under the Contract, the Contractor shall furnish to the Engineer 6 copies and one reproducible of all drawings amended to conform with the Works as built. The price of such Drawings shall be deemed to be included in the Contract Price.

10.1 Performance Security

The text is deleted and substituted with the following:

The Contractor shall provide Performance Security to the Employer in the prescribed form. The said Security shall be furnished or caused to be furnished by the Contractor within 28 days after the receipt of the Letter of Acceptance. The Performance Security shall be of an amount equal to 10% of the Contract Price stated in the Letter of Acceptance. Such Security shall, at the option of the bidder, be in the form of either (a) bank guarantee from any Scheduled Bank in Pakistan or (b) bank guarantee from a bank located outside Pakistan duly counter-guaranteed by a Scheduled Bank in Pakistan ~~or (c) an insurance company having atleast AA rating from PACRA/JC~~R. **Deleted**

The cost of complying with requirements of this Sub-Clause shall be borne by the Contractor.

The following Sub-Clause10.4 is added:

10.4 Performance Security Binding on Variations and Changes

The Performance Security shall be binding irrespective of changes in the quantities or variations in the Works or extensions in Time for Completion of the Works which are granted or agreed upon under the provisions of the Contract.

14.1 Programme to be submitted (If required by the Employer)

The programme shall be submitted within 42 days from the date of receipt of Letter ofAcceptance, which shall be in the form of:

i) a Bar Chart identifying the critical activities.

ii) a CPM identifying the critical path/activities.

(Employer to select appropriate one)

14.3 Cash Flow Estimate to be submitted

The detailed Cash Flow Estimate shall be submitted within 21 days from the date of receipt of Letter of Acceptance

The following Sub-Clause 14.5 is added:

14.5 Detailed Programme and Monthly Progress Report

a) For purposes of Sub-Clause 14.1, the Contractor shall submit to the Engineer detailed programme for the following:

(1) Execution of Works;
(2) Labour Employment;
(3) Local Material Procurement;
(4) Material Imports, if any; and
(5) Other details as required by the Engineer.

(b) During the period of the Contract, the Contractor shall submit to the Engineer not later than the 8th day of the following month, 10 copies each of Monthly Progress Reports covering:

(1) A Construction Schedule indicating the monthly progress in percentage;
(2) Description of all work carried out since the last report;
(3) Description of the work planned for the next 56 days sufficiently detailed to enable the Engineer to determine his programme of inspection and testing;
(4) Monthly summary of daily job record;
(5) Photographs to illustrate progress; and
(6) Information about problems and difficulties encountered, if any, and proposals to overcome the same.

(c) During the period of the Contract, the Contractor shall keep a daily record of the work progress, which shall be made available to the Engineer as and when requested. The daily record shall include particulars of weather conditions, number of men working, deliveries of materials, quantity, location and assignment of Contractor‟s equipment.

The following Sub-Clauses 15.2 and 15.3 are added:

15.2 Language Ability of Contractor's Representative

The Contractor‟s authorised representative shall be fluent in the English language. Alternately an interpreter with ability of English language shall be provided by the Contractor on full time basis.

15.3 Contractor's Representative

The Contractor‟s authorised representative and his other professional engineers working at Site shall register themselves with the Pakistan Engineering Council.

The Contractor‟s authorised representative at Site shall be authorised to exercise adequate administrative and financial powers on behalf of the Contractor so as to achieve completion of the Works as per the Contract.

The following Sub-Clauses 16.3 and 16.4 are added:

16.3 Language Ability of Superintending Staff of Contractor

A reasonable proportion of the Contractor's superintending staff shall have a working knowledge of the English language. If the Contractor‟s superintending staff are not fluent in English language, the Contractor shall make competent interpreters available during all working hours in a number deemed sufficient by the Engineer.

16.4 Employment of Local Personnel

The Contractor is encouraged, to the extent practicable and reasonable, to employ staff and labour from sources within Pakistan.

The following Sub-Clauses 19.3 and 19.4 are added:

19.3 Safety Precautions

In order to provide for the safety, health and welfare of' persons, and for prevention of damage of any kind, all operations for the purposes of or in connection with the Contract shall be carried out in compliance with the Safety Requirements of the Government of Pakistan with such modifications thereto as the Engineer may authorise or direct and the Contractor shall take or cause to be taken such further measures and comply with such further requirements as the Engineer may determine to be reasonably necessary for such purpose.

The Contractor shall make, maintain and submit reports to the Engineer concerning safety, health and welfare of persons and damage to property, as the Engineer may from time to time prescribe.

19.4 Lighting Work at Night

In the event of work being carried out at night, the Contractor shall at his own cost, provide and maintain such good and sufficient light as will enable the work to proceed satisfactorily and without danger. The approaches to the Site and the Works where the night-work is being carried out shall be sufficiently lighted. All arrangement adopted for such lighting shall be to the satisfaction of the Engineer‟s Representative.

20.4 Employer's Risks

The Employer‟s risks are:

Delete the text and substitute with the following:

(a) insofar as they directly affect the execution of the Works in Pakistan:

(i) war and hostilities (whether war be declared or not), invasion, act of foreign enemies,
(ii) rebellion, revolution, insurrection, or military or usurped power, or civil war,
(iii) ionizing radiations, or contamination by radioactivity from any nuclear fuel, or from any nuclear waste from the combustion of nuclear fuel, radioactive toxic explosive or other hazardous properties of any explosive nuclear assembly or nuclear component thereof,
(iv) pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds,
(v) riot, commotion or disorder, unless solely restricted to the employees of the Contractor or of his Subcontractors and arising from the conduct of the Works;

(b) loss or damage due to the use or occupation by the Employer of any Section or part of the Permanent Works, except as may be provided for in the Contract;

(c) loss or damage to the extent that it is due to the design of the Works, other than any part of the design provided by the Contractor or for which the Contractor is responsible; and

(d) any operation of the forces of nature (insofar as it occurs on the Site) which an experienced contractor:

(i) could not have reasonably foreseen, or
(ii) could reasonably have foreseen, but against which he could not reasonably have taken at least one of the following measures:
(a) prevent loss or damage to physical property from occurring by taking appropriate measures, or
(b) insure against.

21.1 Insurance of Works and Contractor's Equipment

(Employer may vary this Sub-Clause 21.1 (b))

21.4 Exclusions

The text is deleted and substituted with the following:

There shall be no obligation for the insurances in Sub-Clause 21.1 to include loss or damage caused by the risks listed under Sub-Clause 20.4 paras (a) (i) to (iv).

The following Sub-Clause 25.5 is added:

25.5 Insurance Company

The Contractor shall be obliged to place all insurances relating to the Contract (including, but not limited to, the insurances referred to in Clauses 21, 23 and 24) with either National Insurance Company of Pakistan or any other insurance company operating in Pakistan and acceptable to the Employer.

Costs of such insurances shall be borne by the Contractor.

The following Sub-Clause 31.3 is added:

31.3 Co-operation with other Contractors

During the execution of the Works, the Contractor shall co-operate fully with other contractors working for the Employer at and in the vicinity of the Site and also shall provide adequate precautionary facilities not to make himself a nuisance to local residents and other contractors.

The following Sub-Clauses 34.2 to 34.12 are added:

34.2 Rates of Wages and Conditions of Labour

The Contractor shall pay rates of' wages and observe conditions of labour not less favourable than those established for the trade or industry where the work is carried out. In the absence of any rates of wages or conditions of labour so established, the Contractor shall pay rates of wages and observe conditions of labour which are not less favourable than the general level of wages and conditions observed by other employers whose general circumstances in the trade or in industry in which the Contractor is engaged are similar.

34.3 Employment of Persons in the Service of Others

The Contractor shall not recruit his staff and labour from amongst the persons in the services of the Employer or the Engineer; except with the prior written consent of the Employer or the Engineer, as the case may be.

34.4 Housing for Labour

Save insofar as the Contract otherwise provides, the Contractor shall provide and maintain such housing accommodation and amenities as he may consider necessary for all his supervisory staff and labour, employed for the purposes of or in connection with the Contract including all fencing, electricity supply, sanitation, cookhouses, fire prevention, water supply and other requirements in connection with such housing accommodation or amenities. On completion of the Contract, these facilities shall be handed over to the Employer or if the Employer so desires, the temporary camps or housing provided by the Contractor shall be removed and the Site reinstated to its original condition, all to the approval of the Engineer.

34.5 Health and Safety

Due precautions shall be taken by the Contractor, and at his own cost, to ensure the safety of his staff and labour at all times throughout the period of the Contract. The

Contractor shall further ensure that suitable arrangements are made for the prevention of epidemics and for all necessary welfare and hygiene requirements.

34.6 Epidemics

In the event of any outbreak of illness of an epidemic nature, the Contractor shall comply with and carry out such regulations, orders and requirements as may be made by the Government, or the local medical or sanitary authorities, for purpose of dealing with and overcoming the same.

34.7 Supply of Water

The Contractor shall, so far as is reasonably practicable, having regard to local conditions**,** provide on the Site, to the satisfaction of the Engineer or his representative, adequate supply of drinking and other water for the use of his staff and labour.

34.8 Alcoholic Liquor or Drugs

The Contractor shall not, otherwise than in accordance with the Statutes, Ordinances and Government Regulations or Orders for the time being in force, import, sell, give, barter or otherwise dispose of any alcoholic liquor or drugs, or permit or suffer any such importation, sale, gift, barter or disposal by his Subcontractors, agents, staff or labour.

34.9 Arms and Ammunition

The Contractor shall not give, or otherwise dispose of to any person or persons, any arms or ammunition of any kind or permit or suffer the same as aforesaid.

34.10 Festivals and Religious Customs

The Contractor shall in all dealings with his staff and labour have due regard to all recognised festivals, days of rest and religious and other customs.

34.11 Disorderly Conduct

The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst staff and labour and for the preservation of peace and protection of persons and property in the neighborhood of the Works against the same.

34.12 Compliance by Subcontractors

The Contractor shall be responsible for compliance by his Subcontractors of the provisions of this Clause.

The following Sub-Clauses 35.2 and 35.3 are added:

35.2 Records of Safety and Health

The Contractor shall maintain such records and make such reports concerning safety, health and welfare of persons and damage to property as the Engineer may from time to time prescribe.

35.3 Reporting of Accidents

The Contractor shall report to the Engineer details of any accident as soon as possible after its occurrence. In the case of any fatality or serious accident, the Contractor shall, in addition, notify the Engineer immediately by the quickest available means.

The following Sub-Clause 36.6 is added:

36.6 Use of Pakistani Materials and Services

The Contractor shall , so far as may be consistent with the Contract, make the maximum use of materials, supplies, plant and equipment indigenous to or produced or fabricated in Pakistan and services, available in Pakistan provided such materials, supplies, plant, equipment and services shall be of required standard.

41.1 Commencement of Works

The text is deleted and substituted with the following:

The Contractor shall commence the Works on Site within the period named in Appendix-A to Bid from the date of receipt by him from the Engineer of a written Notice to Commence. Thereafter, the Contractor shall proceed with the Works with due expedition and without delay.

The following Sub-Clause 47.3 is added:

47.3 Bonus for Early Completion of Works

The Contractor shall in case of earlier completion for either whole or part(s) of the Works pursuant to Sub-Clauses 48.1 and 48.2(a) respectively of the General Conditions of Contract, be paid bonus up-to a limit and at a rate equivalent to 50% of the relevant limit and rate of liquidated damages prescribed in Appendix-A to Bid "Special Stipulations".

48.2 Taking Over of Sections or Parts

For the purposes of para (a) of this Sub-Clause, separate Times for Completion shall be provided in the Appendix-A to Bid "Special Stipulations".

51.2 Instructions for Variations

At the end of the first sentence, after the word “Engineer", the words “in writing” are added.

52.1 Valuation of Variations

In the tenth line, after the words “Engineer shall” the following is added:
Within a period not exceeding one-eighth of the completion time subject to a minimum of 56 days from the date of disagreement whichever is later.

53.4 Failure to Comply

This Sub-Clause is deleted in its entirety.

54.3 Customs Clearance

(Employer may vary this Sub-Clause)

54.5 Conditions of Hire of Contractor’s Equipment

The following paragraph is added:

The Contractor shall, upon request by the Engineer at any time in relation to any item of hired Contractor‟s Equipment, forthwith notify the Engineer in writing the name and address of the Owner of the equipment and shall certify that the agreement for the hire thereof contains a provision in accordance with the requirements set forth above.

The following Sub-Clauses 59.4 & 59.5 are added:

59.4 Payments to Nominated Subcontractors

The Contractor shall pay to the nominated Subcontractor the amounts which the Engineer certifies to be due in accordance with the subcontract. These amounts plus other charges shall be included in the Contract Price in accordance with Clause 58 [Provisional Sums], except as stated in Sub-Clause 59.5 [Certification of Payments].

59.5 Certification of Payments & Nominated Subcontractors

Before issuing a Payment Certificate which includes an amount payable to a nominated Subcontractor, the Engineer may request the Contractor to supply reasonable evidence that the nominated Subcontractor has received all amounts due in accordance with previous Payment Certificates, less applicable deductions for retention or otherwise. Unless the Contractor:

a) submits reasonable evidence to the Engineer, or
b) i) satisfies the Engineer in writing that the Contractor is reasonably entitled to withhold or refuse to pay these amounts, and
ii) submits to the Engineer reasonable evidence that the nominated Subcontractor has been notified of the Contractor‟s entitlement,

then the Employer may (at his sole discretion) pay direct to the nominated Subcontractor, part or all of such amounts previously certified (less applicable deductions) as are due to the nominated Subcontractor and for which the Contractor has failed to submit the evidence described in sub-paragraphs (a) or (b) above. The Contractor shall then repay, to the Employer, the amount which the nominated Subcontractor was directly paid by the Employer.

60.1 Monthly Statements

In the first line after the word "shall", the following is added:

"on the basis of the joint measurement of work done under Clause 56.1,"

In Para (c) the words "the Appendix to Tender" are deleted and substituted with the words "Sub-Cause 60.11 (a)(6) hereof".

(in case Clause 60.11 is applicable)

60.2 Monthly Payments

In the first line, "28" is substituted by "14".

60.10 Time for Payment

The text is deleted and substituted with the following:

The amount due to the Contractor under any Interim Payment Certificate issued by the Engineer pursuant to this Clause, or to any other terms of the Contract, shall , subject to Clause 47, be paid by the Employer to the Contractor within 30 days after such Interim Payment Certificate has been jointly verified by Employer and Contractor, or, in the case of the Final Certificate referred to in Sub Clause 60.8, within 60 days after such Final Payment Certificate has been jointly verified by Employer and Contractor; Provided that the Interim Payment shall be caused in 42 days and Final Payment in 60 days in case of foreign funded project. In the event of the failure of the Employer to make payment within the times stated, the Employer shall pay to the Contractor compensation at the 28 days rate of KIBOR+2% per annum for local currency and LIBOR+1% for foreign currency, upon all sums unpaid from the date by which the same should have been paid. The provisions of this Sub-Clause are without prejudice to the Contractor"s entitlement under Clause 69.

The following Sub-Clause 60.11is added:

60.11 Secured Advance on Materials

a) The Contractor shall be entitled to receive from the Employer Secured Advance against an indemnity bond acceptable to the Employer of such sum

as the Engineer may consider proper in respect of non-perishable materials brought at the Site but not yet incorporated in the Permanent Works provided that:

(1) The materials are in accordance with the Specifications for the Permanent Works;

(2) Such materials have been delivered to the Site and are properly stored and protected against loss or damage or deterioration to the satisfaction of the Engineer but at the risk and cost of the Contractor;

(3) The Contractor‟s records of the requirements, orders, receipts and use of materials are kept in a form approved by the Engineer, and such records shall be available for inspection by the Engineer;

(4) The Contractor shall submit with his monthly statement the estimated value of the materials on Site together with such documents as may be required by the Engineer for the purpose of valuation of materials and providing evidence of ownership and payment therefor;

(5) Ownership of such materials shall be deemed to vest in the Employer and these materials shall not be removed from the Site or otherwise disposed of without written permission of the Employer; and

(6) The sum payable for such materials on Site shall not exceed 75 % of the (i) landed cost of imported materials, or (ii) ex-factory / ex-warehouse price of locally manufactured or produced materials, or (iii) market price of other materials.

(b) The recovery of Secured Advance paid to the Contractor under the above provisions shall be effected from the monthly payments on actual consumption basis.

60.12 Financial Assistance to Contractor

Financial assistance shall be made available to the Contractor by the Employer by adopting any one of the following three Alternatives**:**

(Appropriate alternative only to be retained)

Alternative One: Mobilization Advance

(a) An interest-free Mobilization Advance up to 10-15 % of the Contract Price stated in the Letter of Acceptance shall be paid by the Employer to the Contractor in two equal parts upon submission by the Contractor of a Mobilization Advance Guarantee/Bond for the full amount of the Advance in the specified form froma Scheduled Bank in Pakistan or an insurance company acceptable to the Employer:

(1) First part within 14 days after signing of the Contract Agreement or date of receipt of Engineer‟s Notice to Commence, whichever is earlier; and

(2) Second part within 42 days from the date of payment of the first part, subject to the satisfaction of the Engineer as to the state of mobilization of the Contractor.

(b) This Advance shall be recovered in equal installments; first installment at the expiry of third month after the date of payment of first part of Advance and the last installment two months before the date of completion of the Works as per Clause 43 hereof.

Alternative Two: Mobilization/ Demobilization Cost

Mobilization Cost shall be paid to the Contractor as a part of the priced Bill of Quantities. This cost shall not exceed 10 % of the Tender Price and shall be paid to the Contractor as follows:

(i) 80 % of the Mobilization Cost shall be paid for mobilization at Site. This payment shall be in three stages as follows:

Stage I: 20 % of Mobilization Cost upon obtaining and furnishing of Performance Security and insurance policies and construction of camp and housing facilities as required under the Contract;

Stage II: 30 % of Mobilization Cost upon providing & installing preliminary requirements of Contractor‟s Equipment, materials and temporary structures for the commencement of Works to the satisfaction of the Engineer and achieving 3 % value of the Works (excluding payment under Stage-I);

Stage III: 30 % of Mobilization Cost upon providing balance Contractor"s Equipment to complete full requirement for the entire work and after achievement of progress to the extent of 6 % value of the Works (excluding payments under Stages I and II); and

(ii) 20 % of Mobilization Cost shall be paid for operation and maintenance of the constructed facilities and for demobilization as per schedule of payment to be submitted by the Contractor in accordance with Clause 57.2 and approved by the Engineer.

Alternative Three: Materials Supplied by Employer

The Employer shall supply to the Contractor materials, like cement, steel, bitumen or any other material whichever deemed necessary to complete the project; and the cost thereof shall be recovered from the Contractor through monthly statements on the basis of actual consumption.

The list of materials, quantities and rates to be charged to the Contractor shall be provided alongwith Appendix-A to Bid "Special Stipulations".

(Employer may opt either "Secured Advance on Materials" or "Financial Assistance to Contractor")

63.1 Default of Contractor

The following para is added at the end of the Sub-Clause:

Provided further that in addition to the action taken by the Employer against the Contractor under this Clause, the Employer may also refer the case of default of the Contractor to Pakistan Engineering Council for punitive action under the Construction and Operation of Engineering Works Bye-Laws 1987, as amended from time to time.

65.2 Special Risks

The text is deleted and substituted with the following:

The Special Risks are the risks defined under Sub-Clause 20.4 sub paragraphs (a) (i) to (a) (v).

67. 3 Arbitration

In the sixth to eight lines, the words "shall be finally settled ..... appointed under such Rules" are deleted and substituted with the following:

shall be finally settled under the provisions of the Arbitration Act, 1940 as amended or any statutory modification or re-enactment thereof for the time being in force.

The following paragraph is added:

The place of arbitration shall be..... , Pakistan.

68.1 Notice to Contractor

The following paragraph is added:

For the purposes of this Sub-Clause, the Contractor shall, immediately after receipt of Letter of Acceptance, intimate in writing to the Employer and the Engineer by registered post, the address of his principal place of business or any change in such address during the period of the Contract.

68.2 Notice to Employer and Engineer

For the purposes of this Sub-Clause, the respective addresses are:

a) The Employer :

…….....
(to be filled in by the Employer as appropriate)

b) The Engineer:

…….....
(to be filled in by the Employer as appropriate)

70.1 Increase or Decrease of Cost

Sub-Clause 70.1 is deleted in its entirety, and substituted with the following:

The amounts payable to the Contractor, pursuant to Sub-Clause 60.1, shall be adjusted in respect of the rise or fall in the cost of labor, materials, and other inputs to the Works, by applying to such amount the formula prescribed in this Sub-Clause.

(a) Other Changes in Cost

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

(b) Adjustment Formula

The adjustment to the monthly statements in respect of changes in cost shall be determined from the following formula:-

$$Pn = A + b\frac{Ln}{Lo} + c\frac{Mn}{Mo} + d\frac{En}{Eo} + \ldots\ldots\ldots\ldots\ldots$$

Where:

Pn is a price adjustment factor to be applied to the amount for the payment of the work carried out in the subject month, determined in accordance with Paragraph 60.1 (a), and with Paragraphs 60.1 (b) and (e), where any variations and daywork are not otherwise subject to adjustment;

A is a constant, specified in Appendix-C to Bid, representing the nonadjustable portion in contractual payments;

b, c, d, etc., are weightages or coefficients representing the estimated proportion of each cost element (labour, cement and reinforcing steel etc.) in the Works or Sections thereof, net of Provisional Sums and Prime Cost; the sum of A, b, c, d, etc., shall be one;

Ln, Mn, En, etc., are the current cost indices or reference prices of the cost elements for month "n", determined pursuant to Sub-Clause 70.1(d), applicable to each cost element; and

Lo, Mo, Eo, etc., are the base cost indices or reference prices corresponding to the above cost elements at the date specified in Sub-Clause 70.1(d).

(c) Sources of Indices and Weightages

The sources of indices shall be those listed in Appendix-C to Bid, as approved by the Engineer. As the proposed basis for price adjustment, the Contractor shall have submitted with his bid the tabulation of Weightages and Source of Indices if different than those given in Appendix-C to Bid, which shall be subject to approval by the Engineer.

(d) Base, Current, and Provisional Indices

The base cost indices or prices shall be those prevailing on the day 28 days prior to the latest date for submission of bids. Current indices or prices shall be those prevailing on the day 28 days prior to the last day of the period to which a particular monthly statement is related. If at any time the current indices are not available, Provisional indices as determined by the Engineer will be used, subject to subsequent correction of the amounts paid to the Contractor when the current indices become available.

(e) Adjustment after Completion

If the Contractor fails to complete the Works within the Time for Completion prescribed under Clause 43, adjustment of prices thereafter until the date of

completion of the Works shall be made using either the indices or prices relating to the prescribed time for completion, or the current indices or prices, whichever is more favorable to the Employer, provided that if an extension of time is granted pursuant to Clause 44, the above provision shall apply only to adjustments made after the expiry of such extension of time.

(f) Weightages

The weightages for each of the factors of cost given in Appendix-C to Bid shall be adjusted if, in the opinion of the Engineer, they have been rendered unreasonable, unbalanced, or inapplicable as a result of varied or additional work executed or instructed under Clause 51. Such adjustment(s) shall have to be agreed in the variation order.

The following Sub-Clauses 73.1, 73.2, 74.1, 75.1, 76.1, 77.1and 78.1 are added:

73.1 Payment of Income Tax

The Contractor, Subcontractors and their employees shall be responsible for payment of all their income tax, super tax and other taxes on income arising out of the Contract

and the rates and prices stated in the Contract shall be deemed to cover all such taxes.

73.2 Customs Duty & Taxes

(Employer may incorporate provisions where applicable)

74.1 Integrity Pact

If the Contractor or any of his Subcontractors, agents or servants is found to have violated or involved in violation of the Integrity Pact signed by the Contractor as Appendix-L to his Bid, then the Employer shall be entitled to:

(a) recover from the Contractor an amount equivalent to ten times the sum of any commission, gratification, bribe, finder‟s fee or kickback given by the Contractor or any of his Subcontractors, agents or servants;

(b) terminate the Contract; and

(c) recover from the Contractor any loss or damage to the Employer as a result of such termination or of any other corrupt business practices of the Contractor or any of his Subcontractors, agents or servants.

The termination under Sub-Para (b) of this Sub-Clause shall proceed in the manner prescribed under Sub-Clauses 63.1 to 63.4 and the payment under Sub-Clause 63.3 shall be made after having deducted the amounts due to the Employer under Sub-Para (a) and (c) of this Sub-Clause.

75.1 Termination of Contract for Employer's Convenience

The Employer shall be entitled to terminate the Contract at any time for the Employer's convenience after giving 56 days prior notice to the Contractor, with a copy to the Engineer. In the event of such termination, the Contractor :

(a) shall proceed as provided in Sub-Clause 65.7 hereof; and

(b) shall be paid by the Employer as provided in Sub-Clause 65.8 hereof.

76.1 Liability of Contractor

The Contractor or his Subcontractors or assigns shall follow strictly, all relevant labour laws including the Workmen's Compensation Act and the Employer shall be fully indemnified for all claims, damages etc. arising out of any dispute between the Contractor, his Subcontractors or assigns and the labour employed by them.

77.1 Joint and Several Liability

If the Contractor is a joint venture of two or more persons, all such persons shall be jointly and severally bound to the Employer for the fulfilment of the terms of the Contract and shall designate one of such persons to act as leader with authority to bind the joint venture. The composition or the constitution of the joint venture shall not be altered without the prior consent of the Employer.

78.1 Details to be Confidential

The Contractor shall treat the details of the Contract as private and confidential, save in so far as may be necessary for the purposes thereof, and shall not publish or disclose the same or any particulars thereof in any trade or technical paper or elsewhere without the prior consent in writing of the Employer or the Engineer. If any dispute arises as to the necessity of any publication or disclosure for the purpose of the Contract, the same shall be referred to the decision of the Engineer whose award shall be final.

PART II –PARTICULAR CONDITIONS OF CONTRACT

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY KARACHI

Establishment of Thar Institute of Engineering, Sciences and Technology-TIEST, Islamkot (Constituent College of NED University)

BIDDING DOCUMENTS

VOLUME-II (TECHNICAL SPECIFICATIONS)

CONSTRUCTION OF EXTERNAL WATER SUPPLY & EXTERNAL SEWERAGE WORK OF (CIVIL DEPARTMENT, MECHANICAL DEPARTMENT, MAIN GATE & PROJECT OFFICE) AT THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY

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TABLE OF CONTENTS

GENERAL PROTECT SPECIFICATIONS

SECTION - 0

GENERAL REQUIREMENTS

0.01 GENERAL DESCRIPTION

0.1.01 Location of Site

The site of the project is located in Mithi, Tharparkar.

0.1.02 Work Under This Contract

The work under this Contract comprises the Construction, Completion, Handing over and Maintenance of Structure, Architectural, Finishes, Building Services relating to Electrical, Water Supply and Sewerage, site work and /or any other discipline necessary to be executed together with or incorporated in the structure works including but not limited to pipe sleeves, embedded parts, conduits, earthing pits, tube wells etc. as specified by the Contract/ necessitated by the project requirements/ instructed by the Engineer.

The Contractor shall be required to plan and execute the works in a manner such that the project is completed within the time specified in the Contract and in conformity with the provisions contained in the documents of Contract. The Contractor shall furnish a detailed construction Programe along with a list of plant and equipment with capacities and capabilities for the approval of the Engineer. The Contractor shall also be required to submit a site supervisory/ management chart.

0.1.03 Execution of Work

All Work shall be executed in accordance with the requirements and in a manner set forth in the documents of Contract and in accordance with the instructions of the Engineer or Engineer's Representative. The Contractor shall confine his operations to the areas that are actually designated, for the Works, by the Employer. The Contractor shall be required to supply and maintain his own storage facilities, site office, sanitary facilities, and all temporary connections for electricity, water, sewerage and telephone etc. at his cost, subject to the approval of the Engineer.

0.02 APPLICABLE STANDARDS

Unless specified otherwise in the Contract Documents, all the Work and materials shall conform to the requirements of American Society for Testing Materials (ASTM) Specifications, American Concrete Institute (ACI) and British Standard Specifications (BSS) and as per the Drawings and Specifications.

0.03 TEST LABORATORY AND TESTING

0.03.1 Testing unless specified otherwise in the Contract, shall be performed by an approved testing agency as proposed by the Contractor and at no extra cost to the Employer. The Engineer may require all testing to be carried out under his supervision.

0.03.2 The quality control testing shall be arranged and performed by the Contractor's competent personnel in accordance with a Site Testing and Quality Control Programe/Facility to be established by the Contractor, and approved by the Engineer. The Contractor shall keep complete record of all the quality tests performed including the date and time of testing and submit the same to the Engineer. All quality control and related tests shall be carried out in accordance with applicable standards and codes under the supervision of the Engineer. The Contractor shall establish a laboratory on site which shall have equipment for testing Compressive Strength of concrete, Sieve Analysis and Compaction Test, as per the instructions and to the satisfaction of the Engineer.

0.04 STORAGE AND HANDLING FACILITY

The Employer shall assign the Contractor storage space for the storage of plant, equipment and materials for Contract Works. However the Contractor shall ensure that, on no account shall such temporary

installation conflict/interfere with any of the permanent installations, services and any operational function of the Employer. The handling and storage of all plants, equipment and materials at Site shall be the responsibility of the Contractor and at no risk or cost to the Employer.

The Contractor shall protect all materials against corrosion, damage of any kind or deterioration during storage and also during erection on Site. The protection methods shall be to the approval of the Engineer.

0.05 TEMPORARY FACILITIES

The Contractor shall provide, erect/install, maintain, alter as and when necessary and remove on completion except as otherwise directed by the Engineer all temporary facilities and services as described hereinafter and/or in the Contract documents and/or as instructed and approved by the Engineer, all at his own cost and expenses.

0.05.1 Contractor's Site Office

The Contractor's temporary site office and stores etc. including all buildings, utilities and facilities shall be available for use not later than 15 days after the date of the Site handing over.

0.05.2 Temporary Fencing & Lightning

The Contractor shall provide and maintain at his own cost all temporary lights, guards, fencing and watching to the approval of the Engineer for the safety and protection of the Works.

0.05.3 Site Sign Boards

Before manufacturing and installing sign boards at site, the Contractor shall present a design and obtain the approval of the Engineer.

0.05.4 Temporary Services

a. Water & Electricity

The Contractor shall make his own arrangement at his cost for water for construction, drinking and other purposes and shall also provide temporary power for the operation of construction equipment and lighting. The Contractor shall be responsible for the supply, maintenance, repair and operation of these services at his own costs throughout the construction period. The Contractor shall also provide adequate sanitary facilities for the use of his staff and Workmen and remove these services upon completion of Works at his own cost.

b. First Aid

The Contractor shall provide and maintain First Aid Facilities on the Site. First Aid kits of the type, model and number, equipped properly according to the requirements of the local health authorities and as approved by the Engineer must be furnished by the Contractor at Site.

c. Fire Fighting

The Contractor shall provide and maintain adequate firefighting facilities on the Site at his own cost to the approval of the local Fire Authority and Civil Authority and the Engineer. Firefighting equipment like fire buckets, fire extinguishers or other effective means ready for instant use shall be installed at suitable places at the project.

0.06 FACILITIES FOR THE ENGINEER

0.06.1 Supervisory Staff Site Office

a. The Contractor shall provide and maintain suitably furnished Supervisory Staff Site Office for the Engineer and his staff as per the details approved by the Engineer. The site office shall be air-conditioned and provided with ceiling fans, utilities, security, kitchen and toilet facilities. The floor area and design of the site office shall be as approved by the

Engineer. This duly furnished office shall be ready for possession of the Engineer within 15 days of Receipt of Engineer's notice to commence the work.

b. It shall be provided with Office attendants, Computers, printers, photocopy machines, phones, necessary office stationary etc. as listed in the tender documents

c. The Kitchen shall be equipped with all necessary Kitchen equipment, microwave oven and fridge.

d. Telephone and fax facilities as at (b) above shall be provided by the Contractor and all the installation and running costs shall be deemed to be included in the rates of the Contractor.

e. The Contractor shall provide and would be responsible for the daily cleaning, as well as the running and maintenance of the site office including, electricity supply, water, sewerage disposal etc.

f. The Site Office shall be removed from the site when the project is complete, leaving the site neat and clean and/or all as required by the Engineer. The cost on this account shall be deemed to be included in the unit rates of the Contractor.

0.06.2 **Supervisory Staff Transport**

The Contractor shall provide new air conditioned vehicles as listed in the tender document along with drivers for the use of the Engineer and his staff till the completion of the project. The Contractor shall be responsible for all the running and maintenance costs of the said vehicles. No separate payment shall be allowed on this account and all such costs shall be deemed included in the unit rates of the Contractor. All maintenance and repair works during the currency of the project shall be carried out promptly by the Contractor failing which all such works shall be got done by the Engineer at the cost of the Contractor.

0.07 PROJECT RECORD DOCUMENTS

The Contractor will submit shop drawings showing work sequence, work methodology, including location of construction joints, pouring sequences for the approval of Engineer prior to start of work on each stage of the project or at any time if requested by the Engineer.

The Contractor will maintain complete, accurate log of all construction work as it progresses through recording progress on the approved work-plan, progress reports and construction photographs stage wise.

The Contractor will submit weekly and monthly progress reports to the engineer, on approved format with photographs

On completion of foundation, retaining walls and other major construction milestones, prepare certified As-built drawing showing work done, dimensions, locations, angles and elevations of construction and site work.

0.08 MEASUREMENTS AND PAYMENT

No separate payment shall be made for the services and performance provided under this section of Specifications.

The Contractor is deemed to have covered the costs of all related supplies and performance in the unit prices of other contract items.

**** END OF SECTION****

SECTION - 1

CLEARING, GRUBBING & SETTING OUT OF WORKS

1.01 SCOPE OF WORK

The Work covered by this section of Specifications consists of furnishing all labour, materials, necessary equipment, services, miscellaneous and necessary items, required to satisfactorily complete the clearing, grubbing and setting out of the Works, as indicated on Drawings, specified herein and subject to the terms and conditions of the Contract.

1.02 CLEARING

Clearing shall consist of cutting up or trimming of trees, if any, and the satisfactory disposal of trees and other vegetation designated for removal, together with the down timber, snags, bushes, and rubbish occurring within the areas to be cleared. Trees, other vegetation, stumps, roots, and bushes in areas to be clear shall be cut-off below the original ground to extract the roots except such individual trees, groups of trees and vegetation as may be indicated on the Drawings or designated by the Engineer to be left standing. Individual trees, groups of trees, and other vegetation, to be standing, shall be thoroughly protected from damage incident to construction operations by the erection of barriers or by such other means as the circumstances required, and as approved by the Engineer. Clearing operations shall be conducted so as not to cause any damage or harm to existing structures and installations and to those under construction, and so as to provide for the safety of employees and others.

1.03 GRUBBING

Grubbing shall consist of the removal and disposal of all occurring stumps, roots larger than 38 mm in diameter, matted roots in the designated grubbing areas, stumps, roots, logs or other timber more than 38 mm in diameter, matted roots and other debris shall be excavated and removed to a depth not less than 450 mm below any subgrade, shoulder or slope. In areas where the cut is over 1.0m, grubbing shall not be necessary. In areas to be paved, or in areas indicated on the Drawings or designated by the Engineer as future paved areas where excess excavation from grading operations is placed, grubbing will be necessary.

1.04 DISPOSAL

Unless directed otherwise, timber and other refuse shall be disposed of by burning at locations approved by the Engineer in a manner that will avoid all hazards such as damage to existing structures, construction in progress, trees and vegetation's. The Contractor shall be responsible for compliance with all pertinent laws and regulations pertaining to the burning of fires and observance of any security regulations applicable thereto.

Disposal by burning shall be kept under constant attendance until the fires have burned out or have been extinguished. No materials will be permitted to be pushed or placed on adjacent property without prior written approval of the owner of such property.

1.05 SETTING OUT OF WORKS

The Contractor shall set out the Works and shall be responsible for true and perfect levels and setting out of the same and for correctness of the direction, positions, levels, dimensions and alignments of all parts thereof. If any error in this respect shall appear during the progress of the Work, the Contractor shall at his own expense rectify such error to the satisfaction of the Engineer. Any checking by the Engineer shall not relieve the Contractor from his complete unshared responsibility for correct setting out of Works. The Contractor shall construct and maintain accurate bench marks so that the lines and levels can be easily checked by the Engineer.

1.06 DRAINAGE DITCHES/ DEWATERING

The Contractor shall construct and maintain such ditches/drains in addition to those shown on Drawings or as may be ordered by the Engineer to adequately drain the areas under construction of the water from any source including subsoil water in foundations. If due to any negligence the area is flooded the same shall be drained with adequate measures by the Contractor at his own cost.

1.07 MEASUREMENT AND PAYMENT

The quantities for grubbing, clearing, disposal and protection works shall be taken into account on lump sum basis and payment shall be made accordingly at the rate entered in the Bill of Quantities.

No separate payment shall be made for setting out of Works. The Contractor shall be deemed to cover the costs for this item of work in the unit price of other Contract items.
Disposal of surplus material beyond initial 1000m lead

**** END OF SECTION****

SECTION - 2

EXCAVATION AND BACKFILLING

2.01 SCOPE OF WORK

The Work covered by this section of the Specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with excavation, de-watering, filling, back-filling, stock piling of suitable excavated material and disposal of all surplus and unsuitable material for construction works and foundations for structure & services line trenches, complete, in strict accordance with this section of the Specifications and the applicable Drawings and subject to the terms and conditions of the Contract and as per existing laws imposed by the local authorities.

2.02 SUB-SOIL CONDITIONS

2.02.1 The Contractor shall acquaint himself with the nature of the ground, existing structures, foundations and subsoil conditions, which might be encountered during excavation or earthworks on the Site and his bid shall be fully covering the works involved. The Employer does not guarantee or warrant in any way that the materials to be found in the excavation will be similar in nature to that of any samples which may have been exhibited or indicated in the Geotechnical Report, Drawings or in any other Contract Documents or to material obtained from boring or trial holes.

2.02.2 The Contractor shall make his own deductions for sub-surface conditions which may affect methods or cost of constructions of the work hereunder and he shall make no claim whatsoever for damages or compensation, should he find conditions during the progress of the Work, different from those as calculated and/or anticipated by him.

2.02.3 The Contractor shall be deemed to have made local and independent inquiries as to and shall take the whole risk of the nature of the ground, subsoil or material to be excavated or penetrated and the Contractor shall not be entitled to receive any extra or additional payment nor to be relieved from any of his obligations by reasons of the nature of such ground, subsoil or material.

2.03 EXCAVATION

2.03.1 The Contractor shall perform a joint survey with the Engineer's Representative, of the area where earthwork is required, plot the ground levels on the drawings and obtain approval from the Engineer before starting the earthwork.

2.03.2 Excavation shall include the removal of all material of every name and nature. If rock or concrete is encountered, it should be removed carefully and without excessive noise and vibration. Use of explosives shall not be permitted and no extra rates or any payment in such a case shall be made to the Contractor.

2.03.3 The Contractor shall give reasonable notice to commence any excavation and he shall submit to the Engineer full details of his proposals. If the Engineer may require modifications to be made in the Contractor’s proposals, the Contractor shall give effect to such modifications but shall not be relieved of his responsibility with respect to such work.

2.03.4 For major excavations, the Contractor shall submit for the prior approval of the Engineer full details and Drawings showing the proposed method and procedure for supporting and strutting, dewatering and maintenance of adjacent structures. The design, provision, installation, erection, maintenance and removal of such temporary works shall be the responsibility of the Contractor and all costs in these respects shall be deemed to be included in the rates quoted by the Contractor.

2.03.5 The Contractor’s attention is drawn particularly to his obligations under the General Conditions of Contract in respect of those works which are in close proximity to existing buildings/structures.

2.03.6 The Contractor, if he deems necessary, for large excavations in soil including soft rock, can use excavators, caterpillars, backhoes and/or other excavating machinery as approved by the Engineer, to facilitate efficient operations on site.

2.03.7 The excavation shall conform to the dimensions and elevations as indicated on the Drawings or as directed by the Engineer. Foundations on made up ground shall have to be taken down to natural bottom soil as per Drawings, direction and approval of the Engineer.

2.03.8 Excavation shall extend to a sufficient distance from wall and footings to allow for placing and removal of forms, installation of services and for inspection but the same shall not be paid separately and is deemed to be included in the unit rates of the Contractor.

2.03.9 In the event of any excavations being carried out deeper than required/specified levels, the same shall be filled in by the Contractor at his own cost to the required levels with lean concrete 1:3:6 under the footings and foundation slabs as per the instructions of the Engineer.

2.03.10 In the event of any excavations being carried out wider than the required/specified dimensions, the same shall be filled in by the Contractor at his own cost to the required levels with properly compacted well graded sand free from any deleterious substance as per directions of the Engineer.

2.03.11 No excavation shall be back-filled nor any Permanent Work commenced until the foundation has been inspected by the Engineer and his permission to proceed given.

2.03.12 In case, any excavation is carried out and the pits and trenches, are filled with accumulated sand or debris from blowing windstorm, dust-storms, moving sand dunes or by any other reasons thereof after the levels were checked by Engineer, then the excavation or levelling shall have to be carried out again in the same manner as before unless and until concreting is done in the foundation/trenches. No separate payment shall be made on any such accounts.

2.03.13 The Contractor shall construct and maintain such ditches, in addition to those shown on the plans, as will adequately drain areas under construction.

2.04 SHORING AND BRACING

The Contractor shall provide at his own cost, where required, all shoring, bracing, walls, supports etc. to the sides of the excavation to prevent sliding or any movement. Where necessary, excavated sides shall be sloped as directed by the Engineer with no extra cost to the Employer.

Shoring including sheet piling, where required during excavation, shall be installed to protect workmen and the banks, adjacent, structures, paving and utilities. The term shoring shall also be deemed to cover whatever methods the Contractor selects to adopt with prior approval of the Engineer, for upholding the sides of excavation against the side of public roadways and adjoining properties in existing hardcore or any other material. The Contractor will be held responsible for upholding the sides of all excavations and no claim for additional excavation, concrete or other material will be considered in this respect and shall be deemed to be included in his rates.

2.05 DEWATERING AND DRAINAGE

If water is met with in the excavations due to springs, seepage, rain or any other causes, it shall be removed by suitable diversions, pumping or bailing out and the excavation kept dry at all times. Care shall be taken to discharge the drained water into suitable outlets as not to cause damage to the works, crops or any other property. Due to any negligence on the part of the contractor, if any such damage is caused, it shall be the sole responsibility of the contractor to repair/restore to the original condition at his own cost or compensate for the damage.

The Contractor shall control at his own cost all the grading in the vicinity of the Site of Work in order to prevent any water from running into the excavated areas.

The Contractor shall, at his own cost, keep bone dry all pits and trenches during construction and all dewatering and pumping out whether due to ground water seepage or otherwise shall be included in the

rates as quoted by the Contractor. The method employed in all cases shall be approved and agreed by the Engineer.

2.06 PROTECTION OF UTILITY LINES

When any existing utility lines whether to be retained or to be removed are encountered within the area of operations, the Contractor shall notify the Employer/Engineer, and shall not proceed until necessary measures are taken for protection or removal of the lines and instructions are obtained from the Engineer/Employer. This will be done at no extra cost to the Employer.

2.07 FILL AND BACKFILL

2.07.1 After completion of foundations, footings, walls, slabs and other construction below the elevation of the final grades and prior to backfilling, forms shall be removed and excavation shall be cleaned of trash and debris. No backfilling shall be done until the entire foundations and footings etc. have been cured, inspected, approved and measured by the Engineer. Backfill shall be placed in horizontal layers not more than 6" thick and shall have a proper moisture content for the required degree of compaction of 95%. Each layer shall be compacted by mechanical tampers or by other suitable equipment approved by the Engineer. Backfill shall be brought to a suitable elevation above grade to provide for anticipated settlement and shrinkage thereof.

2.07.2 Where concrete slabs, floors and pavements are to be placed on the ground, any loam, organic and other unsuitable materials shall be removed.

2.07.3 Filling shall consist of approved selected material from excavation or approved granular material, free from lumps, debris, rubbish, wood, organic or other unsuitable matter and capable of compaction by approved means.

Fill, where required to raise the sub-grade for concrete slabs, shall be clean unadulterated earth, free from deleterious and organic substances and shall also be free from wood, stones and other debris. In case, sand shall be provided for filling, the same shall be clean and free from harmful substances.

2.07.4 All materials, when used in fill shall be compacted to 95% modified AASHTO density by power roller, mechanical rammer, or other approved equipment, in layers not more than 6" thick. In sand filling, each layer shall be uniformly spread, saturated with water or dried and then compacted. The Contractor shall arrange at his own cost the testing of the filling.

2.07.5 Backfill shall not be placed against foundation walls etc. before 14 days and not prior to the damp proofing /water proofing treatment as specified elsewhere in these documents. Backfills shall be brought up evenly on each side of structures as far as practicable. Heavy equipment for spreading and compacting backfill shall not be operated closer to the structures less than the distance equal to the height of the backfill above the top of footing.

2.07.6 The filling material shall be subject to the approval of the Engineer and shall conform to AASHTO Soil Classification System.

2.07.7 Filling around pipes and cables shall be carried out carefully by placing fine material to cover the pipe or cable completely before the normal filling is placed.

2.08 COMPACTION

Fill and/or backfill within the building or wherever required within the premises shall be compacted to a density of not less than 95% of the maximum density at optimum moisture content.

2.09 ROUGH GRADING

2.09.1 Necessary rough grading shall be carried out by the Contractor to establish the finish grade or construction requirements of the Site, grades not otherwise indicated shall be uniform levels or slopes between points on existing and finished grades. Abrupt changes in slopes shall be

rounded. Additional fill required to complete rough grading shall be provided as directed by the Engineer.

2.09.2 Where paving or slabs are specified, all rough grading shall be done to the sub-grade of the base course, removing all large stones and debris and shall be compacted uniformly to the correct lines and levels ready to receive the paving or slab. Refilling, where required shall be executed with suitable selected materials in layers not exceeding 6" in thickness and thoroughly compacted to the required density.

2.10 BOTTOM ELEVATIONS OF FOOTINGS/FOUNDATIONS

The elevations as noted in the Drawings are only approximate and must be adjusted in the field with the approval of the Engineer depending on the soil conditions encountered. No concreting shall begin until the design soil bearing capacity is substantiated by visual inspection by the Engineer. Where suitable foundation material is found lower than the underside of footings as detailed, the space between the founding material and footing soffit shall be backfilled with well compacted gravel/soling. Where soling is provided below the foundations, it shall be well compacted and the interspaces shall be properly filled with lean concrete.

The Contractor in planning his work shall make arrangements and provision to construct the lowest level footing first.

2.11 DISPOSAL OF SURPLUS EARTH AND RUBBISH

All surplus earth, unsuitable material and rubbish shall be disposed of the Site as directed by the Engineer. The term disposal shall include all operations of loading, unloading, stacking, spreading, re-handling, filling depressions, leveling and grading as per instructions of the Engineer. The maximum limit for disposal of surplus material shall be 18 miles.

2.12 SAND FILLING IN TRENCHES AND/OR UNDER FLOORS

Sand filling shall be done in layers not more than 4" (100 mm) thick and shall be rammed after saturation to such an extent that 4" (100 mm) layer is reduced to about 2.7" (68 mm) after compaction.

The required in situ density w.r.t. maximum density to optimum moisture content shall be in compliance with test 12 of B.S 1377-1967.

The base shall be perfectly level. A slope of 1:64 shall be provided in verandahs and bath rooms is required.

Sand shall conform in all respect to the specifications for fine aggregate except for its grading, i.e. shall pass through a Sieve No. 16 and not more than 30% shall pass through a Sieve No. 100.

2.13 GRAVEL LAYER UNDER FOOTINGS

A gravel layer, as shown in drawings, will be provided below footings/ rafts as a drainage layer. It shall conform to conditions set out in Section 29 of this specification.

2.14 HARD ROCK EXCAVATION

Rock excavation shall include removal and disposal of the following: (1) all boulders measuring 1/3 of a cubic yard or more in volume; (2) all rock material in ledges, bedding deposits, and un-stratified masses which cannot be removed without systematic drilling and blasting; (3) concrete or masonry structures which have been abandoned; and (4) conglomerate deposits which are so firmly cemented that they possess the characteristics of solid rock and which cannot be removed without systematic drilling and blasting. Except where trees are indicated to be removed, trees shall be protected from injury during construction operations. No tree roots over 2 inches in diameter shall be cut without express permission of the ENGINEER. Trees shall be supported during excavation by any means previously reviewed by the ENGINEER.

It is expected that nearly all excavation can be accomplished using conventional equipment.

a. For general excavation, a D-9N Caterpillar tractor with a single shank ripper, or equivalent equipment, is considered conventional equipment, if it can rip at a production rate of at least 300 bank cubic yards per hour.

b. For trench excavation, a 235C Caterpillar excavator with a medium stick and a rock ripping bucket, or equivalent equipment, is considered conventional equipment, if it can excavate at a production rate of at least 30 bank cubic yards per hour.

If material is encountered which the Contractor believes cannot be excavated by conventional equipment, the Engineer shall be immediately notified.

The Contractor shall provide performance tests of the specified conventional or equivalent equipment. If the Engineer confirms in writing that the specified conventional equipment cannot perform at the production rates specified, the excavation shall be considered rock excavation.

In areas to be later rip-rapped, large rock found during excavation of the stream channel may, upon approval of the Engineer, be left in place, excavated around and incorporated into the final riprap.

Should the Contractor encounter bedrock or excessive large boulders within the project site, which will require extensive excavation to achieve final grade, the Contractor shall immediately notify the Engineer. The Engineer shall review the hydraulic requirements of the stream in the affected area in a timely manner and advise the Contractor on acceptable alternate excavation.

The Contractor shall adopt a method of working such that at any time, control perimeter blasting operations including the drilling of perimeter holes do not advance by more than one panel ahead of bulk blasting operations and more than two panels ahead of mucking operations to remove all blasted materials to the perimeter face, unless specially approved by the Engineer, in order that adjustments to drilling, charging and detonation can be made, appropriate to the conditions being encountered.

Rock on the cut face that is loose, hanging, or creates a potentially dangerous situation during or upon completion of the excavation in each lift shall be removed or stabilized. No drilling for the next lift shall be carried out until this work is completed. Stabilization shall be performed at Contractors' own expense if caused by the Contractor's blasting operations

Slopes of cuttings formed in rock are to be cleaned of all rock fragments which move when pressed with a crowbar

Explosives and Blasting

It is not anticipated that blasting will be required for this project. Should the Contractor exhaust conventional equipment and methods for rock excavation and removal and desire to use explosives to accomplish this work, it shall comply with the following:

a. Blasting and storage and handling of explosives shall be in accordance with the Construction Safety Orders of the Division of Industrial Safety of the California Department of Industrial Relations, Federal Safety Requirements, the San Mateo County Sheriff, and other authorities which have jurisdiction.

b. The Contractor shall obtain all necessary permits and furnish copies to the Engineer before explosives are transported to the site. The Contractor shall pay for permits at no additional cost to the Owner.

c. Blasting shall be done only by skilled operators under the direction of a licensed foreman.

d. The Contractor shall identify all property, structures, and persons which may be affected by blasting and shall take all safety precautions and protective measures to prevent damage or injury to same. All personal injury or damage to persons or property of any nature, whether in the WORK or appurtenant to it, shall be the responsibility of the Contractor.

e. The Contractor agrees by submission of a bid to indemnify and hold the Owner, its officers, agents, employees, and the Engineer harmless from any and all liability claims, costs and expenses including expenses of investigation and defending against same in regard thereto.

f. Blasting shall only be permitted in hours approved by the Engineer and regulatory agencies having jurisdiction. Blasting will not be permitted on legal holidays.

Pre-Blasting

a. Inspections of all structures within [300-feet] of the blast site shall be made more than 2 weeks prior to commencement of blasting. A qualified independent inspector shall perform the inspections for the purpose of detecting and documenting any visible or reasonable recognizable pre-existing defects or damages in structures.

b. Waiver of inspections shall be in writing, signed by structure owners or persons with control or custody of the structures.

c. Complete inspection reports listing findings with photographs or waivers shall be signed by the inspector. One copy of inspection reports and waivers, shall be submitted to the Engineer before blasting commences.

d. The Contractor shall give 30 and 5-day notices to all residence and businesses, and utility owners which may be affected by blasting.

Blasting

a. The Contractor shall perform instrumented seismographic monitoring on blasting. A seismograph shall be placed at [the nearest structure to the blast] to monitor the ground motion particle velocity and frequency during each blast. One copy of each daily seismograph chart shall be furnished to Engineer.

b. Fly rock from blasting shall be contained within the project site and shall not represent a hazard to persons, vehicles, existing improvements, or vegetation.

c. The blasting site shall be cleaned of all debris at the end of each day.

d. No blasting shall be done within 100-feet of concrete which has been placed in less than 7 days, except by permission of the Engineer.

Post-Blasting

The Contractor shall submit an As-built layout plan showing the extent of the rock excavation/blasting area (Before and after excavation within the claiming period) with indication of hard rock area rock's spot levels.

The independent inspector shall investigate each complaint of property damage and a written report shall be furnished to the Engineer within 30 days of receipt of the complaint.

2.15 MEASUREMENT & PAYMENT

Excavation shall be measured per cubic Meter/ft on the assumption of vertically excavated walls required for the nominal concrete dimensions of the structural members of the foundation shown on the Drawings and paid for at the unit rates entered in the Bill of Quantities, inclusive of backfilling, compaction, disposal of surplus earth, dewatering, bracing, shoring etc.

All horizontal measurements shall be taken from established reference point. At the option of the Engineer-in-charge, the contractor shall leave depth indicators during excavations of such shape and size and in such positions as directed so as to indicate the original ground level as accurately as possible. The contractor shall see that these remain intact till the final measurements are taken.

Disposal of surplus material beyond initial 100 ft lead up to a maximum of 18 miles, shall be paid separately, at the rate approved by the Engineer.

Dewatering shall not be paid separately. All dewatering and pumping out whether due to ground water seepage or otherwise shall be included in the rates as quoted by the Contractor

**** END OF SECTION****

SECTION - 3

TERMITE CONTROL

3.01 SCOPE OF WORK

The Work covered by this section of Specifications consists of furnishing all labour, materials, equipment, services, miscellaneous and necessary items required to complete Termite Control Work, related works as indicated on Drawings, specified herein, in the Bill of Quantities and subject to the terms and conditions of the Contract.

The work for anti-termite treatment will includes injection of insecticide in sides and bottom of excavated foundation, trenches, spraying on stockpiled backfill material, filled up earth, injections of the insecticide in floor sub-grade of the building and any other operation, which the specialized firm may considered necessary in context to their guarantee obligations. The scope also covers treatment of all wood works with insecticides before installation in position.

3.02 MATERIALS

3.02.1 The chemicals approved by Pakistan Council of Scientific and Industrial Research (PCSIR) like Fiprokil, Biflex, Agenda, Dursbanetc., or approved equivalent, emulsifiable concentrate insecticide, specially formulated to prevent infestation by termites.

3.02.2 The chemical will be diluted with water as per manufacturer/ supplier instructions. Fuel oil will not be permitted as diluents.

3.02.3 Pure turpentine shall be used for dilution of insecticide, in approved proportion for application to woodwork.

3.03 METHOD OF APPLICATION

Pesticide solution shall be applied with approved pressure spraying equipment maintaining a pressure of $1N/mm^2$ ($10\ Kg/cm^2$) to all applications on or in earth. Spraying to wood shall be done by hand compression sprayers with an approximate pressure of $0.15\ N/mm^2$ ($1.5\ Kg/cm^2$). Mixing and dilution of the concentrate insecticide with water shall be done at site and as per manufacturer recommendations. This solution shall be sprayed over 500 square feet of surface area.

Rate of application of the solution shall be as per the recommendations of the manufacturer. Insecticide shall penetrate to a depth of 1 inch. (25mm) minimum in porous earth at bottom and at least 50mm at the sides of excavations

3.04 EXTENT OF APPLICATION

3.07.1 Soil treatment shall begin after all work of preparation of earth prior to installation of concrete has been done. After application, no additional earth moving or work upon sub grade should be done. No covering of earth or concrete should be applied over soil treatment until at least 24 hours after treatment has been made.

3.07.2 Insecticide solution should not be applied during wet weather, or when the earth surface is excessively wet. Application should be made to all areas beneath concrete slabs-on-grade, including sidewalks and paving abutting buildings for distance of at least 6 feet beyond building line.

3.07.3 Contractor to ensure a continuity of treatment under and around the footings and up to the slab on grade in the form of an envelope.

3.07.4 Care shall be exercised to insure that no marks or damage occurs to the finished structure as a result of the work under this section.

3.07.5 All woodwork for the entire project is to be insecticide treated (before application of solignum). Insecticide shall be sprayed on all surfaces of all the wooden work viz., door frames, blocking, furring, planks, boards etc. before installation. Spraying is to be done at the site, after delivery and before installation. No spraying shall be necessary after field sawing, jointing or installation of such material.

3.07.6 Sides of foundation excavations, grade beam, and similar areas shall be treated with solution at a rate of 0.5 lit per square feet upon inner sides of such excavations, and at all locations where concrete slabs for platforms and similar work about the building. Similar treatment

shall be made at all locations where expansion Joints, control joints, column bases and similar work occur at or below grade slabs.

3.07.7 In the areas of application signs shall be fixed to show that soil treatment has been applied. Such signs shall be removed when areas are covered by other construction.

3.07.8 All excavations, all walls and bottoms of all pits or trenches for footings or foundations are to be sprayed. Pesticide shall penetrate to a depth of 12" minimum in porous earth at bottom and 3" minimum at sides of excavations.

3.07.9 Stockpiled excavated material to be used as backfill is to be spray treated as above. After backfilling to plinth level, area of the whole building up to 10 ft. outside the building line is again to be sprayed penetrating a minimum of 12" into soil.

3.07.10 After grading, compaction and levelling and before formation of hard core/soling under floor slabs, all areas to receive slabs shall be sprayed with pesticides, penetrating a minimum of 12" into soil.

3.05 LOCATION AND SCHEDULING

3.08.1 Saturation of earth is to be done by adequate personnel and in such a manner as to in no way disrupt the progress of Work.

3.08.2 Care shall be exercised to ensure that no marks or damage occurs to the finished building as a result of the work under this section and the Contractor shall verify and ensure that no material used herein will impede the growth of grass or plants at areas where spraying is done.

3.06 APPLICABLE STANDARDS

All methods of termite protection used herein shall be in accordance with best standard practices of National Pest Control Association, USA and the British Wood Preserving Association.

3.07 QUALITY ASSURANCE

In addition to the requirements of these specifications, the contractor shall comply with manufacturer's instructions and recommendations for the work, including preparation of substrata and application.

A professional operator shall be engaged who shall have license in accordance with regulations of governing authorities for application of soil treatment solution.

3.08 GUARANTEE

The Contractor is to guarantee that the building shall be free from termite (white ants), wood bores and other pests or rodents which cause damage to wood or other organic material for at least 10 years from the date of acceptance of the building.

In the event of any damage caused within the guarantee period, the Contractor shall replace at his own cost such damaged material, finishes and affected portion thereof and suitably preserve and treat the entire premises with the best method known to the trade to prevent the spreading of termites.

3.09 TESTING

The Contractor shall supply samples of all the materials to be used for insecticide control for approval of the Engineer-in-charge. All materials and samples shall be subject to standard testing in accordance with the standards specified herein and shall be rejected if found below these standards. Rejected materials shall be removed from the Site immediately.

3.10 MEASUREMENT AND PAYMENT

Only the top surface area of the finished floor or pavement shall be measured for the payment of termite proofing work of the whole project carried out under this section. The measurement will be made in square feet/ meter and paid for at the unit rates entered in the Bill of Quantities

**** END OF SECTION****

SECTION - 4

PLAIN AND REINFORCED CONCRETE

4.01 SCOPE OF WORK

The Work covered by this section of the Specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with plain and/or reinforced concrete work complete in strict accordance with this section of Specifications, applicable Drawings and subject to the terms and conditions of this Contract.

4.02 APPLICABLE STANDARDS

Latest editions of the following Pakistan, British and ASTM ACI Standards are relevant to these specifications wherever applicable.

4.02.1 Pakistan Standards

PS233	Portland Cement (ordinary & rapid hardening)
PS243	Natural aggregates for concrete
PS279	Abrasion of coarse aggregates by the use of Los Angeles machine.
PS280	Determination of aggregates crushing value
PS281	Organic impurities in sand for concrete aggregate.
PS282	Material finer than No. 200 BS test sieve in aggregates, method of test for
PS283	Soundness test for aggregates by the use of sodium sulphate or magnesium sulphate.
PS284	Sampling aggregates for concrete
PS285	Sieve or screen analysis of fine and coarse
PS286	Description and classification of mineral aggregates
PS421	Sampling fresh concrete
PS422	Slump test for concrete
PS560	Making and curing concrete compression test specimen in the field. Sulphate-resistant Portland cement type 'A' and sampling fresh concrete in the laboratory.
PS612	Mixing
PS716	Compacting factor test for concrete
PS717	Definitions and terminology of cements
PS746	Making and curing concrete compression test cubes.
PS849	

4.02.2 ASTM (American Society for Testing and Materials)

C33	Standard Test Method for Fine and coarse aggregates Organic impurities in sand for concrete.
C39	Standard Test Method for Compressive Strength of Cylindrical Concrete
C40	Specimens
C87	Effect of organic impurities in fine aggregates on strength of mortar. Soundness of aggregates.
C88	Ready mixed Concrete.
C91	Cement Standards and Concrete Standards
C94	Compressive strength of hydraulic cement mortars
C 109	Material finer than No. 200 (0.075mm) sieve
C 117	Light weight pieces in aggregates.
C 123	Concrete and concrete aggregates.
C 125	Specific gravity and absorption of coarse aggregate.
C 127	Specific gravity and absorption of fine aggregate.
C 128	Resistance to abrasion of small size coarse aggregate.

C 131	Sieve or screen analysis of fine and coarse aggregate.
C 136	Clay lumps and friable particles in aggregates.
C 142	Slump of Portland Cement Concrete
C 143	
C150	Standard Specification for Portland Cement
C156	Water retention by concrete curing material
C171	Sheet material for curing concrete.
C185	Air content or hydraulic cement mortar.
C188	Density of hydraulic cement.
C191	Time of setting of hydraulic cement by vicat needle
C260	Air entraining admixture for concrete.
C289	Potential reactivity of aggregate.
C309	Liquid membrane forming compounds for curing concrete.
C387	Chemical admixtures for concrete.
C494	Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete
C535	
C75	Resistance to abrasion of large size coarse aggregates.
C994	Aggregate sampling.
C1190	Preformed expansion joint filler for concrete.
C1715	Concrete joint sealer (hot poured elastic type).
	Preformed expansion joint filler for concrete paving and structural concrete.
D1850	Concrete joint sealer (cold application type).
E11	Wire cloth sleeves for testing purposes.
E96	Water vapor transmission of materials in sheet form.
E154	Materials for use as vapor barrier under concrete slabs.
E337	Relative humidity by wet and dry bulk psychrometer.

4.02.3 **ACI (American Concrete Institute)**

211	Recommended practice for selecting proportions for normal and heavy weight concrete.
214	Quality control charts
301	Specifications for structural concrete for building.
304	Recommended practice for measuring, mixing, transporting and placing concrete.
305	Hot weather concreting.
308	Recommended practice for curing concrete.
309	Recommended practice for consolidation of concrete
315	Manual of standard practice of detailing reinforcement concrete structure.
	Building code requirement of reinforced concrete.
318	Recommended practice for concrete formwork.
347	

4.02.4 **British Standards**

BS 12	Specifications for Portland cement, ordinary and rapid hardening
BS 410	Specifications for Test Sieve
BS 812	Specification for aggregates from natural sources for concrete Method of testing concrete
BS 822	Test for water making concrete
BS 1881	Method for determination of Compressive Strength of Concrete Cubes
BS 1348	Rigid expanded polyvinyl chloride for thermal insulation.
BS 3837	Sulphate-resisting Portland cement
BS 4027	Specification for Sulfate-Resisting Portland Cement
CP 8110	Specifications for Design and Construction of Reinforced and Pre-stressed Concrete
CP 114	
BS 4550	The Structural Use of Reinforced Concrete in Buildings

BS 8500	Methods of Testing Cement Concrete – Complementary British Standard

In addition, the latest editions of other Pakistan and British Standards, American Concrete Institute Standards, American Society for Testing and Materials Standards and other Standards as may be specified by the Engineer for special Materials and Construction are also relevant.

4.03 GENERAL

4.03.1 Until and unless specified or directed otherwise by the Engineer, all materials and workmanship shall be based on the latest versions of applicable ASTM Standards in force at the time of inviting tenders.

4.03.2 Any defective work in the opinion of the Engineer shall be removed and reconstructed without undue delay to the approval of the Engineer and the Contractor shall bear all additional costs incurred.

4.03.3 Any previous checks by the Engineer shall not in any way relieve the Contractor of his responsibility in respect of quality and accuracy of Work.

4.03.4 Full care shall be taken to install embedded items. Embedded items shall be inspected and checks for reinforcements and other materials and items shall be completed and approved before concrete is placed.

4.03.5 The Contractor shall get the bar bending schedules of reinforcement checked and approved from the Engineer prior to the cutting of reinforcement.

4.03.6 The Contractor shall maintain an accurate record of ambient temperature of Site. Ambient temperature shall be measured using mercury thermometers or other thermometers acceptable to the Engineer.

4.03.7 Throughout the concrete work, the Contractor shall employ full time on the Works suitable number of qualified and experienced Engineers whose sole duties shall be as follows:

- Design of concrete mixes
- Quality control of concrete
- Supervision of mixing, transporting, placing, compacting, finishing, curing and protecting concrete.
- Supervision of sampling and testing.
- Preparation and submission of test certificates and reports.
- Completion and keeping of record.
- Such other duties as the Engineer may direct.

4.03.8 All concrete work including reinforcement etc. shall be carried out in accordance with the applicable requirements of ACI/ASTM/BSS Standards and to the instructions of the Engineer.

4.04 MATERIALS

4.04.1 Cement

a) Ordinary Portland cement shall be grey normal setting cement of approved make and source and of the specified gravity, fineness and chemical composition fully conforming to British Standard Specifications BS-12 and shall be capable of satisfying all tests such as the tensile strength tests contained therein.

b) Sulphate resistant cement where required shall be sulphate resistant Portland cement of the approved make fully conforming to BS-4027 and satisfying the requirements for fineness, chemical composition, strength, setting time and soundness, etc.

c) For all types of cement described in sub-clauses 4.03.1 (a) & (b) above, the cement shall have a tricalcium aluminate (C_3A) content by weight not less than 5% and not more than 8%.

d) For all types of cement described in sub-clauses 4.03.1 (a) & (b) above. The initial setting time shall not be less than 45 minutes and final setting time not more than 10 hours.

e) The supply of cement must be so programmed by the Contractor that at no time the quantity of cement stock shall be less than that required for an average consumption of four weeks. Lorry or truck or other means of transportation for the conveyance of cement to the Site of Work shall be clean, dry, metal-lined and covered from top with water proof sheets, so that cement is sufficiently protected from any deterioration during transit.

f) Cement shall be delivered in sealed bags and be stored in moisture-protected and well-ventilated sheds and each cement supply shall be stored separately.

g) The Contractor shall provide at his own cost on the Site all necessary sheds which shall be perfectly dry, waterproof and adequately protected against ingress of water for the storing of cement to be delivered to the Work, to ensure adequate supplies being available for the Work.

h) Cement, which is damp or contains lumps which cannot be broken to original fineness by finger pressure will be condemned irrespective of age and must be removed from the Site.

i) If any time the Engineer considers that any batch of cement may have deteriorated on Site during storage for any reason, he will direct that tests shall be made and the batch of cement on the Site which may be in question shall not be used until it has been shown by test to be of satisfactory quality at a laboratory approved or appointed by the Engineer. The Contractor shall bear all costs of such testing. The Contractor without delay shall remove any rejected cement from the Site. Cement reclaimed from cleaning bags or leaking containers shall not be used in the Works and immediately be removed from the Site.

j) Cement shall be consumed in the sequence of its arrival at Site unless otherwise directed by the Engineer.

4.04.2 **Aggregates**

a) All fine and coarse aggregates to be used shall be supplied from approved sources, which shall not be changed without permission in writing from the Engineer. Aggregates shall conform to the requirements of applicable ASTM C33-82.

b) Fine aggregates, shall be from an approved source of supply of a uniform quality conforming to ASTM C-33-82 and shall be clean and sharp and free from clay, earth, vegetable and organic matters, alkaline or acid reactions or other deleterious salts or such harmful matters and impurities.

c) Fine aggregates shall conform to the requirements of the relevant ASTM C-33-82 Specifications, and shall be graded as follows;

Sieve Number/Size	Percentage (by weight) passing
9.5 mm (3/8")	100
4.75 mm (No. 4)	95 - 100
2.36 mm (No. 8)	80 – 100
1.18 mm (No. 16)	50 – 85
0.6 mm (No. 30)	25 – 60

0.3 mm (No. 50)	10 – 30
0.15 mm (No. 100)	2 – 10

d) Coarse aggregates shall be approved river gravel or hard crushed stone from a source approved by the Engineer and shall be clean, inert, hard, non-porous and free from laminated particles, sand, dust, salt, lime, chalk, clay, organic impurities or other deleterious matter.

e) Coarse aggregate shall also conform to the requirements of Table 2 of ASTM C-33 and shall be graded as follows:-

For Reinforced Concrete (Nominal Size of Graded Aggregates 20.0 mm to 2.36 mm)

Sieve Number/Size	Percentage (by weight) passing
25.0 mm	100
20.0 mm	90 – 100
9.5 mm	20 – 55
4.75 mm (No. 4)	0 – 10
2.36 mm (No .8)	0 – 5

f) All aggregates shall be stored on properly constructed paving and in bins and there shall be a physical partition between the stockpiles of coarse and fine aggregates. No mixed up aggregates shall be used in any concrete. Under no circumstances aggregates shall be allowed to be in contact with ground.

g) If required, aggregates shall be washed and screened to the sequence of receipt of supplies unless otherwise directed by the Engineer.

h) All aggregates shall be subjected to the approval of the Engineer. Any aggregates not found to be of the required standard shall be rejected by the Engineer and shall have to be removed from Site without delay. Concrete structures executed with rejected aggregates shall be dismantled and rebuilt at the Contractor's expense.

i) Special fine gravel of 9 mm. size shall be used if called for in the Drawings or as directed by the Engineer.

j) Physical properties of aggregates shall be in accordance with Table 3 of ASTM C33.

4.04.3 **Water**

Water to be used in the Work shall be potable water and shall be free from all impurities whether suspended or dissolved. Further, the water shall not contain any chemical impurities, salts etc. of any kind. Water shall be tested for its fitness in Works in accordance with AASHTO Method T26-51.

4.04.4 **Admixtures**

a) Suitable admixtures from BCR, Sika, Fosroc, Betocrete C-16or Master Builders or other approved manufacturers may be used in concrete mixes with the prior approval of the Engineer. The amount of admixtures added to each batch of concrete requires careful control and shall be added in the doses as recommended by the manufacturers and approved by the Engineer. The cost of the admixtures shall be deemed to be included in the rates.

b) For use of an admixture, the information required by the Engineer shall be submitted to him for each admixture for his approval.

c) BASF 700 or approved equivalent concrete retarding agent, may be used if required with the approval of Engineer

4.05 CLASSIFICATION OF CONCRETE

Classification of concrete to be used in various parts of the Works shall be as indicated on the Drawings and mentioned in the Bill of Quantities. Unless noted otherwise, all blinding concrete shall be of Class E. The concrete of various grades shall be proportioned as set out in Table-1 appended hereto.

Table-1 showing minimum required compressive strengths on 6" x 12" long test cylinders and minimum quantity of cement required per m^3 of finished concrete for various mixes and under various conditions is given below:

TABLE – 1

Class of Concrete	Minimum Qty. of Cement Kg/m^3	Work Cylinder Strength		Max. Water-Cement Ratio
		@ 7 days (psi)	@ 28 days (psi)	
D2	540	4200	6000	0.33
D1	400	3500	5000	0.40
D	385	3150	4500	0.42
A3	350	2800	4000	0.45
A2	325	2450	3500	0.47
A1	300	2100	3000	0.50
C	300	1750	2500	0.50
E	275	1400	2000	0.52
F	217	875	1250	0.55
G	159	600	850	-

Non-structural Concrete

Non-structural concrete (NS concrete) shall be used only for non-structural purposes where shown on the Drawing. NS concrete shall be compound of ordinary Portland cement and aggregates complying with this Specification.

The weight of cement mixed with 0.3 cubic meters of combined aggregate shall not be less than 50 kg. The mix shall be proportioned by weight or by volume. The maximum aggregate size shall be 40 mm nominal.

The concrete shall be mixed by machine or by hand to a uniform colour and consistency before placing. The quantity of water used shall not exceed that required to produce a concrete with sufficient workability to be placed and compacted where required.

The concrete shall be compacted by hand towels or rammers or by mechanical vibration.

4.06 PROPORTIONING OF CONCRETE MIXES

All concrete shall be proportioned by weight for design of concrete mixes, unless specifically agreed by the Engineer to proportion them by volume, which permission shall be given only if the arrangements made at Site are satisfactory. The Contractor shall submit to the Engineer proposed mix designs for concrete to be used, based on preliminary laboratory tests to determine proportion of cement, aggregates and water in the concrete conforming to the quality and strength requirements specified herein. Preliminary test results of at least three different mixes of each class of concrete with varied water-cement ratio shall be submitted. The results of 7 days and 28 days cylinder tests shall be used to establish the ratio between 7 days and 28 days strengths of used concrete. The Engineer may make adjustments in the ratio of fine to coarse aggregates in the mix for a certain work. Preliminary design of mixes and testing shall be the responsibility of the Contractor at his own cost. The proportion of voids in between the coarse aggregate shall be controlled and if it exceeds 0.45%, the Contractor

without any charge shall increase sand and consequently the cement. If the proportion is less than 0.45%, sand shall be decreased but not the cement.

The detailed data, calculations and test results shall be compiled in a report and the proposed mix be declared by the Contractor. The report shall be submitted to the Engineer in time before commencing the concrete works and all test results shall be to the Engineer's satisfaction.

Lack of approval by Engineer shall not constitute a reason for an extension of time or additional costs.

4.06.1 **No Fines Concrete**

"No Fines" concrete shall consist of approved aggregate graded between 40mm and 20mm with not more than 5% passing the 20mm sieve.

The mix shall consist of 0.25 cu m of aggregate to 50kg cement. The aggregate is to be damp at the time of mixing and the water/cement ratio is to be strictly controlled to evenly wet the aggregate with grout.

The concrete is to be placed as quickly as possible after mixing and is to be lightly rodded to assist placing. The concrete shall not be vibrated or rammed.

4.06.2 **Maximum Allowable Water Content**

All concrete specimens shall be made, cured and tested in accordance with ASTM Standard. A curve representing the relation between the water content and the average 28 days compressive strength or earlier strength at which the concrete is to receive its full working load shall be established for a range of values including all the compressive strengths shown on the plans. The curve shall be established by at least four points, each point representing average values for at least four test specimens. The maximum allowable water content for the concrete shall be as determined from this curve and shall correspond to a strength 15% greater than indicated on the plans. However, the water cement ratio shall not exceed the value given in Table-1 above for the class/strength of concrete specified. No substitution shall be made in the materials used in the work without additional tests in accordance herewith to indicate that the quality of the concrete is satisfactory.

4.06.3 **Slump Test**

The slump for concrete, determined in accordance with ASTM C-143 Test for Concrete, shall be minimum of 2" and maximum of 4" provided the requisite strength is obtained. Corrective additions to remedy deficiencies in aggregate gradations shall be used only with the written approval of the Engineer. When such additions are permitted, the material shall be measured separately for each batch of concrete.

4.07 BATCHING AND MIXING

Concrete shall be mixed by a mechanical batch type mixing plant with adequate facilities for accurate measurements and control of each material entering the mixer and for changing the proportions to conform to varying conditions of the Work. The mixing plant assembly shall permit ready inspection of operations at all times. The plant and its location shall be subject to approval of the Engineer.

Water shall be measured for every batch with due allowance for water already present in aggregates.

4.07.1 **Batching Units**

Batching units shall be supplied with the following items:-

a) Weighing unit shall be provided for each type of material to indicate the scale load at convenient stages of the weighing operations. Weighing units shall be checked at times directed by and in the presence of the Engineer and required adjustments shall be made before further use.

b) Water mechanism shall be tight, with the valves interlocked so that the discharge valve cannot be opened before the filling valve is fully closed and shall be fitted with a graduated gauge.

c) Discharge gate shall control the mix to produce a ribboning and mixing of cement with aggregates. Delivery of materials from the batching equipment to the mixer shall be accurate within the following limits:-

Materials	**Percentage by Weight**
Cement	+1%
Water	+1%
Aggregate smaller than 3/4"	+2%
Aggregate larger than 3/4"	+3%

4.07.2 **Mixing Units**

a) Mixers shall not be charged in excess of rated capacity nor be operated in excess of rated speed. Excessive mixing requiring addition of water to preserve required consistency shall not be permitted. The entire batch shall be discharged and discarded before re-charging.

b) Mixing time shall be measured from the instant water is introduced into the mixer drum containing all solids. All mixing water shall be introduced before one-fourth of the mixing time has elapsed. Mixing time for mixers of one cubic meter or less shall be not less than 2 minutes; for larger than one cubic meter capacity mixers, time shall be increased by 15 seconds for each additional half cubic meter or fraction thereof, which may be varied if the charging and mixing operations fail to result in the required uniformity in composition and consistence within a batch and from batch to batch. If an air-entraining agent is allowed to be used, additional mixing time shall be allowed so as to provide the specified air-content.

c) Unless waived by the Engineer, device such as discharge-lock to lock the discharge mechanism, until the required mixing time has elapsed, shall be provided on each mixer. Mixing shall continue for at least 40 revolutions of mixer drum.

d) No hand mixing under any circumstances even with extra cement shall be permitted. If during concreting, the mixing plant fails, the concrete already poured shall be removed, unless directed otherwise by the Engineer. Mixers, which have been out of use for more than 30 minutes shall be thoroughly cleaned before any further concrete is mixed.

e) The mixing water shall be regularly sampled and tested for salt content and contamination.

4.08 SAMPLES AND TESTING

4.08.1 **General**

Test cylinders of concrete shall be prepared and stored by the Contractor in accordance with the ASTM C-172, as and when directed by the Engineer. Test cylinders and the concrete materials shall be tested in an approved laboratory and the Contractor shall bear all charges for the same, including such other tests as may be determined by and acceptable to the Engineer.

4.08.2 **Water**

Water shall be tested in accordance with AASHTO Method of Test T26-51.

4.08.3 **Cement**

Cement shall be tested as prescribed in BS-12.

4.08.4 **Aggregate**

Aggregates shall be tested as prescribed in ASTM C-33. In addition, fine aggregates shall be tested for organic impurities in conformity with ASTM C-40.

4.08.5 **Reinforcement**

Reinforcement bars shall be tested as prescribed in BS 4449, BS-4461 and ASTM A-615-82(S1) for deformed steel bars and mild steel plain bars. Refer clause 4.10 of this section for specification requirements of reinforcement works.

4.08.6 **Testing of Concrete**

4.08.6.1 Concrete Compressive Strength Test

a) Works Test Cylinders shall be made of all structural concrete incorporated into the works. Unless otherwise directed by the Engineer, one set of cylinder of any particular mix shall be taken from either :-
   - Each 350 Cft or part thereof in columns
   - Each 1050 Cft in walls and small foundations
   - Each 1750 Cft in slabs, beams and large foundations, or
   - each day's production

   Whichever is the more frequent

b) Each set of the Works Test Cylinders shall comprise six 6"x12" Cylinders made from a single sample of concrete taken from the point of final deposition of the set concrete under the Engineer's supervision.

c) The sampling, making, curing and testing of Works Test Cylinders shall be carried out in accordance with ASTM C3 & C39. Test results shall be recorded on approved forms and submitted in duplicate to the Engineer immediately following the test.

d) A sample of concrete shall be taken at random on eight separate occasions during each of the first five days of using that mix. The number of samples per day and the times which they are taken shall be varied at random (thereafter at least one sample shall be taken each day the concrete of that particular mix is made).

e) From each sample six Cylinders shall be made, two for test at seven days, and the other four for test at twenty-eight days.

f) Specimens shall be cured under laboratory conditions except that the Engineer may require curing under field conditions in which case strength of field cured specimens shall not be less than 85% of that of companion laboratory condition cured specimens.

g) All cylinder moulds shall be steel moulds perfectly true, having all internal and meeting faces machined to a smooth surface.

h) If the strength tests of the laboratory cured specimens for any portion of the Work falls below the minimum allowable compressive strength at 28 days required for the class of concrete used in that portion, the Engineer shall have the right to order replacement of the affected work.

i) All test specimens shall bear distinguishing mark showing number, date of casting, quality of concrete and place from where sample was taken. A proper daily record of test specimens made and test results obtained shall be

maintained by the Contractor and weekly test results shall be submitted to the Engineer.

4.08.6.2 Testing for Chloride Ion Content

Maximum water soluble chloride ion concentrations in hardened concrete at ages from 28 to 42 days contributed from the ingredients including water, aggregates, cementitious materials, and admixtures shall not exceed 0.15% by weight of cement. To determine water soluble chloride ion content, test procedures shall conform to ASTM C 1218.

4.08.7 **Concrete Members not complying with Specifications**

(i) Where concrete in the Works does not comply with the Specifications, the Engineer may order any or all of the following or any other appropriate action to be taken:

(a) The drilling of test cylinders in mass concrete and testing the cylinders to destruction by compression.

(b) The carrying out of load tests or other non-destructive tests on concrete structure.

(c) The cutting out and replacement of such volume as is considered defective by the Engineer.

(d) Strengthening of the structure in accordance with the requirements and as proposed by the Engineer.

(ii) The Contractor shall carry out all such tests, investigations, rehabilitation or replacement in coordination with and as acceptable to the Engineer at no additional cost to the Employer.

4.09 TRANSPORTING AND PLACING CONCRETE

4.09.1 General

a) Concreting shall be conveyed and deposited as quickly as possible after mixing and shall proceed so that, as far as possible, a complete section of the Work is done in one operation. The concrete may be distributed in barrows, skips, and chutes and by any other method such as pumps, conveyor belts etc. all to the approval of the Engineer.

b) Transportation of concrete shall be in a manner approved by the Engineer and shall be so as to avoid segregation or loss of ingredients of concrete.

c) All foundations and portions of Work to be concreted shall be approved by the Engineer in writing before concrete is poured.

d) All forms and reinforcement shall be completed, cleaned, inspected and approved before pouring of concrete. No concrete is to be deposited till the Engineer has inspected and approved in writing all reinforcement, foundations, forms, details, positioning of all fixtures and materials to be embedded in concrete, control levels and screeds, etc. and is satisfied with the arrangements the Contractor has made to efficiently proceed with the work such as sufficient labour, materials, plants etc. Such an approval will not relieve the Contractor from any of his obligations under this Contract. No concrete shall be deposited without the written permission from the Engineer who shall have no authority to waive off this condition. Any concrete without such written authorization shall be liable to be rejected.

e) Placing of concrete shall not be permitted when, in the opinion of the Engineer the sun, heat, wind, cold, snow, or limitations or facilities furnished by the Contractor prevent proper placing, finishing and curing of concrete.

f) All concrete shall be thoroughly compacted and consolidated by means of pneumatic or mechanical immersion type vibrators of suitable size having minimum frequency of 8000 RPM. Care shall be taken to avoid segregation due to excessive vibration. The Contractor shall maintain on Site at all times one or more standby vibrators. Tapping or other external vibration of forms shall not be allowed unless so directed by the Engineer. In that case formwork shall be adequate to withstand vibrations. Compaction shall be done until the whole mass assumes a jelly like appearance and consistency with water just appearing on the surface. Concrete shall be sufficiently tamped and consolidated around the steel bars, care shall be taken that the vibrator does not touch steel or formwork, and is worked into all parts of the moulds in order that no voids or cavities are left. Steel shall not be disturbed during operations of concreting. Concrete shall be brought up in even layers not more than 8" thickness and worked against side of forms to give a smooth and uniform surface. No surplus water shall be allowed to come out and lie on the surface of concrete. The concrete must be of such a consistency that when ramming, consolidating and tamping is completed, a thin film of water is just appearing on the surface. In vibrating, care shall be taken to avoid displacing the reinforcement.

g) Hardened concrete, debris and foreign materials shall be removed from interior of forms and from inner surface of mixing and conveying equipment.

h) Runways and gangways shall be provided for wheeled concrete handling equipment and workmen, and such equipment shall not be wheeled over reinforcement, nor shall runways be supported on reinforcement.

i) Concrete shall not be dropped freely from a height of more than 10 ½ ft. in columns and 4 ft. elsewhere. In cases where an excessive drop is inevitable, the Contractor shall provide spouts, down pipes, chutes, or side ports to forms with pockets, which will let concrete stop and flow easily into the form without any risk of segregation. The discharge of the spouts, down pipes or chutes shall be controlled so that the concrete may be effectively compacted into horizontal layers not more than 8" thick.

j) Concrete is to be deposited as quickly as possible after mixing and to proceed continuously. Concrete which has attained its initial set or has contained its mixing water for more than 30 minutes shall not be allowed to be placed in the work.

k) When concrete is laid on hard core, such as sub-grade for floor slabs, or other absorbent material, the surface is to be watered, consolidated and, where specified, blinded before the concrete is deposited.

l) Fresh concrete shall not be placed on previously laid concrete or on old concrete surfaces until the latter has been cleaned of all dirt, scum and laitence by wire brushes. The clean surface shall then be thoroughly wetted and grouted with cement slurry as approved by the Engineer.

m) Care shall be taken not to disturb newly placed concrete by vibrator, indirect loading or otherwise. No traffic or loading shall be allowed on the concrete until it has thoroughly set and hardened.

n) Construction joints in concrete shall only be given at locations indicated on the drawings or as approved by the Engineer. If approved by the Engineer, the concrete at the end of the day's work shall be finished off against a temporary shutter stop, which shall be vertical and securely fixed. Such stops shall be removed within 24 hours of placing of concrete. Construction joints not shown on the Drawings shall be reinforced with steel bars or dowels, if deemed necessary by the Engineer, and shall be furnished by the Contractor without any additional cost.

o) No concrete shall be placed during rains or inclement weather and all fresh concrete shall be suitably protected from rain fall and excessive heat or cold.

p) Should any part of the exposed surface present a rough, uneven or imperfect appearance, when the shuttering is removed, it shall be picked out to such depth and refilled and properly re-surfaced and entirely redone as per directions and approval of the Engineer at the cost of the Contractor.

q) On removal of the forms and before the concrete skin has had time to harden, all faces of the concrete inside and outside to be kept exposed (i.e. unplastered) shall be rubbed over with carborundum stone, and washed with cement to remove all marks, projections, hollows, or any other defect. No extra payment shall be made for this work.

r) All exposed surfaces and lines of the concrete work are to be true and fair without cracks, bends, windings and distortions of all kinds, without any extra charges by the Contractor. All concrete work to remain exposed and unplastered is to be fairfaced, smooth, pleasing and to the entire satisfaction of the Engineer.

s) A float or screed is to be worked over the exposed surfaces of all concrete work on the flat or curve, so as to render the surfaces perfectly smooth, clear and to the necessary slopes or falls or as required to receive the floor or roof finishes according to the Drawings and as directed by the Engineer without any extra charge by the Contractor.

4.09.2 Temperature

No concrete shall be mixed or placed while the temperature is above 35 degrees centigrade (°C) on a rising thermometer or above 40 degrees centigrade (°C) on a falling thermometer. The Contractor shall supply an accurate maximum and minimum thermometer and hang it in an approved position in the Works.

The Contractor shall plan the day's concrete in such a manner as to ensure that each bay or panel is completed at a proper construction joint before the temperature rises above the permissible limit.

The Contractor shall allow in his rates for any additional expenses incurred by complying with this Clause in order to complete the works within the "Time for Completion".

4.09.3 Hot Weather Concreting

Hot Weather Concreting Operation should conform to the provisions of ACI Standard 305-72 "*Recommended Practice for Hot Weather Concreting*". The following precautions should be adopted as necessary to comply with the above limit:-

a. Shading of aggregate stock piles.
b. Insulation of water tanks and pipelines and formwork.
c. Refrigeration of mixing water.
d. Addition of ice to mix to lower temperature.
e. Shading of formwork and reinforcement from the sun and drying winds.
f. Cooling of formwork and reinforcement prior to and ahead of casting of the concrete by mist spraying.
g. Covering and spraying with water of hardening concrete surfaces.
h. Concreting during the cooler part of the day.

4.10 PROTECTION AND CURING

All exposed concrete shall be cured. Curing shall be accomplished by preventing loss of moisture, rapid temperature change and mechanical injury or injury from rain or flowing water for a period of at least seven (7) days. Curing shall be started as soon as the concrete has hardened sufficiently for the surface not to be marked. Curing shall be done either by covering with sand, hessian, canvas or other approved fabric mats, which shall be kept continuously wet. If required and so directed by the Engineer, formed surface with forms in position shall also be cured by keeping all forms continuously wet. As an alternative, curing of concrete on all exposed surfaces which could not be kept covered, such as sides of the beams, under side of the slabs, may also be done by sealing concrete surface with liquid membrane-forming curing compounds white pigment type conforming to ASTM C-309 or equal so as to arrest loss of moisture from concrete, with the approval of the Engineer. Care shall be taken so

as to spray the compound/chemical on all the exposed faces of concrete so that no loss of moisture takes place. The Contractor shall take special care that curing of concrete is satisfactorily carried out and in accordance with methods specified herein and/or as instructed by the Engineer.
Any negligence in this regard may result in total rejection of such concrete works, which in the opinion of the Engineer have not been adequately cured. Period of curing for any concrete shall be 7 days or more as directed by the Engineer. All concrete pours and concrete structures shall be clearly marked with non-washable paints to indicate the date of placing concrete. During hot weather, curing shall be done even at night. It shall be obligatory on the part of the Contractor to obtain a certificate from the Engineer that the curing has been properly done. A suitable format shall be printed and kept on Site to be signed by the Engineer for every part of the Work.

For sections 5 ft. or more thick, the Contractor shall ensure that the temperature differential between the inner and outer surfaces shall not exceed 20°C and shall submit to the Engineer his proposals to control and monitor this.

4.11 CONSTRUCTION JOINTS

Construction joints shall be located as indicated on the Drawings and/or as approved or directed by the Engineer. Prior to construction of any structure, the Contractor shall submit a proposal showing location of construction joints and sequence of construction to suit his concreting programmed for the approval of the Engineer. Joint in columns shall be made at the underside of the deepest beam framing thereto. Beam stems and slabs shall be poured monolithically unless allowed otherwise by the Engineer in writing. Joints not specified or shown on the Drawings if so required and approved by the Engineer, shall be so located as to least impair the strength and appearance of the Work. Except and where indicated on the Drawings, no jointing shall be made in footings or foundations without written approval of the Engineer. Construction joints shall be at right angles to the member and shall be formed against firm stop boards. The stop board shall be removed as soon as possible after placing the concrete but without the risk of movement of the concrete and the concrete surface shall be well brushed with a hard brush and washed off with a spray of water, two to four hours after casting, to expose the aggregate and provide key for the next pour.
In all water retaining structures and other substructure pits and trenches, P.V.C. or any other approved water stops shall be provided at the construction joints in the manner shown on the Drawings and/or approved by the Engineer.

Whenever a section of concrete is left unfinished, for any reasons with the approval of the Engineer, leaving surface which will be hard-set before additional concrete can be joined to it, such dovetails, grooves or other bonds shall be provided as may be necessary to ensure a good bond with the new work, at the cost of the Contractor. Before deposition fresh concrete upon or against any concrete which is already set, the surface of the set concrete shall be roughened with a cutting tool, any laitance removed, thoroughly cleaned from all foreign matter, well-watered and covered with approved bonding agent and cement grout, and special care shall be taken to ram the fresh concrete thoroughly up and against the set concrete; and, if deemed necessary by the Engineer, the joints shall be reinforced with steel bars or dowels to be all furnished and done by the Contractor without any additional cost.

4.12 CONCRETE FLOOR SLAB FINISHING

Concrete slabs shall be finished as described herein. In preparation for finishing, floor slabs shall be struck off to the required level at or below the elevation or grade of the finished floors as shown on the Drawings. Floors shall be levelled with a tolerance of 1 mm in 1m. Where drains occur, the floor surface shall be pitched to the drains as indicated on the Drawings or as directed by the Engineer.

4.13 MONOLITHIC FINISH

All concrete surfaces in floors, except where other finish is specified, shall be finished by steel floats or straight edges to bring the surface to the required finish level as shown on the Drawings. While the concrete is still green, but sufficiently hardened to bear a man's weight without deep imprint, it shall be wood floated to a true even plane with no coarse aggregate visible. Sufficient pressure shall be used on the wood floats to bring moisture to the surface. The concrete shall then be hand trowelled to produce smooth impervious surface free from trowel marks. If necessary, the process shall be repeated so that

the final finish shall produce ringing sound from the trowel. No separate payment shall be made for finishing floor slabs in the aforementioned manner.

4.14 CONCRETE TOPPING

Where indicated on the Drawings, base slab under concrete topping shall receive a screeded finish. After the base slab is thoroughly cured and when directed, concrete topping shall be laid to the thickness as indicated on the Drawings in alternate panels of suitable sizes as directed by the Engineer.

4.15 ANCHOR BOLTS, INSERTS, SLEEVES, CHASSIS, RECESSES, STEEL FRAMES

The Contractor shall provide chases and openings required for other sections of the Works and will cooperate and coordinate with other trades in placing their pipes, ducts, recesses and other built-in items as the Work proceeds, entirely at his own cost and risk.

The Contractor shall furnish and place in position accurately, as shown on the Drawings, all inserts, sleeves, chases, recesses, etc., supplied by the Contractor, subcontractors or other contractors, as directed. Full cooperation and coordination shall be maintained with other contractors, subcontractors in this regard.

4.16 WATERPROOF CONCRETE

Waterproof concrete shall consist of structural concrete as specified herein and with the addition of an approved waterproofing additive. This shall be mixed in accordance with the manufacturer's instructions and as detailed in the Bill of Quantities.

Contractor's attention is drawn to the special care required for casting roof framing, ponds, swimming pools and all underground structures including basement floor, retaining walls, sumps, pits, etc. These are all designed to BS 8007, British Standard for water retaining structures. The contractor shall ensure that workmanship and curing is up to the required standard. The crack widths in such structures shall not exceed 0.2mm.

The Contractor shall take full responsibility for ensuring that the resulting construction is completely watertight and free from penetration of moisture.

When in the opinion of the Engineer, damp patches and/or leakage of water in the finished work are due to failure of the Contractor to comply with this specification, the affected work shall be made good at the Contractor's expense.

Water-stoppers shall be provided in all construction joints and the type of Water-stoppers will be as specified or to the approval of the Engineer. All Water-stoppers will be joined by welding strictly in accordance with the manufacturer's recommendations and all multiple joints and special intersections shall be manufactured by the supplier.

Before commencement of work, the Contractor shall obtain the Engineer's approval of the methods to be used to support and maintain the Water-stoppers in the correct location while the concrete is placed and also the layout and form of all additional construction joints other than those shown on the drawings. Unless indicated otherwise on the drawings, all construction joints in waterproof concrete shall be formed incorporating Water-stoppers to Engineer's approval.

All service holes cast in shall incorporate sleeves with puddle flanges and temporary openings for services should incorporate Water-stoppers.

Care shall be taken at all times to ensure that Water-stoppers are not perforated or damaged in any way and the concrete shall be carefully placed and compacted around the Water-stoppers to ensure void free impervious concrete.

All kickers or starter plinths to walls (if used) on the periphery of the watertight construction shall be cast monolithically with the base.

The formwork shall comply with this Specification and in addition any bolt or fastening embedded in or passing through the concrete shall be to the approval of the Engineer and not impair the water tightness of the structure. The use of through bolts and sleeves is strictly prohibited.
Special attention shall be given to the elimination of shrinkage or thermal cracking. The size of any bay or slab or wall and sequence of pouring shall be such as to minimize cracking.

Slotted inserts or sockets cast into the structural concrete shall be provided for all fixings including services. The cutting of holes in watertight concrete is strictly prohibited.

The Contractor is completely responsible for making all basements and swimming pools absolutely watertight. If any leakages or moist patches occur, the cost of any repairs, etc. to make the basement and swimming pool fully watertight will be borne by him. The Contractor is to give a ten year guarantee for water tightness, reckoned from the date of completion of roof framing, basement and swimming pool. The form of guarantee is to be to the satisfaction of the Client. Should any leaks or dampness occur during the Guarantee period of ten years, the Contractor shall, at no cost to the Client, immediately re-waterproof the defective area or areas and make good all damages to surface finishes such as plaster, painting, paneling, tiling, etc. electrical or other installations or other property, caused by leaks or dampness or reimburse the Client for making good such damages.

Water tightness of swimming pools shall be inspected and tested in accordance with BS 8007:1987 and/or ACI-350.

4.17 CLEANING AND REMOVAL OF RUBBISH

On completion of Works herein, the Contractor shall remove all concrete debris, rubbish, shuttering materials, scraps etc., from the vicinity of the structures completed. All areas shall be cleaned to the satisfaction and approval of the Engineer. The rubbish shall be disposed of within or outside the Site premises, free of cost as directed by the Engineer.

4.18 MEASUREMENT AND PAYMENT

a) Concrete works shall be measured and paid for as per theoretical volumes calculated on the basis of the Drawings, or as otherwise approved by the Engineer and paid at per cubic foot at the rates entered in the Bill of Quantities.

   Recesses (e.g. openings in slabs, break-through and the like) with an individual volume of more than 1 sq. ft. or 2 cft shall be deducted.

b) The prices for concrete works shall include all cost for the complete work and are not limited to the cost of formwork, its support, anchoring's, chamfers, construction joints etc., the required scaffolding, falsework, temporary works, post-treatment and, if necessary, repair of concrete, all preliminary and routine tests, as well as the required statical checks and drawings for Temporary Works in connection with the concrete works.

c) The cost for special finishing of exposed concrete surfaces such as fair-faced finish etc. shall be included in the unit price applicable to the respective structural member and will not be compensated for separately.

d) The cost of all concrete admixtures and additives shall not be paid for separately and is deemed to be included in the unit rates of respective items of the BOQ.

Joints

a) Expansion Joints

   Expansion joints will be paid per number, according to the Drawings. The prices shall include all costs for the different materials and performances relative to the laying and sealing of the joints.

b) Dummy Joints

Dummy joints required by the Contractor with the Engineer's consent for the sound execution of the Works will not be paid for separately, but the costs involved are deemed to be covered by the concrete prices applicable to the respective structural member.

c) Construction Joints

Construction joints will be measured and paid for as below:

The Contractor is deemed to have covered the costs for all related supplies, laying, formation and performances of construction joints included in the respective concrete prices. However, the cost of PVC water stoppers and or swell bars shall be measured and paid for separately per running foot of accepted lengths.

It the approved pouring sequence has not been followed by the contractor. Any increase in quantity of materials (pvc water stoppers, swell bars, rear guards, sealants, SBR etc.) associated with the construction joints and or additional reinforcement required shall be paid for by the Contractor at his own cost.

Tamping of Equipment and Grouting of Recesses

The costs resulting from materials and performances in connection with the tamping of installed items or the grouting of recesses are deemed to be included in the prices for the supply and/or installation of the respective items, and will therefore not be separately compensated for.

**** END OF SECTION****

SECTION - 5

REINFORCEMENT STEEL

5.01 SCOPE OF WORK

The work covered by this subsection of the specifications consists of furnishing all materials, tools, labor and in performing all operations in connection with the providing, straightening, cutting, bending, fixing, binding including binding wire, chairs, pins, spacer blocks complete in strict accordance with this subsection of the Specifications, the applicable Drawings, approved bar bending schedule, and the terms and conditions of the Contract.

5.02 GENERAL

a) The Contractor shall procure reinforcing steel only from reputable manufacturers/ suppliers duly approved by the Engineer.

b) Verification of the source of supply shall be prepared by the Contractor and submitted to the Engineer along with necessary certificates and test reports.

c) The Contractor shall prepare detailed bar cutting and bending schedules on the basis of the working Drawings and in consideration of BS-4466 and of any requirement resulting from the applied bar bending process.

d) The Contractor shall inform the Engineer of the completion of any reinforcement in time, in order to facilitate its inspection and check of conformity with the working Drawings well before the concreting. Relevant formalities shall be agreed upon between the Contractor and the Engineer at the appropriate time.

e) Reinforcement bar sizes have generally been shown on the Drawings in the form of designated bar numbers.

5.03 MATERIAL

a) Reinforcement shall be deformed reinforcement, except that plain reinforcement bars are permitted for spirals. Reinforcing steel bars (Plain and deformed) shall be from the new billet stock of mild steel and shall conform to the British Standard Specifications mentioned below and as indicated on the Drawings and Bill of Quantities.

i. Hot rolled deformed bars conforming to ASTM A-615 / BS 4449
ii. Cold worked deformed bars to conforming to BS 4461 (revised 4449-1988)
iii. Plain round steel bars to conforming to BS 4449

b) For each consignment, the Contractor shall furnish to the Engineer the manufacturer's mill test certificates to guarantee that the steel supplied meets all the requirements of the relevant specifications and further meets the requirements of specified characteristic strength and minimum tensile strength requirements given as under:-

High Yield Deformed Steel Bars:

i. Specified Characteristic Strength:

up to 16 mm (5/8")	460 N/mm2 (66,700 psi)
over 16 mm (5/8")	425 N/mm2 (61,625 psi)

ii. Tensile Strength:
Minimum Tensile Strength shall be 10% greater than the Specified Characteristic Strength.

iii. Minimum Elongation

up to 16 mm (5/8")	12%
over 16 mm (5/8")	14%

Mild Steel Plain Steel Bars:

(i) Specified Characteristic Strength 250 N/mm2 (36,000 psi)

(ii) Tensile Strength:
Minimum Tensile Strength shall be at least 15% more than the Specified Characteristic Strength.

(iii) Minimum Elongation 22%

a) **Bendability**
All the bars shall be capable of being bent cold through 180 degree round a pin without cracking on the outside of the bent portion as per ASTM-A615.

b) 18 gauge galvanized wire to BS 4482 shall be used for binding the steel reinforcement.

c) Samples shall be tested for above requirements in an approved laboratory before starting the cutting of bars or when so required by the Engineer; and all cost of such tests shall be borne by the Contractor.

d) All reinforcing steel bars shall be free from loose mill scale, loose rust, oil, grease, dirt or other harmful substances.

Wire Gauze

General
Unless otherwise specified the wire gauze shall be of best quality approved uniformly, woven wire webbing of 12 x 12 meshes to 645 mm square (one Sq. Inch) made from 22 gauge galvanized iron wire. All panels shall be in one piece and no joints shall be allowed.

Fixing
Wire gauze shall be fixed as shown on the drawings or as directed. The gauze shall remain tight to the fill width without any sag.

5.04 STORAGE

Reinforcement bars shall be stored on platform sufficiently above ground surface and be free from scales, oil, and structural defects prior to placement in Works. Rusted or dirty steel bars shall not be used in the Works unless brushed and cleaned by proper steel wire brushes and after being approved for use by the Engineer.

5.05 REINFORCEMENT CUTTING AND PLACING

All reinforcement steel shall be cut and bent cold in strict accordance with bar bending schedules prepared by the Contractor and approved by the Engineer. The Contractor shall prepare bar bending schedule from approved structural working Drawings and as per instructions of the Engineer. The bending schedules shall be drawn on approved forms and submitted to the Engineer for checking and approval. The steel reinforcement shall be cut and bent to sizes as per Drawings and approved bending schedules. In case, any bars cut, bent or even fixed in position are found incorrect in dimensions, size and shape and are not according to the requirements of the Drawings or instructions of the Engineer, notwithstanding any previous approval of the Engineer, the Contractor shall replace such steel bars, cut, bent or fixed in position, by correct sizes bars at his own cost and no extra payment shall be made to the Contractor on such account. Suitable spacers, chairs as approved by the Engineer shall be used for the purpose of supporting and spacing of bars. In case, any bars are bent or displaced they shall be straightened or replaced prior to pouring. All reinforcement bars within the limit of a day's pour shall be in place and firmly tied with 18 gauge wires. Bars with kinks or bends not shown on the Drawings shall not be used. Reinforcement bars shall not be used for supporting the workmen and concreting work. Separate supporting system shall be used for this purpose.

Concrete cover to all reinforcement bars shall be provided as shown in the Drawings using steel chairs and concrete spacer blocks.

The concrete spacer blocks shall be cast from cement sand mix in a ratio of 1:2 in suitable required sizes. These shall be well cured and dry before use in the Works. The spacers shall meet the specified requirements of water absorption. All spacers shall be properly fixed in their required positions and as directed by the Engineer.

For any structural member which shall receive fair-forced concrete surfaces, special spacers shall be used while do not impair the specified appearance of concrete surfaces.

5.05.1 Laps and Splices

No splicing of bars shall be allowed at positions other than shown on the Drawings. All lap lengths shall be of the minimum sizes as indicated on the Drawings and in accordance with ACI 318-95. Splices of adjacent bars shall be staggered, unless approved otherwise by the Engineer. All reinforcing steel fixed in position shall be inspected by the Engineer and no concrete shall be poured until steel placement has been approved in writing by the Engineer. For inspection purposes, the Contractor shall give to the Engineer reasonable notice before the scheduled pouring time. Clear concrete cover to reinforcement steel shall be as specified or indicated on the Drawings.

5.05.2 Mesh Reinforcement

a) Where indicated mesh shall be of the sizes as shown on the Drawings and conform to BS 4482 or 4449 with mesh sizes to BS 4483 or ASTM A-185 (Welded Steel Wire Fabric for Concrete Reinforcement). Mesh reinforcement when used in slabs shall be supported at proper elevations by standard accessories. In slabs on ground (porous fill), precast concrete spacer blocks may be substituted for chairs.

b) Overlaps in fabric reinforcement shall be a minimum of two meshes, except where otherwise shown on the Drawings, correctly aligned and at least 50% of the wire intersections shall be tied with 18 gauge tying wire. Laps shall be staggered in adjacent rows of sheets.

5.06 MEASUREMENT AND PAYMENT

Reinforcing bars will be measured as per Drawings in consideration of the volumetric weight of 7.85 t/m3, without additions for rolling tolerances, deformations, waste lengths and binding wires and paid per ton at the unit rate entered in the Bill of Quantities.

The prices shall include all costs involved with the supply, transportation, storage and protection, the cutting, bending and placing, inclusive of concrete spacers, supports, stands, tying into position, etc.

Assembly stands, spacers etc., whether designated in the Drawings or not or otherwise demanded by the Engineer will not be measured and paid for separately.

If installed reinforcement must be dismantled under certain circumstances or where additional reinforcing bars are to be provided on Engineer's instruction, the Contractor is not entitled to any compensation, if such additional supplies and/or performances are required and demanded by the Engineer due to the Contractor's faulty execution of the respective work.

**** END OF SECTION****

SECTION - 6

FORMWORK

6.01 GENERAL

The formwork shall be inclusive of all labor, material, workmanship and alike. All formwork and supports thereto shall be designed by the Contractor and relevant drawings shall be submitted to the Engineer for approval before the Work is put in hand. Such an approval shall not relieve the Contractor from all or any of the obligations of the Contractor or give rise to any claims.

6.02 MAKING FORMS

The formwork for columns, beams, slabs, foundations, pits, lintels, fins, panels, purdees, parapets and all other works whether to be precast or cast-in-situ shall be of steel plates, scaffolding pipes and joints or other approved material and shall be rigidly formed and designed by the Contractor to the shapes and forms as per Drawings in accordance with the best of the existing practices, so as to be able to withstand without displacement, deflection or deformation or movements of any kind, the pressure of the moist concrete and all other loads. No plank timber formwork will be accepted at any location. Only system formwork will be accepted.

6.03 FAIR FACED FINISH

a) Facing Material
The form facing material shall produce a smooth, hard, uniform texture on the concrete. It shall be M.S. steel sheets, plywood, tempered concrete grade hardboard, metal or plastic, or other approved material capable of producing the desired finish. The arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to the practical minimum. It shall be supported by studs or other backing capable of preventing excessive deflection. Material with raised grain, torn surface, worn edges, patches, dents, or other defects which will impair the texture of the concrete surface, shall not be used. Tie holes and defects shall be patched. All fins shall be completely removed.

b) Shop Drawings
Shop Drawings shall be submitted by the Contractor for Engineer's approval, showing grooves, joints etc. if indicated on the Drawings or instructed by the Engineer before taking up the job of formwork in hand.

c) Repair
No repair of surfaces designated `fair faced' shall be allowed. Any concrete failing to achieve the desired finish or with defective surfaces shall be removed and replaced at Contractor's expense. The Engineer may reject any defective concrete surface and order it to be cut out in part or in whole and replaced at the Contractor's expenses.

6.04 RIGID WITH ALLOWANCE FOR CAMBER & BULGES

The formwork shall be fabricated and erected in position, perfect in alignment, levels and true to plumb and shape and securely braced so as to enable it to withstand all weights, dead and live, to be endured during placing of concrete and its subsequent hardening till the formwork is struck. It shall be sufficiently rigid as not to lose its shape and shall be made to compensate for bulging, and deflection to give the finished concrete the required lines, plumb, size and shape.

6.05 EXPOSED SURFACES LEFT UN-PLASTERED

In addition to the provision made elsewhere, for all the concrete work covered in this Contract which are to remain exposed in the finished work and left un-plastered, the formwork shall be smoothly faced by using M.S. steel sheets or lining the shuttering with smooth G.I. sheets or non-absorbent material like Formica sheets or in any manner as approved by the Engineer so as to make a perfectly smooth surface of the finished concrete. Where any surface defects on the exposed concrete surfaces occur and which do not impair the structural performance, being in excess of the designed surfaces and the

architectural appearance of the Work in the opinion of the Engineer such defects may be removed by guniting and grinding with carborundum stone or in any other approved manner, at the cost of the Contractor, otherwise the whole or part of the Work shall be removed and made good by the Contractor, at his own cost. For precast concrete members, the forms shall be rigid, exact and smooth.

6.06 MATERIALS AND LABORS

The Contractor shall supply all materials runners, and labor, necessary for a good and speedy erection of formwork such as steel plates, shuttering planks, struts, bolts, stays, gangways, boards, fillets etc. and shall do all that is essential in executing the job in a workman-like manner to the satisfaction of the Engineer.

6.07 FORMWORK NOT TO INTERFERE OR INJURE WORK

The formwork shall be so designed and arranged as to not unduly interfere with concrete during its placing and easy to be removed without injuring the finished concrete. Wedges, clamps, bolts and rods shall be used, when permitted and where practicable, in making the formwork rigid and in holding it to true position.

6.08 OPENINGS IN FORMWORK

Wherever concreting is required to be carried out within forms of depth exceeding 6.5 feet, temporary openings in the side of the form shall be provided to facilitate the pouring and consolidation of the concrete. Small temporary openings shall be provided at bottom of the forms to permit the removal of rubbish etc. but the same shall be suitably closed before pouring.

6.09 OPENING AND OTHER DETAILS

Provision shall be kept in the formwork such as openings, recesses, holes, pockets, fillets, etc. for housing services and other architectural details in the finished concrete or on its surface and edges as shown on the Drawings or as directed by the Engineer and to fix all necessary inserts, dowels, pipes, holdfasts etc. in concrete as shown on the Drawings or as directed by the Engineer.

6.10 JOINTS IN FORMWORK

All joints in the formwork shall be sufficiently closed to prevent leakage of mortar from concrete for concrete surfaces not to be exposed in the finished work. The joints in the finished work shall be close jointed and perfectly smooth so as not to allow any leakage of the mortar from the concrete and show any appearance of leaking mortar on concrete surfaces.

6.11 TREATMENT AND INSPECTION OF FORMS

All rubbish particularly chippings, shavings and saw dust shall be removed from the interior of the forms, before placing concrete. Forms shall be coated with approved shuttering oil before reinforcement is placed. Surplus oil on forms and any oil thus applied on reinforcing steel shall be removed. If the forms are not used within 24 hours, a fresh coat of oil shall be given before placing of concrete.

6.12 STRIPPING SHUTTERING

Formwork should not be removed until the concrete has developed sufficiently strength to support all loads placed upon it. The time required before formwork removal depends on the structural function of the member and the rate of strength gain of the concrete. The grade of concrete, type of cement, water/cement ratio, temperature during curing etc. influence the rate of strength gain of concrete.

No struts or timbering which serve the purpose of supporting the shuttering or centering shall be struck and removed without permission from the Engineer in writing and the work of striking and removal after the receipt of such permission shall be conducted under the personal supervision of the competent foremen in the employment of the Contractor and the Contractor even after the permission from the Engineer shall hold himself fully responsible for any consequences whatsoever.

In all cases the Engineer will direct and control the minimum period of time for which the forms, shuttering or centering shall remain in place before being struck; but, for the general guidance of the Contractor, the following are to be considered as the minimum periods for the main classes of Work.

Type of Formwork	**Normal Weather**	**Cold Weather**
Footing Sides	24 hours	36 hours
Vertical sides of Beams, Walls and Columns (unloaded)	24 hours	36 hours
Slab soffits (up to 15 ft span)	10 days	14 days
Slab soffits (> 15 ft span)	14 days	21 days
Beam soffits (up to 15 ft span)	14 days	21 days
Beam soffits (> 15 ft span)	21 days	28 days

The Engineer may require, however, that any walings, soldiers, struts or other timbers or supports, the removal of which may cause the transference of load to the finished work, to be kept in place for three weeks after the placing of the concrete.

The formwork parts and connections should be arranged in a way that makes formwork removal easy and simple, prevents damage to concrete and formwork panels so that it can be reused without extensive repair.

The formwork removal procedure should be supervised by the engineer to ensure that quality of hardened concrete in structural member, i.e. it should be free from or has minimum casting defects such as honeycombing, size and shape defects etc. These defects in concrete influence the strength and stability of structure. Thus immediate repair works can be done or the members can be rejected.

The separation of forms should not be done by forcing crowbars against the concrete. It may damage the hardened concrete. This should be achieved by using wooden wedges.

Beam and joist bottoms should remain in place until final removal of all shoring under them are done.

Joist forms should be designed and removed so that the shores may be removed temporarily to permit removal of joist forms but must be replaced at once. The shores and joists will be dismantled beginning from the middle of the member’s span, continuing symmetrically up the supports.

The approval from the engineer should be obtained for the sequence and pattern of formwork removal, prior to start of removal.

6.13 INJURY OR DAMAGE

The Contractor shall be responsible for any injury to the Work and any consequential damages caused by or arising from the removal and striking of forms, centering and supports, due to striking too soon. Any advice, permission or approval given by the Engineer relative to the removal and striking of forms, centering and supports shall not relieve the Contractor from the responsibilities herein defined.

6.14 TREATMENT AFTER REMOVAL OF FORMS

Any minor surface honey-combing or other irregularities are to be properly made good immediately upon the removal of the formwork and the surface made good to the satisfaction of the Engineer at the Contractor's own expense. Any small voids shall be neatly repaired with cement mortar consisting of one part of cement to two parts of sand and the whole surface rubbed over with carborundum stone and cement wash to bring the whole to a smooth and pleasing finish and uniform color.

6.15 TOLERANCES

The structure shall be built to dimensions and levels shown on the Architect's drawings. Deviation from true positions and/or levels will be accepted only if they do not affect the finished dimensions, positions and levels as shown on the Architect's drawings.

Permitted tolerances shall be in accordance with the current issue of BS 5606, Code of Practice for Accuracy in building with up-to-date amendments.

Construction Tolerances of Structural Elements Supporting curtain walls or surfaces affecting curtain wall set out:-

- Maximum deviation vertically from defined position immediately after stripping of formwork ±12mm.
- Maximum deviation laterally from defined position immediately after stripping formwork and prior to any pre-stressing (if used) ±12mm or building height/4000 whichever is greater. This laterally out of position tolerance includes all local deviations in edge of slab or edge beams as well as overall building tolerance.

NOTE: All structural tolerances given above are for curtain walls (if used) and for all external structural faces of building affecting set out of masonry, windows and other cladding/finishes.

6.16 EXTERNAL EXPOSED CONCRETE SURFACE

All external exposed concrete surfaces of cast-in-situ or precast units shall be given smooth or pattern finish as shown in the Drawings schedule or as directed by the Engineer.

6.17 MEASUREMENT AND PAYMENT

All costs for formwork must be included in the concrete prices and will not be measured and paid for separately.

**** END OF SECTION****

SECTION - 7

BRICKS MASONRY WORK

7.01 SCOPE OF WORK

The Work covered by this section of the Specifications consists of all work required in connection with construction of brick masonry portions of structures and partition walls including, cement mortar, all related items and appurtenances including all items supplied by other trades and customarily built-in and installed under masonry work or required to complete masonry work, all labor, plant, tools, scaffolding, hoisting equipment and all other materials, and in performing all operations in connection with brickwork, i.e., erecting, placing, bedding, building in, curing and protecting all masonry works, complete in accordance with requirements of Drawings, Bill of Quantities, Specifications as stated herein, and to the entire satisfaction of the Engineer and subject to the terms and conditions of this Contract.

7.02 MATERIALS

Bricks for plain brick masonry shall be first class bricks made from carefully selected earth which shall be good loam or clay. The earth shall be free from objectionable quantities of lime, gravel, coarse sand and roots and other organic matter. The salt contents shall not exceed 0.3 per cent and calcium carbonate content shall not exceed 2 per cent.

7.03 BRICK MANUFACTURE

All bricks shall be manufactured by the Trench Kiln Method or other standard method approved by the Engineer. The moulds to be used in the manufacture of bricks shall be thoroughly sanded before each use and shall be sufficiently larger than the size of the bricks being manufactured to allow for shrinkage in drying and burning. Each finished brick shall be a nominal 230x115x75 mm in size, shall weigh between 3.2 and 4.1 kilograms and shall have a "frog" 6-millimeter-deep on the upper face. The bricks shall be thoroughly burnt but without being vitrified. The bricks used shall be well burnt, uniform in shape, size, texture, Color and should produce a ringing sound when struck. The bricks shall be free from flaws, cracks, chips, stone nodules of lime or kankar or other blemishes. Bricks over burnt, vitrified, irregular in shape or not having uniform Color or under burnt shall not be used. Bricks of uniform size shall be used throughout the work and the source of supply shall not be diversified.

7.04 STACKING AND SAMPLING

The bricks shall be sorted and arranged in stacks of one or two thousand or as directed by the Engineer. Each stack shall be 10 courses high and two bricks thick so that at least 2 feet (0.6 metres) space between the stacks shall be left for the purpose of inspection. Each size or class of brick shall be stacked separately. For purposes of inspection and tests the sample bricks shall be selected by the Engineer or a person authorized by the Engineer for this purpose. These samples shall be furnished by the Contractor without charge. The sampling shall conform to ASTM C 67. For the modulus or rupture, compressive strength and absorption determinations at least 10 bricks shall be selected from each lot of 25,000 bricks or a fraction thereof. For larger lots five additional bricks shall be selected from each 50,000 bricks or a fraction thereof contained in the lot. In no case shall less than 5 bricks be taken. Additional specimens may be taken at the discretion of the Engineer. Each specimen shall be marked so that it may be identified at any time. Markings shall not cover more than 5 per cent of the superficial area of the specimen.

7.05 SCAFFOLDING

Contractor shall provide safe scaffolding of adequate strength for use of workmen at all levels and heights. Scaffolding which in the opinion of the Engineer is unsafe, shall not be used until it has been strengthened and made safe for use of workmen to the satisfaction of the Engineer. Damage to masonry from scaffolding or from any other causes shall be repaired by the Contractor.

7.06 PLACING BRICK MASONRY

The methods and equipment used for transporting the bricks and mortar shall be such as will not damage the brick nor delay the use of mixed mortar. Brick shall not be placed during rains sufficiently heavy or prolonged to wash the mortar from the brick. Mortar already spread which becomes diluted by rain shall be removed and replaced before continuing with the work. All brick to be used in brick masonry shall be moistened with water for three to four hours before they are used by a method which will ensure that each brick is thoroughly and uniformly wetted. All bricks shall be free from water adhering to their surface when they are placed in the brick masonry. Bricks shall be laid "frog" upward with mortar joints and in English/Flemish bond as shown on the Drawings or as directed by the Engineer. Both bed and vertical joints shall be approximately 6mm and 10mm in thickness completely filled with cement mortar as specified herein, and each brick shall be bedded by firmly tapping with the handle of the trowel. All horizontal joints shall be parallel and all vertical joints in alternate courses shall be directly over one another. Excess mortar at the outer edges shall be removed and joints drawn straight with the edge of a trowel and a straight edge. All anchors and similar work required to be embedded in the brick masonry shall be installed as the work progresses. At the completion of the work all holes or defective mortar joints shall be cut out and repointed. Where shown on the drawing the exterior faces of the walls shall be finished by striking the joints as the work proceeds. The joints shall be struck by raking the green mortar after the brick work has been laid and finishing the joint with a pointing tool. Horizontal joints shall be struck to form a weathered joint and vertical joints shall be struck with a V notch. Care shall be taken that the striking tools do not develop a cutting edge as the object of striking the joint is to compress the mortar into the joints. The exposed faces of all brick masonry shall be thoroughly cleaned and left bare with struck joints as specified above. The fair face Brick cladding (gutka) shall be laid in running bond unless otherwise as shown on the drawing or directed by the Engineer

7.07 CURING

All brickwork requiring mortar shall be cured by water or other acceptable methods. All methods and operations of the Contractor in curing the different portions of the work shall be subject to the approval of the Engineer. When curing by water, the brickwork shall be kept wet for 7 days unless specified otherwise or covered with water-saturated material or by a system of perforated pipes, mechanical sprinklers, porous hose, ponding or by any other approved method which will keep all surfaces to be cured continuously wet. Water used for curing shall meet the requirements for water used in the manufacture of bricks.

7.08 PROTECTION AND CLEANING

7.08.1 Surface of masonry not being worked on shall be properly protected to all times during the construction operations. When rain is expected and the work is discontinued, the top of exposed masonry walls shall be covered with a strong waterproof membrane, well secured in place.

7.08.2 Exposed masonry surfaces shall be cleaned with water and fiber brushes or as directed by the Engineer.

7.08.3 Protect adjacent work during cleaning operations. Make good any damages from neglect of this account.

7.09 SAMPLES

Samples of all kind of materials to be used on the job shall be submitted to the Engineer and to be approved by him before quantities are procured for the Works. Source of supply or quality or materials not be changed unless authorized in writing by the Engineer.

7.10 TESTING

All the materials and completed masonry work shall be subjected to standard testing and if found below the Specifications and BSS or ASTM standards, shall be rejected. Rejected material shall be removed from the Site immediately at the Contractor's expense. All testing shall be done at the Contractor's cost.

7.11 CONCRETE LINTEL BEAM

Unless otherwise indicated, provide concrete lintel over openings in the concrete masonry unit walls and partitions. Lintels shall be of the size and shall be reinforced as indicated. All lintel shall be as-in place and when exposed shall be the same color, surface texture and finish as the adjacent walls or partition. Concrete work shall conform to section 4 of this specification.

7.12 MEASUREMENT AND PAYMENT

Masonry Works in accordance with this section of Specifications shall be measured and paid for per square Meter/feet wall of a thickness as specified in the Drawings and Bill of Quantities complete and approved including mortar as specified, preparations, tests etc. but excluding cost of brick which shall be supplied by the Employer. Openings of more than 0.28 sq.m shall be deducted. Damp-proof course shall be measured and paid for separately.

Steel anchors/wall ties for connection to R.C.C. or steel columns are deemed to be included in the above rates and will not be paid for separately.

Cuttings for conduit/pipe installations, anchors, fixing of other installations, embed items, fittings & fixtures are deemed to be included in the relevant items and will not be paid for separately.

**** END OF SECTION****

SECTION - 8
PLASTERING AND RENDERING

8.01 SCOPE OF WORK

The Work covered by this section of the Specifications consists of furnishing all plant, labor, appliances/ equipments and materials for performing all operations in connection with lathing, plastering and rendering, complete in all respect; in strict accordance with this section of the Specifications and the applicable Drawings and subject to the terms and conditions of the Contract.

8.02 APPLICABLE STANDARDS

Latest editions of following Pakistan, British & ASTM standards are relevant to these specifications wherever applicable.

Pakistan Standard
PS 232 Ordinary Portland Cement

ISO (International Organization for Standardization)
R 597 Definitions and terminology of cement.

R 679 Method of testing strength of cements, compressive and flexural strength of plastic mortar (Rilem - Embureau method).

R 680 Chemical analysis of cement& main constituents of Portland cement.

R 681 Chemical analysis of cements-mixer Constituents of Portland cement.

R 682 Chemical analysis of cements - determination of Sulphur as Sulphide.

ASTM (American Society for Testing and Material)
C 144 Aggregate for Masonry mortar
C 631 Bonding compounds for interior plastering

BSI (British Standards Institution)
812 Methods for sampling and testing of mineral aggregates, sands and fillers.

1199 Sands for external renderings internal plastering with lime and Portland cement and floor screeds.

1369 Metal lathing (steel) for plastering.

5262 External rendered finishes.

5492 Internal plastering.

8.03 GENERAL

Except as may be otherwise shown or specified, all interior & exterior plaster shall be cement plaster in specified thickness shown on Drawings & BOQ. Plastered ceilings and walls shall include partitions, piers, columns, beams, ceilings, plastered jambs and other returns, reveals, and backs of recesses and alcoves, and joints and heads of windows and doors, unless otherwise specified or shown on the Drawings. Plaster on walls shall be carried down to dado, skirting and projected bases. Plasterwork shall also include all plasterwork on and under concrete surfaces and masonry. Concrete surfaces to be left exposed and concrete not specified to be left fair faced, as indicated on Drawings.

A 3/8" render coat shall be applied to walls with a slightly roughened surface where wall finishes of applied nature, such as ceramic tiles, marble tiles, granite tiles, textured paint etc., are to be installed over wall surfaces.

Plastering shall not commence until all electric conduits, drainage and sanitary pipes, inlets to tanks, brackets, clamps, doors and window frames and all sorts of inserts and embedded items are fixed in position. It shall be the responsibility of the Contractor to make sure that other contractors carry out all such work before starting of plasterwork. Chiseling and repairing of cement plaster shall not be permitted without the approval of the Engineer.

8.04 MATERIALS

a. Cement for plaster shall be Ordinary Portland Cement (BS 12 or PS 232) or Sulphate Resisting Cement (BS 4027 or P.S. 612) as specified and shall conform to requirements specified in the section "Plain and Reinforced Concrete".

b. Sand for plaster shall comply with the requirements of BS 1199, BS 1200, ASTM C-33 and/or the Pakistan Standard "Sand for Plaster" as directed by the Engineer.

c. Water shall be clean and free from oils, acids, alkalis, salts and organic or other injurious matter and as described in section for "Plain and Reinforced Concrete".

d. All materials and workmanship for plaster not explained in these Specifications, shall comply with the requirements of relevant BS CP 211 and CP 221 as directed by the Engineer.

e. External rendered finishes should comply with appropriate clauses of BS 882.

f. Mortar plasticizer shall comply with BS 4887 and shall be used in accordance with the manufacturer's instructions.

g. Pigments to be used shall comply with BS 1104.

h. Galvanized metal angle beads and plaster stops shall be as manufactured by the Expanded Metal Co. Ltd., London or other equal and approved.

8.05 MIXING OF PLASTER

Measurement of materials by volume shall be by containers of known capacity to maintain consistent proportions. No lumpy or caked material shall be used. Mixing equipment boxes and tools shall be clean. Materials shall be proportioned as specified on the Drawings or as directed by the Engineer. Mixing shall be continuous until all ingredients are evenly distributed and thoroughly mixed. Only limited water shall be added for proper workability and such quantity of mortar shall be prepared which can be consumed in thirty minutes after preparation. Preparation of mortar in bulk quantity for use during the entire day or for any other time more than that stipulated above is expressly prohibited. Re-tempering shall not be permitted and all mortar, which has begun to stiffen, shall be discarded.

Except where hand mixing of small batches is approved by the Engineer, mechanical mixers of an approved type shall be used for the mixing of plaster. Frozen, caked, or lumped materials shall not be used. Mechanical mixers, mixing boxes and tools shall be cleaned after mixing each batch and kept free of plaster from previous mixes. Plaster shall be thoroughly mixed with the proper amount of water until uniform in color and consistency.
Re-tempering will not be permitted, and all plaster which has begun to stiffen shall be discarded.
Plaster ingredients shall be thoroughly mixed either by hand on a clean cement concrete platform or by a mechanical mixer, as directed by the Engineer.

Water Proofing Plaster 1/2 inch. (13mm) thick 1:4 cement sand plaster mixed with approved water proofing agent.

Re-tempering will not be permitted, and all plaster which has begun to stiffen shall be discarded.

8.06 PROPORTIONING OF PLASTER ON INTERNAL AND EXTERNAL WALLS

All plaster shall be Portland cement plaster, all coats of which shall be mixed in the following proportions by volume:

- One part cement and 4 parts sand or specified otherwise.

All coats of plaster in water retaining structures shall be waterproofed by the addition of an approved waterproofing additive/admixture from BCR, Sika, Fosroc, Betocrete C-16or Master Builders or approved imported equivalent.

External plaster shall be pigmented plaster in the shades/ colors to the approval of the Engineer.

8.07 PREPARATION OF SURFACES OF PLASTER

a. Surfaces to receive plastering shall be brushed to remove all loose particles, dust, laitance, efflorescence, etc. and any projecting fins on concrete surfaces shall be hacked off.

b. Glossy or greasy surfaces shall also be suitably cleaned and chipped off to remove all traces of mould oil.
c. Where unduly smooth in-situ concrete surfaces are encountered, such surfaces must be hacked properly before applying plaster.
d. Surfaces shall thoroughly be sprayed with water and all free water allowed to disappear before plaster is applied.
e. Irregularities in the surfaces to be plastered shall be filled with cement mortar 24 hours before plastering is commenced.
f. Before plastering is commenced, all junctions between differing materials shall be reinforced. This shall apply where walls join columns and beams particularly where cracks are likely to develop and places directed by the Engineer. The reinforcement of such joints shall consist of a strip of galvanized expanded metal lathe/mesh, at least 6" wide, which shall be plugged, nailed or stapled to the surfaces to be plastered at the intervals not exceeding 12". The joints in mesh shall be lapped minimum 6".
g. Metal angle beads shall be fixed with plaster dabs at 24" centers applied to the wall on either side of the arise and the wings of the beads pressed well in.
h. The Plaster stops shall also be fixed in a similar manner or plugged, nailed or stapled to the surfaces to be plastered to the approval of the Engineer.
i. Metal angle beads and plaster stops shall be fixed at places shown on the Drawings or as directed by the Engineer.
j. It shall be responsibility of the Contractor to ensure that all electrical conduits, pipes, concealed or embedded items, ducts, brackets, doors, window and ventilator frames, and all other fixtures on walls, ceilings, columns or required elsewhere have been fixed in position before the plastering is commenced.
k. Cuttings and chasings in the blockwork shall be repaired as per the instructions of the Engineer at least twenty four hours before the plastering is commenced.

8.08 APPLICATION OF PLASTER

The Contractor shall not start any work till the surfaces are inspected by the Engineer. In case, any plaster work is done without obtaining the consent of the Engineer, the Engineer shall have the right to order removal of all such work and cleaning and preparation of the surfaces to his full satisfaction and the Contractor shall comply with such orders without any delay.

All surfaces to be plastered shall be treated with cement slurry as a base coat for proper bond. Any approved bonding agent may also be used as an alternative to cement slurry.

Plaster to internal and external surfaces shall be applied in the thickness shown on the Drawings or specified elsewhere. In any case, the plaster thickness shall not be less than the specified thickness.

Plaster shall be applied in two (2) coats on masonry and concrete surfaces where thickness is more than 3/4". The thickness of each coat shall not exceed 3/4".

a. In case of 2 coats, the first coat or the under coat shall be full and thick and shall be applied with sufficient force to form good keys. The under coat shall be roughened and cross-scratched upon attaining its initial set to provide a proper bond to the next coat and shall be kept damp with a fog spray.
b. Finish coat shall not be applied until the under coat has seasoned for 2 days. Just before application of the finish coat, the under coat shall again be wetted evenly with a fog spray.
c. Finish coat shall be smooth finished.
d. The finish coat shall be kept moist with a fog spray for at least 2 days and thereafter shall be protected against rapid drying until properly and thoroughly cured.

Plastering shall be executed in a neat workmanlike manner and shall be finished off with a wood or steel float, straight and plumb and shall not have wavy surface. The surface shall be of even texture and entirely free from all marks. The edges and corners shall represent a straight line. All the arises shall be rounded to 6 mm radius unless otherwise specified.

Plastering shall neatly be made good around pipes or fittings.

As far as practical, plastering shall not be commenced until all mechanical, electrical and plumbing items, conduits, pipes, fittings and fixtures have been installed in their sequence of operations.

Plaster is to be maintained in moist condition for at least four days after it has developed enough strength not to be damaged by water.

Plaster stops and angle beads of expanded metal shall be used for protection of arises, edges and plaster ends as shown on the Drawings and as directed by the Engineer.

Plaster containing cracks, blisters, pits, discoloration or any defects shall not be acceptable. Any such defective plaster rejected by the Engineer shall be removed and replaced in conformity with these Specifications by the Contractor at his own cost to the satisfaction and approval of the Engineer.

8.09 SAMPLING OF PLASTER

Samples may be taken by the Engineer at any time from plaster work in place. Areas represented by samples which show over sanding will be rejected.

8.10 PATCHING

Plaster containing cracks, blisters, pits, checks, or discoloration will not be acceptable. Such plaster shall be removed and replaced with plaster conforming to this Specification and approved by the Engineer. Patching shall match with existing work in texture and colour.

8.11 CONCRETE / MASONRY JOINTS

All joints of concrete and block walls shall be specially treated as described here or as shown on Drawings. A 150 mm wide approved expanded metal shall be fixed at the joints and then plaster shall be applied. The expanded metal shall be with a weight of 3.0 lbs./sq. yd.

8.12 CLEANING AND PROTECTION

Rubbish and debris shall be removed as necessary to make way for work of other trades and as directed by the Engineer. As each room or space is completed al! Rubbish, debris, scaffolding and tools should be removed to leave the room clean.

Prior to plastering all aluminum windows, finished metals should be covered by sheet of plastic or tarpaulin to protect it from damage.

Protect finished plaster from injury by any source. Contractor shall also protect walls, floors and work of other trades from plaster materials.

8.13 TOLERANCES

The work shall be carried out while maintaining the following tolerances:

- Surfaces of plaster work shall be finished with a true plane to correct line and level unless otherwise specified and with walls and reveals plumb and square.
- Maximum permitted tolerances shall not exceed 1/8 inch. (3mm) in 6ft. (2 meter), but not exceeding 12 mm, maximum over the length of the building.
- Variation from plumb or level in any exposed line or surface and 1/16 inch (1.5 mm)
- Variation between planes of abutting edges or ends 1/16 inch (1.5 mm)
- Maximum permissible Offset at joints is1.5 mm maximum

8.14 MEASUREMENT AND PAYMENT

Plaster shall be measured and paid per square Meter/feet, complete and approved, at the unit rates entered in the Bill of Quantities, including preparations, junction reinforcements, angle beads, plaster stops, framing and metal furring, metal lathe, chamfered edges, rounding off corners etc. and in the thickness as specified in Bill of Quantities.

**** END OF SECTION****

SECTION - 9

CARPENTRY AND JOINERY

9.01 SCOPE OF WORK

The work covered under this section of Specifications consists of providing all material, labor, plant, equipment, appliances and performing all operations connected with the fabrication and erection of all woodwork, mill work, construction assembly, surface finish treatment and building in of all cabinet type items, supports etc. of wood or metal and incidentals, associated woodwork appurtenances, procuring and applying preservatives, installation of "Finish Hard Ware" in connection with finish woodwork as per details shown on the Drawings or as directed by the Engineer. The scope of this section is covered with detailed specifications as laid down herein.

9.02 APPLICABLE STANDARDS

Latest editions of following British and ISO Standards are relevant to these specifications wherever applicable.

ISO (International Organization for Standardization)

1891 Bolts, screens, nuts and accessories-Terminology and nomenclature.

1097 Plywood - Measurement of dimensions of panels.

1098 Veneer ply wood for general use-General requirements.

2427 Veneer ply wood with rotary cut veneer for general use-Classification by appearance of panels with outer veneer of beech.

2429 Ply wood - Veneer ply wood with rotary cut veneer for general use-Classification by appearance of panels with outer veneers of brand leaved species of tropical Africa.

3804 Ply wood-Determination of dimension of test pieces.

3805 Ply wood-Determination of density.

3806 Ply wood-Determination of moisture content.

6442 Door leaves-Measurement of defects.

6443 Door leaves-Measurement of dimensions and of defects of squareness.

6444 Door leaves-Test of behavior under humidity variations.

BSI (British Standards Institution)

459 Wooden doors.
1186 Quality of timber and workmanship in joinery.
1127 Hinges
1331 Builder's hardware for housing.
1567 Wood door frames and linings nails.
1202 Nails
1203 Specifications for synthetic resin adhesive for plywood.
1204 Synthetic resin adhesives for wood.
1282 Guide to choice, use and application of wood preservatives
1494 Fixing accessories for building purposes.
1579 Connectors for timber.
3842 Treatment of ply wood with preservatives.

9.03 MATERIALS

1. **Timber**

   Common Timber shall be sub divided into following:-.

   - ***Hardwood 1st Class***

     - Teak Burma
     - Shisham

   - ***Softwood 1st Class***

     - Deodar

   - ***Softwood 2nd Class***
     - Kail
     - Chir
     - Partal
     - Spruce
     - Garjan
     - Loagerstoemia

   Wood types to be used shall be taken as per architectural details.

2. **General Characteristics**

   All the timber shall be in accordance with the requirements of BSI No: 1186, 'Quality and Workmanship in Joinery'.

   The whole of the timber shall be from the heart of sound and fully grown tree, uniform in substance, straight in fibber, first class quality properly seasoned, free from large or loose dead knots, and open shakes and excessive sapwood. The scantlings of all timbers shall be bright, sound and square edged. The moisture content of timber shall not be more than ten (10) percent.

3. **Preservation of Wood**

   Prior to installation of all finish wood works in their respective positions, preservatives shall be applied to safeguard the woodwork against fungus, termite and bores.

   The preservatives shall be of the best available quality of solignam oil (clear) as approved by the Engineer. The method of application shall be strictly in accordance with the manufacturer's instructions. The treatment and application of all the preservatives shall comply with the requirements of BS-CP 98:1964.

4. **Adhesive:**

   The adhesives shall conform to the requirements of BSI No. 745 "Animal Glues for Wood" or as directed and approved by the Engineer.

5. **Nails and Screws:**

   All Nails shall comply with BS 1202, screws with BS 1210, bolts with BS 916 and timber connectors with BS 1579

6. **Ply Wood**

   a. The plywood shall comply in all respects with BSI No. 1455:1963. All the plywood shall

only be obtained from manufacturers approved by the Engineer.

b. Plywood used for doors, paneling and other similar works shall be to the thickness and size as shown on the Drawings or as directed by the Engineer. The grade shall be first quality and the face and back shall be free from end joints, dead knots, overlaps, patches and other surfaces shall be free, smooth for painting or polishing.

c. The veneer shall be of the required thickness and quality including base veneer and shall be impregnated with an approved adhesive and machine compressed. Such machine pressed veneered wood shall be fixed on all sides of the inner core wood (softwood of approved quality) after it has been treated with water resistant hot setting glue.

d. External quality plywood shall have Grade 2 veneer with WBP bonding and internal quality plywood shall have Grade 2 veneer with MR bonding.

7. **Manufactured Boards**

a. Blockboard shall comply with BS 3444 Grade 2.

b. Chipboard shall be resin-bonded wood chipboard complying with BS 2604.

c. MDF boards shall be "Lasani Board" complying with BS 1142 -89.

d. Gypsum plaster board shall comply with BS 1230.

8. **Decorative Plastic Laminate**

Decorative laminated plastic sheeting shall be 0.6 mm thick locally available complying to BS 3794 Class. Color and type shall be to the approval of the Engineer.

9. **Priming Coat**

Priming Coat shall comply with BS 2521.

10. **Wood Treatment**

Prior to fixing in position, all the timber including ceiling frames, joints, purlins, planks, all the door frames, furring strips, blocking, grounds, nailing strips scantlings, boards etc. in contact with concrete or masonry or wood or other materials shall first be treated with clear Termidor insecticide for termite proofing with approved pressure spraying equipment. All spraying will be done within one week of working of the material. Spraying shall once again be done at the site, after delivery and before installation in accordance with manufacturer's instructions and complying with BS 1282.

11. **Ground, Blocking and Nailing Strips**

Ground, blocking and nailing strips shall be provided in ceiling and elsewhere as necessary or as shown on Drawings to receive the Work included herein ad as required for the Work of other trades.

Except as otherwise shown or specified and approved by the Engineer, ground, blocking and nailing strips shall be secured in place as follows:-

- To steel – by means of ½" diameter bolts spaced not over 4 ft.
- To concrete blocks - by the use of steel cut nails spaced not more than 4 ft. apart and driven directly into the block.
- To poured concrete – by means of galvanized screws as per details shown on the Drawings.

12. **Glues**
All glues and adhesives used in carpentry, joinery and in the door manufacture shall be synthetic resin adhesives to BS 1204, unaffected by oil, gasoline and solvents, resistant to the growth of fungus and bacteria, immune from insects and such that the cured glue shall not be harmed by paint and lacquer solvents. The Contractor shall furnish a guarantee that the adhesives/glues used in the manufacture of all doors, joinery and paneling work conform to the Specifications stated above. All the samples of gluing materials shall be subject to the approval of the Engineer before use.

9.04 SAMPLES

All samples of the material used for the work under this Section of Specification shall be approved by the Engineer and same type of material shall be used throughout the work. If the Engineer desires to get the material tested, this will be done by the Contractor at his own cost from a laboratory approved by the Engineer.

9.05 FABRICATIONS

General
Unwrought' timber shall be used. Sawing shall be done true to the size and dimensions to finally meet the requirements of specified sizes and dimensions of the finished work.

All framing shall be joined as shown on the Drawings or as directed by the Engineer. All joints shall be secured with sufficient number of nails. The Contractor shall perform all necessary mortising, tenoning, grooving, matching, tonguing, housing, rebating and all operations required for the correct jointing. The Contractor shall also provide all metal plates, screws, nails and other fixing material that may be ordered by the Engineer for the proper execution of the joinery work. Fabrication that develop defects due to bad workmanship or unsound materials not conforming to these specifications and the directions of the Engineer, shall be cut out and replaced at Contractor's own expense before the expiry of the maintenance period.

Doors
Verify design and size of doors required for each opening. Door thickness shall be 40 mm (1 1/2 inch.) unless otherwise indicated.

Fabricate flush wood doors in accordance with the following requirements.

Cores
Edging of doors, cores and shutters shall be of wood as shown on the drawings planed to a smooth uniform thickness.

All doors and shutters shall have wood lapping on all edges as per details shown on the drawing.

Face Panels
- Door facing on each side of door shall consist of plywood have total minimum thickness of 1/8 inch before sanding.

- Door plywood shall be bonded to each other, and to core unit with approved adhesive and machine compressed.

9.06 PROTECTION OF MATERIALS

All materials and assembled units shall be protected from weather and stored in such a way as to prevent decay and attack by fungus and termites.

9.07 WOODEN DOORS & DOOR FRAMES

9.07.1 Materials

- First class Deodar wood as approved by the Engineer shall be used for the door frames and full/half glazed and paneled shutters.

- The plywood and veneering shall be of selected best quality as approved by the Engineer.

9.07.2 Exterior and Interior Door Frames

All exterior and interior door frames shall be constructed 18 SWG MS sheet or of wood as shown on the drawings.

The door frames shall be secured in place by means of mild steel anchors welded/screwed in place and built into the masonry as it is being constructed. There shall be one such anchor near the top and bottom of each jamb but not over 900mm intervals between the top and bottom anchors.

9.07.3 Exterior and Interior Wooden Doors

The Engineer shall unless otherwise shown or specified, of the paneled type, flush and type as shown on the Drawings or as direct the exterior and interior wooden door.

All the door shall conform to the following requirements:

Paneled doors shall be constructed in accordance with the requirements of Part I of British Standard Specification No. 459 with the additional requirements that panels in exterior openings shall be assembled with waterproof glue, glued tacked in place. Flush door shall comply with BSI 459 Part-2 and shall consist of solid core 40mm (1 1/2 inch.) thick shutters as shown on drawings.

9.07.4 Door Shutters

The shutters will be fixed to the frames with approved quality hardware schedule.

All doors, shutters shall be fabricated in a workman- manner strictly to the correct sizes and shapes as shown on the Drawings or as directed by the Engineer.

The door shutters shall have solid core as shown on the Drawings. It shall be built in sections, properly jointed and glued together, both sides being covered with plywood of the required thickness and approved quality. The surfaces shall be prepared for painting or polishing.

The arrangements of inner core for solid shutters shall be approved by the Engineer. It shall be so adjusted that circulation of air is free and uninterrupted. Minute holes shall be provided in edges at suitable places to admit and exit air.

Each door shall be constructed so as to permit the installation of hinges, knobs and locks in the position shown on the Drawings.

Completed doors shall be sound, rigid and free from defects and warp. All edges shall have Deodar wood lipping and shall be aligned and smooth, joints shall be close fitting, hard wood doweled or mortised framed and of strength to maintain frame and of strength to maintain the structural properties of the member connected. All adjoining edges and faces shall be flush and smooth. Edges shall be rectangular and solid

9.07.5 Fitting. Hanging and trimming

All the doors shall be fitted, hung and trimmed as hereinafter specified and as indicated on the Drawings.

Doors shall have a clearance of 4 mm at sides and top unless otherwise directed by the Engineer and shall have 5 mm clearance at bottom. Doors shall be hung and trimmed with hardware as specified. All the locks shall be installed at the same height and shall be located at height as directed by the Engineer.

9.07.6 **Hardware**

Hardware shall be of approved quality and first class finished material. The Contractor shall obtain prior approval from the Engineer for quality; shape and pattern of ail the hardware materials by providing samples and shall provide and fix only the approved hardware materials.

Hardware shall be carefully and securely fitted. Upon handing over the work, hardware shall be demonstrated to operate freely. Keys shall be placed into respective locks and upon acceptance of the work keys shall be tagged and delivered to the Employer.

9.07.7 **Quality Assurance**

Tolerances: Doors shall be fabricated to the following

- Size: Plus or minus 1.6 mm overall dimensions
- Maximum Wrap: 3mm
- Squareness: Maximum diagonal difference 3mm (between length of diagonal measured on face of door from upper right corner to lower left corner and length of diagonal measured from upper left corner to lower right corner).

9.07.8 **Submittals**

a. Provide shop drawings showing door types, details and locations, referred to the door type and hardware group shown on door and hardware schedules.

b. Provide certificates stating that doors were constructed timbers of the species specified having moisture content and meeting equilibrium and relative humidity requirements.

c. Submit samples of face veneers for selection of color and pattern.

9.07.9 **Product Delivery, Storage and Handling**

a. Keep products dry, stack products off ground on level platforms, fully protected from weather, including direct sunlight.

b. Identify type, size and location of each door in order to permit installation at correct location.

9.07.10 **Installation**

a. Install doors at correct openings and assure smooth swing and proper closer with frames.

b. Install finishes hardware in accordance with manufacturer directions.

9.08 KITCHEN CABINETS/WOODEN

CABINETS/WARDROBES/DRESSERS/SHELVES/SEATS

All kitchen cabinet/ wardrobes/ dressers/ shelves/ seat/ file cabinets including fittings, fixtures and hardware's shall be supplied of approved manufacturer and shall be of best quality fabricated by using materials and details as shown on the drawings.

9.09.01 **Installation**

All cabinets, wardrobes and shelves/seat shall be installed in position by the skilled workmen specialized in the job. Works shall be executed in accordance with drawings and the Engineer's instructions.

The Contractor shall inspect delivered cabinets, wardrobes seats and shelves and related parts for indication or location, size required by field measurements, finishing hardware and similar preliminary works. Verify locations for installation, required floor and wall finishes, painting and all other related work. Cabinets/wardrobe, shelves and seats shall exactly flush the floor and wall surfaces. Cut and fit accurately scribe strips at wall surfaces and bases. Secure wall cabinet to blocking. Concealed fasteners all joints surfaces shall be smooth and even. Doors and other moving parts shall exactly fit in the frame. Refit, as necessary, to ensure proper and easy operation. Refit, if necessary, all cabinet, wardrobes and shelves hardware, test for proper operation, remove for painting and other finishing and properly replace in position with all fittings and accessories.

All work shall be thoroughly protected from damage at all times by suitable methods approved by the Engineer. Adjacent works shall similarly be protected from damage. Any damage or disfigurement shall immediately make good at Contractor's expense.

9.09.02 Cabinet work will be coordinated with Employer supplied items (if any) such as cooking range etc.

9.09.03 Kitchen cabinet work, generally all Framing will be in treated Deodar wood with portions' etc., in best quality commercial plywood. All exposed surfaces will be covered by approved laminates. Exposed edges, if any, will be covered by polished Deodar wood lipping. Where approved counter tops for kitchen will be specified thick selected marble on painted M.S. framing.

9.09.04 Best quality hinges, metallic drawer guides (with bearing) and handles will be used. Samples and shop drawings to be approved by Engineer.

9.09.05 **Wardrobes**

Wardrobes (and similar works) will be made of deodar wood. Internal partitions will be as shown on the drawings. Shutters will have a (deodar wood) louvered front backed by laminated plywood. All louvers and exposed deodar wood edges/faces will be polished. Best quality hinges metallic drawer guiders (with bearing) handles locks catches etc., will be used. Shoe rack (inside wardrobe) will consist of 13mm dia (hollow) chrome plated M.S. rods. Samples and shop draw to be approved by the Engineer.

9.09 WOODEN LOUVERS

If shown on Drawings, wooden louvers shall be made in first quality seasoned deodar wood. Frame with recesses on sides to receive louvres shall be made as per details shown on the Drawings from first quality seasoned deodar wood planks and louvers shall be securely fixed in the recesses. The frame shall be anchored by means of 1"x4" M.S. hold fasts, and shall be perfectly in line and plumb.

9.10 ARCHITRAVES, MOLDINGS AND TRIMS

Architraves, Moldings, Beadings, miscellaneous trim and scribe pieces shall be provided as shown on Drawings and shall be in deodar wood shop milled to type, profiles and machine sanded to a smooth and even finish all to the approval of Engineer. On running trim, all outsides corners to be mitered and shall be leveled. All flat trim is to be blocked out to prevent warp. Nailing is to be concealed wherever practicable and all nails are to be driven below surface, filled in and polished or painted as specified

9.11 DEFECTIVE WORK

In the event of non-conformance to specification and drawings, the wood works shall be rejected by the

Engineer and the Contractor shall remove and replace the rejected work by new work of same specifications.

9.12 SURFACE PREPARATION

The surfaces of all wood works shall be prepared in the manner as directed by the Engineer for polishing and painting.

9.13 MOCK-UP SAMPLE

After approval of shop drawings and tests etc., the contractor shall submit at his own cost one mock-up sample of each type of wood works complete with all fittings/fixtures accessories prior to the actual fabrication of the bulk.
The samples shall be returned to the Contractor for incorporation in the works after installation of at least 80% of the works.

9.14 MEASUREMENT AND PAYMENT

Door shutters shall be measured per square Meter/ feet rough opening area, complete and approved, including cost of door frames, hardware as specified in Drawings, architraves/beadings etc. supply, fabrication, fixing, installation, at the unit rates entered in the Bill of Quantities.

No separate payment shall be made for Termite Proofing for carpentry/joinery items and shall be deemed to be included in the rates of relevant items.

All other items shall be paid at the rates entered in the Bill of Quantities.

***** END OF SECTION*****

SECTION - 10

ALUMINUM WORKS

10.01 SCOPE OF WORK

The work under this section of specification includes furnishing all labor, equipment, appliances and materials and performing all operations in carrying out the work of anodized aluminum doors, windows and ventilators (other than curtain wall type doors and windows) ventilators, louver and fly screen. All related items such as sealants, rubber gasket for glazing, netting, rollers, latches, fastenings, glazing, anchor bolts and all items supplied by other trades and customarily built in and/or installed in strict accordance with this section of the specifications and as shown on the applicable drawings and subject to the terms and conditions of the Contract.

10.02 APPLICABLE STANDARDS

Latest editions of following ISO and British Standards are relevant to these Specifications wherever applicable.

a. ISO (International Organization for Standardization

1804 Doors	- Terminology
6442 Door Leaves	- Measurement of defects of general flatness,
6443 Door Leaves	- Measurement of dimensions and defects of squareness.
6444 Door Leaves	- Test of behavior under humidity variations (successive uniform climates)
6612 Windows& Doors	Wind resistance tests
6613 Windows& Door	- Air permeability test.

b. BSI (British Standard Institution)

1227	- Hinges
4873	- Aluminum alloy windows

10.03 GENERAL

a. Aluminum doors and windows shall be of profile, pattern and design shown on drawings and manufactured by reputable manufacturer approved by the Engineer. The contractor shall provide manufacture literature completely describing the product, instructions for installation and maintenance.

b. All the sections used for doors, windows, ventilators & fly screens shall be of best quality aluminum products such as equal and unequal angles, channels, tubes, corrugated strips, moldings etc., in accordance with International standards conforming to ASTM B308 & B221.

c. All doors windows & ventilators shall be of type and size indicated on drawings and shall conform to the requirements shown and specified herein.

d. Contractor shall arrange tests and analysis if directed by the Engineer of scaled models of each window type at the maker's works or any laboratory specified by the Engineer for the material supplied by him to be tested in the presence of the Engineer's Inspector, to whom test certificates, proof sheets, etc. shall be furnished. The models shall be submitted to the Engineer for approval prior to testing. Nevertheless, neither the fact that the materials have been tested in the presence of the inspector nor that the Engineer may have been furnished with test certificates in lieu of sending an inspector to the works shall affect the liberty of the Engineer to reject, after delivery of materials found not in accordance with these specifications.

e. The contractor shall submit shop drawings, which shall show full construction details, quantities and locations, fastenings and attachment to adjacent construction and materials. Shop drawings shall be submitted at the proper time to allow for checking, revisions, and agreement and to permit manufacturer's product delivery and start of site work to suit the building program. The Contractor shall submit representative samples of finished windows, anchoring mechanism, embedded parts, fastenings, glass panes, accessories and other materials for the Engineer's

approval.

f. After approval of shop drawings and tests etc., the contractor shall submit at his own cost one mock-up sample of each type of aluminum works complete with glazing, all component assembly method and required fittings and accessories prior to the actual fabrication of the bulk. The samples shall be returned to the Contractor for incorporation in the works after installation of at least 80% of the works.

g. Fabricate and assemble all work in the shop of the approved manufacturer to reduce field fabrication to a minimum unless otherwise directed by the Engineer.

h. The glass shall conform to specification laid down under section 'Glazing' and shall be free from all blemishes, bubbles, distortions and other flaws of any kind and shall be properly cut to size as shown on drawings, so as to fit the grooves in door and window members. All the glass shall be best quality of approved manufacture.

i. The structural shape of the Aluminum members shall be of uniform quality, color and temper, clean, round, commercially straight and free from injurious defects.

j. All doors, windows and ventilators shall be fabricated as a complete unit, fully airtight and watertight, including rubber gasket for glazing, rollers, latch, anodized in specified color, inclusive of glass sheet, necessary holes for fixing, door locks, door closures and window locking requirements, all as approved by the Engineer.

k. Contractor shall, on request, get certificate signed by the manufacturer stating that each lot has been sampled, tested and inspected and has met the requirements in accordance with these specifications, and the same shall be furnished to the Engineer.

10.04 MATERIAL

10.04.1 Aluminum

a. All aluminum extruded sections shall comply with BS 1470 to BS 1474 and shall be manufactured by Pakistan Cables or approved equivalent. Certificates of origin shall be supplied in all cases.

b. All aluminum shall be anodized to comply with BS 3987 and 1615 with an anodic film thickness of not less than 25 microns. All surfaces are to be anodized.

c. Aluminum shall be supplied in natural matt anodized finish to the approval of the Engineer.

d. The Contractor/manufacturer shall provide 25 years guarantee of 25 micron anodized aluminum extruded sections against corrosion to the satisfaction of the Employer.

10.04.2 Other Components

a. All glazing gaskets are to be vinyl glazing channel gaskets (extruded Neoprene or Hypalon). Gaskets shall conform to commercial standard CS-230-60.

b. All draught seals are to be either in Neoprene as above, or in approved nylon pile, of density and configuration suitable for the designed condition.

c. All fly screens are to be approved pattern aluminum screens.

d. Hardware shall be manufacturer's standard match door and windows finish.

e. Joint sealant shall be approved elastomer.

f. The finish shall be in approved color in accordance with the standards of Aluminum Association.

g. Minimum coating should not be less than 23-25 micron.

10.04.3 Fixings

All fixings shall be in aluminum, non-ferrous metal or stainless steel, selected to prevent galvanic action with the components fastened. In no circumstances shall untreated or painted steel fixings be employed on any part of any door or window component.

10.04.4 **Glass and Glazing**

Glazing shall be provided as shown in Drawings and Bill of Quantities and shall meet the Specification requirements as described in "Section 12 – Glass & Glazing".

10.04.5 **Frames/Shutters**

The frames/shutters of anodized aluminum doors, windows, ventilator and louvers shall be formed from rolled, strip or extruded aluminum and be as per drawing. Fastening bolts and screws shall be made from hardened aluminum.

10.05 WORKMANSHIP DESIGN AND FABRICATION

The Contractor shall be responsible for the protection and installation of all items furnished. All items shall be installed plumb and square and shall be solidly anchored in a good workman like manner in accordance with the manufacturer's instruction and as specified herein. The Contractor shall be responsible for the protection of installed items from damage by other trades. All items shall be left in operating, neat and clean condition, free from dirt, finger marks, etc. The Contractor shall be responsible for final cleaning before the final acceptance.

The glass panes shall firmly be secured in the rebates with the rubber gasket. Ensure that the beads and grooves are clean, dry and unobstructed at the time of glazing. The complete unit shall be airtight and watertight on completion. No doors windows ventilator louvers shall be considered complete until and unless the fingerprints and other stains and marks have been removed from the surface of glass and aluminum.

10.06 PRODUCT DELIVERY AND STORAGE

10.06.01 Deliver doors, windows, ventilator and louvers in a manner preventing damage to units. Store materials off the ground under cover in a manner preventing deterioration or damage.

10.06.02 All embedded parts and anchor bolts shall be delivered to the site carefully and keeping the fabricated shape and configuration. All these parts shall be suitably marked for identification.

10.07 FIXING AND ERECTION

10.07.01 All aluminum doors, windows & ventilators shall be fixed in strict accordance with the manufacturer's detailed requirements and recommendations, using only fixing components specified by them, by operative experience in this work. All windows & ventilators shall be solidly and rigidly fixed, square, level, plumb and without distortion; all opening lights and hardware are to be eased, oiled and otherwise left operating smoothly.

10.07.02 All aluminum protection is to be left in place until all surrounding wet trades have been completed and cured; then removed by approved means.

10.07.03 Raw plugs and anchoring bolts shall be embedded into the concrete or block masonry for holding the doors, windows, ventilators and louvers in their correct positions.

10.07.04 Care shall be taken to install the doors and windows, ventilators and louvers in line and plumb& solidly anchored in a good workman like manner in accordance with the drawings. Should any scale or scratch appears on the surface of doors, windows, ventilators the contractor shall at his own expense and louvers the contractor shall at his own expenses and at the Engineers direction have all exposed surfaces cleaned to bare bright specified color.

10.07.05 All works shall be installed in strict accordance with the manufacturer's instructions.

10.08 PROTECTION AND CLEANING

10.08.01 Temporary protection shall be achieved by applying water-soluble protective coating capable of withstanding the action of lime mortar.

10.08.02 Apply coating in the manufacturer's plant to the exposed surfaces of all components.

10.08.03 Before application of coating, remove all fabrication compounds, moisture and dirt accumulations.

10.08.04 All the aluminum doors, windows & ventilators and other items shall be protected throughout the Contract period.

10.08.05 Any damage occurring to any of the member of the windows & ventilators before the Contract completion from whatever cause shall be rectified or replaced at Contractor's cost, all to the satisfaction of the Engineer

10.09 DEFECTIVE WORK

In the event of non-conformance to specifications and drawings the aluminum work shall be rejected by the Engineer and the Contractor shall remove and replace the rejected works by new work of same specifications.

10.10 GUARANTEE

The manufacturer shall furnish his standard written guarantee against leakage of rain, excessive infiltration of dust and air and all defects in materials and workmanship covering all work under this section.

Such guarantee shall be in addition to and not in lieu of all other liabilities, which manufacturers and the Contractor may have by law or by other provisions of the Contract Documents.

10.11 MEASUREMENT AND PAYMENT

Aluminum doors, windows & ventilators shall be measured per Square Meter/feet and paid for at the unit rates entered in the Bill of Quantities and as per the terms and Conditions of this Contract.

The unit rates shall include the cost of all glazing, aluminum sections, hardware, fly screens, fixing accessories, gaskets, sealants etc., fixing and installation, complete in all respect.

***** END OF SECTION*****

SECTION - 11

WATER PROOFING

11.01 SCOPE OF WORK

The works under this section of the Specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in any floor and at any height in connection with installation of insulation, water-proofing and built-up roofing, including water proof treatment to roof, terraces, balconies and other roofing structures complete in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and conditions of the Contract.

11.02 SUBMITTAL

2.1 Shop Drawings: Shop drawings showing layout and all the details for construction.

2.2 Samples of all materials proposed for use under this section shall be submitted to the Engineer for approval.

11.03 MATERIALS

a. 1/2" thick CS slurry with SBR

b. 3mm thick water proofing membrane

c. 200 micron thick polythene sheet

d. Average 3" thick PCC 1:3:6 screed

e. 3" to 1" CC 1:6 base laid to slope

f. Heat insulation tiles with expansion joints (for Roof)

g. 3/4" thick boticina marble slab (For Open Terrace)

h. Cement and aggregates shall be in accordance with specifications Section for "plain and reinforced concrete".

11.04 DELIVERY STORAGE AND HANDLING

Materials shall be protected from damage during loading shipment delivery and storage non-staining materials shall be used for blocking and packing.

11.05 PREPARATORY WORK

All scuppers and roof drains shall be placed and metal flashing, cant strips flanges etc. shall be provided in time to be installed along with the roofing assembly.

All surfaces, to be treated shall be dust free and dry. Application of roof finishes shall not start unless the preparatory work has been inspected and approved by the Engineer.

11.06 APPLICATION

a. All water proofing treatment shall be done as specified, as indicated on the drawings, as per manufacturer/ supplier instruction and to the approval of Engineer.

b. Waterproofing shall not be applied during rain or while surfaces are damp, it shall be applied only to surfaces that are clean and dry.

c. Mopping of surface with bitumen shall be performed so that the surface shall be completely covered. Coats of bitumen shall be as specified in drawings. All bitumen shall be applied with mops except that the hot surfacing application shall be poured from a dipper.

d. Polyethylene sheet shall be laid in position wherever shown in drawings. Where joint is necessary at the side or end of the sheet, this shall be a double weld folded joint made by placing the edges together and folding over twice continuously taking the top edge prior to plastering or screeding. The contractor shall protect the sheets from damages during laying and subsequent operation and shall replace at his own cost all damaged sheets to the satisfaction of the Engineer.

e. Mud mortar/concrete screed of specified thickness as indicated on drawing shall be laid in slope.

f. Brick tiles of specified size laid over prepared base to be grouted and flush pointed with cement sand mortar.

11.07 MEASUREMENT AND PAYMENT

The waterproofing shall be measured per square meter and paid as per unit rates entered in the Bill of Quantities inclusive of all overlaps, complete in accordance with the terms and Conditions of Contract.

PVC water stop shall be measured per running meter and paid at per unit rates entered in the Bill of Quantities of accepted lengths a complete with accordance with the terms and Conditions of the Contract.

***** END OF SECTION*****

SECTION - 12

MARBLE AND GRANITE WORK

12.01 SCOPE OF WORK

The work under this section of specifications, consists of providing all material, labor, plant, equipment, appliances and performing all operations required for providing and installing marble natural stone slab and tile finishes in floor and special aglow marble stone in floor & skirting, where shown on the drawings, complete in strict accordance with this section of the specification and the applicable Drawings.

12.02 SUBMITTALS

Submit three range samples of size as mentioned in BOQ, of each type of marble, granite used; showing color, grade, finishing and texture for approval.

12.03 DELIVERY, STORAGE AND HANDLING

Materials shall be protected from damage during loading, shipment, delivery and storage. Non-staining materials for blocking and packing shall be used. Stack marble units at site in accordance with manufacturer's recommendations and as required to prevent staining, scratching, etching or breakage.

12.04 MATERIALS

12.04.1 General

The marble/granite work of all types should be consistent in type, color range and texture.

Provide slabs or tiles of specified sizes in floor and wall areas as given in BOQ.

Provide marble/stone of specified thickness. Saw-cut the back surfaces that are meant to be concealed in finished work.

Provide irregular shaped units, staircase units and skirting base units to the profiles of required, with arises sharp true and matched at joints, polish exposed edges.

12.04.2 Marble/Granite Type

All marble/granite types are to be selected, as shown in drawings, as written in BOQ and as approved by the Engineer for quality, color and texture as:

a. Marble of local origin or imported, first class quality and high class finish acceptable to the Engineer.

b. As approved by the Engineer.

c. Granite shall be of good quality, having smooth, hard polished surface, regular in shape, size and of uniform thickness, of good appearance, and of sharp and square edges. It shall be free from cracks and other defects. The color and size shall be as per the instruction of the engineer, as per drawings, or given in BOQ. Sample of granite stone to be used shall be submitted to the engineer and his approval should be taken before the bulk purchase. All the granite stone supplied shall conform to the approved sample in all respect.

12.04.3 Beds and Backings

Where applicable, standard cementitious screed and mortar beds and backings, mixed and proportioned by volume as given in BOQ.
Mortar mixing shall be done as per specification for mortar mixing of block masonry work

12.04.4 **Adhesives Grouts and Sealants**

Proprietary adhesives, joint grouts and sealants of approved type as required and recommended by the manufacturer for specific application shall be used. The color of the joint grout and the sealants shall match with the color of stone/marble.

12.04.5 **Marble, Granite Counter Tops**

Marble/ Granite slabs to kitchen counters, toilet counters or others shall be provided to sizes and profiles as indicated on the Drawings. The marble/ granite tops shall be provided in configurations to suit the built-in cabinets as per approved shop drawings in approved shade and color, delivered to Site polished and finished to the approval of the Engineer. Marble/ Granite tops for toilets shall be recessed to provide wash hand basins, where required.

12.05 EXECUTION

13.05.1 **Flooring, Skirting and Stair**

Apply cement slurry coat over surfaces of concrete substrate immediately prior to placing setting bed. Limit area of application to avoid premature drying out. Install setting bed of required thickness and set marble/stone units before initial set occurs. Apply a thin layer of cement paste to bottom of each unit. Set, tamp and level units immediately. Set units in required pattern with uniform joint widths.

Joints as soon as possible after initial set. Force grout into Joints, strike flush and tool slightly concave.

Remove mortar and grout from surfaces while still moist and as the work progresses. Do not permit traffic on finished surface during setting and for a minimum of 24 hours after final pointing of joints.

13.05.2 **Dressing**

Each marble/granite stone slab shall be machine cut to required size and shape as specified in the drawings. All angles and edges of the marble/granite slabs shall be true and square and free from chippings and the surface shall be true and plane. The thickness of the stone shall be as specified in the drawings. No tolerance shall be allowed for thickness.

The marble/granite slabs shall be mirror polished. All v stones shall be brought pre-polished to the site. The contractor shall prepare samples and obtain approval of the Engineers before proceeding with the work.

The contractor shall ensure that no chisel marks are visible on the surface of the stone before fixing. Stones with chisel marks or broken edges shall be rejected.

13.05.3 **Laying**

The base shall be made rough and watered and given a cement wash and then the mortar shall be laid in 19-20 mm. thick layers as per instruction of Engineer. After laying mortar, it should be leveled with wooden floats. Proper slope for draining wash water shall be provided as per instruction of the Engineer. And over this, marble/granite stone should be laid; the joints should not be more than 1.5 mm. The joints should be painted with approved colored cement slurry.

13.05.4 **Curing**

After about 2 hours of laying, the surface shall be covered with wet bags and kept wet and left undisturbed for 2 days.

13.05.5 **Repair and Cleaning**

Remove and replace marble/stone units, which are broken, chipped, stained or otherwise damaged. Where directed, remove and replace units, which do not match adjoining stonework or are not in line and level as shown on Drawings. Provide new matching units, install and point joints to eliminate evidence of replacement. Repoint defective and unsatisfactory joints to provide neat, uniform appearance.
Clean stonework not less than 6 days after completion of work, using clean water and bristle brushes. Do not use wire brushes, acid or caustic type cleaning agents or other cleaning compounds which may be detrimental to the marble/stone finish or joint grout.

13.05.6 **Protection**

Provide covers, boards, supports and all other necessary materials to protect finished work from collapse, deterioration, discoloration or damage during installation and until contract completion.

13.05.7 **Polishing**

The finished surface shall be provided with two applications of approved wax polish or as approved by Engineer.

13.05.8 **Finish**

Finally, when the surface is absolutely dry, the surface shall be rubbed with wax to give a glazing surface, as per instruction of Engineer. Care shall be taken that the floor is not left slippery and that ordinary wax is not used under any circumstances

12.06 MEASUREMENT AND PAYMENT

Measurement shall be in square meter of exact length and breadth of the floor. Rate shall include materials, mixing, laying, curing, finishing and labor etc. all complete.

***** END OF SECTION*****

SECTION - 13

FLOOR AND WALL FINISHES

13.01 SCOPE OF WORK

The work under this section of the Specification consists of furnishing all plant, labor, equipment, appliances and materials and performing all operations in connection with the laying of cement concrete floors and floor finishes including bases, skirting and dado, complete in strict accordance with this section of the specifications and the applicable drawings and in accordance with the terms and conditions of the Contract.

13.02 APPLICABLE STANDARDS

Latest editions of following Pakistan, ISO, British& ASTM standards are relevant to these specifications wherever applicable.

Pakistan Standard

P.S. 232 Ordinary Portland Cement

ISO (International Organization for Standardization

R 680 Chemical analysis of cements Main constituents of Portland Cement.
R 681 Chemical analysis of cements Minor constituents of Portland cement.

ASTM (American Society for Testing and Materials)

C 482 Bond strength of ceramic tile to Portland cement.
C 648 Breaking strength of ceramic tile.
C 650 Resistance of ceramic tile to chemical substances.
C 798 Color permanency of glazed ceramic tile.
E 84 Surface burning characteristics of building materials

BSI (British Standards Institutions)

882 Pt.2 Course and fine aggregates from natural sources.
1199 Sands for external renderings, internal plastering with lime and Portland cement and floor screeds.
1201 Pt.2 Aggregates for granolithic concrete floor finishes.
1281 Glazed ceramic tiles and tile fittings for internal walls.
5442 Classification of adhesives for use in Construction pt-1 Adhesives for use.
203 Tile flooring
204 In-situ Floor Finishes.
209 Pt.1 Care and Maintenance of floor surface, wooden flooring.

13.03 GENERAL

13.03.1 Samples and Approval

a. All applied floor finishes materials such as terrazzo tiles, marble imported or local, imported Porcelain Tiles and ceramic tiles etc. to be used in the Works shall receive prior approval of the Engineer.

b. Samples of all the materials to be used shall be submitted to the Engineer for his selection and approval before their use in the Works. The Contractor shall strictly follow the instructions of the manufacturers and the floor finishes shall be laid accordingly.

c. Floor finishes shall be laid true to the line and level in approved manner satisfactory to the Engineer.

d. Any work covered under this section of the Specifications not conforming to the requirements of the specified quality and workmanship will not be acceptable and shall be rejected and the Contractor shall be required to remove and replace such work at his own cost as per the instructions of the Engineer.

13.03.2 Floor Screed Beds

a. All floor finishes of an integral nature such as cement concrete flooring, waterproof flooring shall be laid direct on to structural or site reinforced concrete slabs. In these cases, the slabs must first have been fully cured, then hacked, chipped or otherwise roughened to provide a good adhesion key, then brushed, hosed and cleaned thoroughly of all loose concrete, dirt, dust, grease, oil and other impurities. The surfaces shall then be thoroughly wetted for a period of at least a day before the application of the floor finish, and given a thin brush applied cement slurry grout. The floor finishes of integral nature shall then be laid as described in their respective subsections.

b. All floor finishes of an applied nature such as terrazzo tiling, ceramic/marble tiling, etc. shall be laid on a floor screed as described below at 7.03 or as per the instructions of the Engineer. The floor screed shall be laid to a thickness calculated to be the overall nominal floor thickness less the actual thickness of the applied finish.

c. Care is to be taken to relate finished floor levels to specified floor levels. The screed is to be completely flat, level and smooth, with no projections, low or high areas, etc., and finished with a wood float. Where required, the screed shall be laid to falls as shown on Drawings or as directed by the Engineer.

13.04 CEMENT SAND SCREED

13.04.1 Preparation of Base

a. The laitance on the base shall be entirely removed by complete chipping, hacking & exposing the clean coarse aggregate. All loose concrete and dirt should be removed by thorough washing or hosing. The Contractor shall not undertake any finishing work until the surfaces are approved by the Engineer.

b. The base concrete shall be wetted thoroughly for a period of at least a day before the application of floor finishes and any excess water is brushed off before laying the screed.

c. Just before the screed is to be laid, a neat grout should be brushed into the base. The grout should consist of water and cement mixed to the consistency of a thick fluid. An approved bonding agent may be used as an alternative to the grout. Excess of the grout shall be removed by thorough sweeping just prior to placing the topping material.

13.04.2 Laying of Screed

a. Cement sand screed up to a thickness of 40 mm shall be mixed in the proportions of 1:3 by volume with fine aggregate of approved size and gradation. Screeds over 40 mm thick should be mixed in the proportions of 1: 1 ½ :3 (cement: sand: aggregate) to the approval of the Engineer.

b. Where specified, Aqua guard or an equal approved waterproofing additive shall be mixed in the waterproof cement sand screed in the ratio as per manufacturer's instructions or as directed by the Engineer and shall be finished with a steel float.

c. Where screeds are to receive terrazzo or marble tiles etc. the screeds shall be finished with a slight rough finish to accept the cement paste and tiles. The mortar bed shall be spread and tamped to an even thickness over an area no greater than that, which can be tiled before the mortar reaches its initial set. However, ceramic tiles shall be bedded over a hard set cement sand floor screed laid earlier and well cured.

13.05 MARBLE FLOOR TILES

13.05.1 Description

a. The Work included under this subsection shall comprise of providing and fixing marble tiles in floors at locations shown on the Drawings in approved shades and colors. Unless otherwise specified, all marble work shall be in conformity with the latest British Code of Practice for this Work.

b. The marble tiles shall be from approved local source, uniform in color, texture, shade and quality.

c. Generally, marble tiles shall be 12”x12”x 1/2” and 24” x 24” x 3/4" or of size and thickness specified in the Drawings and Bill of Quantities.

13.05.2 Materials

a. Marble

- Marble shall be best quality Boticina marble, compact, dense, metamorphic rock of lime stone origin from quarries in Pakistan or elsewhere. It must be evenly grained with sugar like appearance. The shade and colors shall be to the approval of the Engineer.
- All marble tiles shall be totally free from cracks, defects, fissures etc. and shall have adequate strength to perform as required with good resistance against abrasion and shall have an abrasive strength not less than 20.

b. Portland cement conforming to BS 12.

c. White Cement conforming to relevant BS Specification.

d. Sand and aggregate shall comply with requirements of ASTM Specifications C-33.

e. Water shall be clean potable drinking water, free from oils, acids, alkalis, and salts and organic or other injurious matter.

f. Pigments to be used shall comply with BS 1014.

13.05.3 Samples

a. The Contractor shall provide samples of marble tiles to be used for this item of Work showing the entire range of variation and color for the selection and approval of the Engineer. The samples shall be in finished sizes and shape, the cost of which shall be deemed to be included in the rates. The approved samples shall be retained by the Engineer to form standards against which deliveries will be judged.

b. The samples supplied shall conform to the ASTM standards stated below for the determination of the following:

Weight % Absorption	ASTM C-97-47
Modules of Rupture	ASTM C-99
Compressive Strength	ASTM C-170
Resistance to Abrasion	ASTM C-241-51
Flexural Strength	ASTM C-8880-78

13.05.4 Bedding & Finishing

a. The Contractor shall employ skilled and trained marble workers for doing this job. The Contractor may be allowed to employ an approved specialist subcontractor for this item of Work. All Work shall be of the highest quality in conformance with the Contract requirements and to the approval of the Engineer. Any substandard work shall be rejected and the Contractor shall remove and replace the same at his own cost.

b. The surface over which the marble tiles are required to be fixed shall be clean of all dirt and dust and should be properly hacked so that the mortar sticks well to the surface.

c. The Contractor shall ensure that all the edges of tiles supplied at Site are at right angles to each other, unless other angles are required due to design requirements. The Contractor shall also ensure that all sizes are adequate for the Work as specified.

d. Damaged tiles or tiles with broken edges shall not be acceptable and in no case shall be used in the Work & shall immediately be removed from the Site.

e. Marble tiles shall be bedded on the wet screeding described above at 7.02.2 and 7.03 by applying a thin layer of neat cement paste on to the screed bed and the tiles placed in position and tamped down gently with a wooden mallet to be level with other tiles. The tiles shall be laid in the manner so that they align perfectly to the specified lines and levels and are square. The tile joints shall be as thin as possible but not more than 2 mm wide and shall be regular and perfectly straight, and setting out shall be carried to ensure a minimum of cut tiles. Any tiles requiring to be cut shall be saw-cut by approved tools. Tiles pattern shall be square to the spaces floored, and any patterning by tile jointing, alternating colors, etc. is to be carried out as indicated on the Drawings and as approved by the Engineer.

f. The surface during laying shall be frequently checked with a straight edge at least 2m long to obtain a true surface with dead level or slope, as directed.

g. All tile joints shall be grouted up solidly with a grout comprising of white Portland cement and water, all surplus to be cleaned off immediately.

h. Once bedded, curing shall be carried out by covering in hessian and continuous wetting for a minimum period of 3 days and the floor kept clear of traffic for at least 48 hours.

i. When cured, the marble tiling shall be polished with chemical polish to the approval of the Engineer. No wax polish shall be allowed. Polishing must be evenly and carefully carried out and a perfect smooth surface produced.

j. The marble shall be chemical polish finished to a glossy surface that will reflect light to emphasize the color and marking. All finished surfaces shall be of uniform texture, color and appearance.

13.05.5 Dado

a. Dado in all marble tiled areas are to be in marble to match the floor tiling to the area concerned, unless specified otherwise. The dado shall be produced in an identical manner as for tiling. The dado shall normally be fixed to the walls up to heights shown in the Drawings with top edges arris-rounded or as shown on the Drawings or as approved by the Engineer.

b. The dado tiles shall be fixed to walls on a plastered backing having a slightly rough surface with neat cement paste. The back of each tile shall be covered with a thin layer of neat cement paste and the tile shall then be gently tapped against the wall with a wooden mallet so that the tile faces are set in one plane. The tiles shall then be grouted and polished with chemical polish as for marble floor tiling.

13.05.6 Marble Tread and Risers

Stair tread and riser slabs shall be provided in local “Boticina” marble or imported marble in approved color and shade and to sizes and profiles as indicated on the Drawings. Treads to be 3/4” thick in single pieces as shown on Drawings, length to suit stair widths, one long edge arris-rounded and polished, risers shall be 3/8” thick in single pieces of sizes to suit stair widths; ends polished. Treads and risers shall be bedded in screed as for tiling, of thickness as indicated, all level and square or to profiles shown on Drawings, chemical polished and finished.

13.05.7 Marble Counter Tops

Marble slabs to kitchen counters, toilet counters or others shall be provided to sizes and profiles as indicated on the Drawings. The marble tops shall be provided in configurations to suit the built-in cabinets as per approved shop drawings in approved shade and color, delivered to Site polished and finished to the approval of the Engineer. Marble tops for toilets shall be recessed to provide wash hand basins, where required.

13.06 CERAMIC FLOOR TILES

13.06.1 Description

The Work included in this sub-section shall comprise of providing and fixing in position locally manufactured ceramic floor tiles in approved sizes, color and pattern at locations shown on the Drawings and mentioned in the Bill of Quantities.

13.06.2 Materials

a. Ceramic floor tiles shall be local or imported or equal approved from local source. Ceramic floor tiles for bathrooms shall be non-skid.

b. The tile shall be bedded with neat cement paste or as recommended by the manufacturer to the approval of the Engineer.

c. Joint filler shall be white cement grout which shall be non-shrinking, stain resistant, permanent in colors, and shall not inhabit fungus and bacterial growth. It shall be odorless and non-toxic, of smooth consistency for easy preparation and neat, rapid installation, and shall not contain any metallic material or ingredients. The joint floor grout shall be water resistant and shall not washout underwater.

d. Portland cement conforming to BS 12.

e. White Cement conforming to relevant BS standard.

f. Sand & aggregate shall comply with ASTM C33.

g. Water shall be clean potable drinking water, free from oils, acids, alkalis, salts and organic or other impurities and injurious matter.

h. Pigments to be used shall comply with BS 1014.

13.06.3 Samples

The tile samples for local ceramic floor tiles shall be furnished from various product ranges of different manufacturers in sizes, patterns and colors for the selection and approval of the Engineer. The approved samples shall be retained by the Engineer to form standards against which deliveries will be judged.

13.06.4 Bedding, Laying & Jointing

a. Ceramic Tiles shall either be bedded on the hard set floor screeding described above at 7.02.2(b) and 7.03 by applying a thin layer of neat cement paste on to the screed bed and the tiles placed in position and tamped down gently with a rubber mallet to be level with other tiles or directly on top of the M. S. plate with approved tile adhesive. The tiles shall be laid in the manner so that they align perfectly to the specified lines and levels and are square. The tile joints shall be as thin as possible but not more than 2 mm wide if spacer nibs not provided, and shall be regular and perfectly straight, and setting out shall be carried to ensure a minimum of cut tiles. Any tiles requiring to be cut shall be cut by approved tools. Tiles pattern shall be square to the spaces floored, and any patterning by tile jointing, alternating colors, etc. is to be carried out as indicated on the Drawings and as approved by the Engineer.

b. The surface during laying shall be frequently checked with a straight edge at least 2m long to obtain a true surface with dead level or slope as directed. Tiles that are out of true plane or placed incorrectly shall be removed and reset.

c. All tile joints shall be straight, level and of even width throughout. The tile joints shall be grouted up solidly in matching color with a grout comprising of white cement or approved tile joint filler, pigment and water; all surplus to be cleaned off immediately.

d. Once bedded, curing shall be carried out by covering in hessian and continuous wetting for a minimum period of 3 days and the floor kept clear of traffic for at least 48 hours.

e. When cured, the floor shall be washed and cleaned to the approval of the Engineer.

13.06.5 Skirting

a. Skirting in all ceramic floor tiled areas are to be of ceramic tile to match the floor tiling to the area concerned, as specified or shown on Drawings. The skirting shall be provided in an identical manner as for tiling. The skirting shall normally be 4" high with top edges arris-rounded or in the size and shape as shown on the Drawings or as approved by the Engineer.

b. The skirting shall be fixed to walls on a plastered backing having a slightly rough surface with neat cement paste. The back of each skirting tile shall be covered with a thin layer of neat cement paste and the tile shall then be gently tapped against the wall over rendered backing with a rubber mallet so that the tile faces are set in one plane. The skirting shall be grouted and finished as for ceramic floor tiles.

13.06.6 Dado

a. Dado in all ceramic floor tiled areas is to be in ceramic tiles to match the floor tiling to the area concerned, as specified or shown on Drawings. The dado shall be provided in an identical manner as for tiling. The dado shall normally be fixed on walls upto the heights shown in the Drawings with top edges arris-rounded or as shown on the Drawings or as approved by the Engineer.

b. The dado tiles shall be fixed to walls on a plastered backing having a slightly rough surface with neat cement paste. The back of each tile shall be covered with a thin layer of neat cement paste and the tile shall then be gently tapped against the wall over a rendered backing with a wooden mallet so that the tile faces are set in one plane. The dado shall be grouted and finished as for ceramic floor tiles.

13.07 QUARRY FLOOR TILES

The non-slip quarry tiles shall be in accordance to B.S. ASTM standard of sizes colors and design as indicated in the Schedule of Finishes. Square tiles shall be laid square with straight joints perfectly horizontal and vertical. Rectangular tiles shall be laid similarly to the square tiles or with broken joints to the tile face.

The preparation, Workmanship and protection are to be as described in the above Specification for Tiling work.

13.08 PORCELAIN FLOOR TILES

13.08.1 Description

The Work included in this subsection shall comprise of providing and fixing in position imported porcelain floor tiles of approved size, color and pattern at locations shown on the Drawings and mentioned in the Bill of Quantities.

13.08.2 Materials

a. Imported non-skid Porcelain Ceramic Floor Tiles shall be from RAK Ceramics, UAE, or equal approved to the approval of the Engineer in the specified size, color and pattern.

b. The tiles shall be bedded with neat cement paste or as recommended by the manufacturer and approved by the Engineer.

c. Joint filler grout shall be from the same manufacture. The grout which shall be non-shrinking, stain resistant, permanent in color, and shall not inhabit fungus and bacterial growth. It shall be odorless and non-toxic, of smooth consistency for easy preparation and neat, rapid installation, and shall not contain any metallic material or ingredients. The joint floor grout shall be water resistant and shall not washout underwater.

d. Portland cement conforming to BS 12.

e. White Cement conforming to relevant BS standard.

f. Sand & aggregate shall comply with ASTM C33.

g. Water shall be clean potable drinking water, free from oils, acids, alkalis, salts and organic or other impurities and injurious matter.

h. Pigments to be used shall comply with BS 1014.

13.08.3 Samples

The tile samples for the imported porcelain floor tiles shall be furnished from various product ranges of different manufacturers in sizes, patterns and colors for the selection and approval of the Engineer. The approved samples shall be retained by the Engineer to form standards against which deliveries will be judged.

13.08.4 Bedding, Laying & Jointing

a. Porcelain Tiles shall either be bedded on the hard set floor screeding described above at 7.02.2(b) and 7.03 by applying a thin layer of neat cement paste on the screed bed and the tiles placed in position and tamped down gently with a rubber mallet to be level with other tiles. The tiles shall be laid in the manner so that they align perfectly to the specified lines and levels and are square. The tile joints shall be as thin as possible but not more than 2 mm wide, and shall be regular and perfectly straight, and setting out shall be carried to ensure a minimum of cut tiles. Any tiles requiring to be cut shall be cut by approved tools. Tiles pattern shall be square to the spaces floored, and any patterning by tile jointing, alternating colors, etc. is to be carried out as indicated on the Drawings and as approved by the Engineer.

b. The surface during laying shall be frequently checked with a straight edge at least 2m long to obtain a true surface with dead level or slope as directed. Tiles that are out of true plane or placed incorrect shall be removed and reset.

c. All tile joints shall be straight, level and of even width throughout. The tile joints shall be grouted up solidly in matching color with approved tile joint filler and water; all surpluses to be cleaned off immediately.

d. Once bedded, curing shall be carried out by covering in hessian and continuous wetting for a minimum period of 3 days and the floor kept clear of traffic for at least 48 hours.

e. When cured, the floor shall be washed and cleaned to the approval of the Engineer.

13.08.5 Skirting

a. Skirting in all porcelain ceramic floor tiled areas are to be of porcelain tiles to match the floor tiling to the area concerned, as specified or shown on Drawings. The skirting shall be provided in an identical manner as for tiling. The skirting shall normally be 4" high with top edges arris-rounded or in the size and shape as shown on the Drawings or as approved by the Engineer.

b. The skirting shall be fixed to walls on a plastered backing having a slightly rough surface with neat cement paste. The back of each skirting tile shall be covered with a thin layer of neat cement paste and the tile shall then be gently tapped against the wall over rendered backing with a rubber mallet so that the tile faces are set in one plane. The skirting shall then be grouted and finished as for porcelain tiling.

13.08.6 Protection

The completed Works or parts thereof shall be protected by the Contractor against any damage. The Works shall be handed over in perfect condition. If any damage is incurred then the Contractor shall remove and/or replace the same at no additional costs. The Contractor shall exercise all care to protect the works executed by other trades and not covered by his Contract. Any damage to these shall be made good and the works restored at no additional cost.

13.09 MEASUREMENT AND PAYMENT

Floor tiling works covered by this section of Specifications, complete and approved, will be measured and paid for per square meter, at the individual item rates entered in the Bill of Quantities and generally in accordance with the applicable terms and conditions of the Contract.

Skirting, treads and risers shall be measured and paid for per square meter at the individual item rates entered in the Bill of Quantities, as per terms stated above.

***** END OF SECTION*****

SECTION - 14

PAINTING

14.01 SCOPE OF WORK

The work under this section of the Specifications consists of furnishing all materials, plant, labor, equipment, appliances and performing all operations in connection with surface preparation, mixing, painting concrete works, gates, grills, frames, walls, ceilings and all such surfaces as shown on the Drawings and/or as directed by the Engineer. The scope of this section of specification is covered with detailed specifications as laid down herein.

14.02 APPLICABLE STANDARDS

Latest editions of following British Standards are relevant to these specifications wherever applicable.

BSI (British Standards Institution)

BS 245 -- Specification for mineral solvents (white spirits and related hydrocarbon solvents) for paints and other purposes.

BS 2521 -- Lead-based priming paint for woodwork.

BS 2522 -- Lead based priming paint for iron and steel.

BS 2569 -- Sprayed metal coatings. Paint colors for building purposes

CP 231 -- Painting of building

CP 3012 -- Cleaning and preparation of metal surfaces.

14.03 GENERAL

14.03.1 Except as otherwise specified, all painting shall be applied in conformity with BS CP 231 "Painting of Building" as applicable to the work.

14.03.2 The Contractor shall repair at his own/expense all damaged or defective areas of shop-painted metal work and structural steel work. Metal surfaces against which concrete is to be placed will be furnished shop-painted and shall be cleaned to being embedded in concrete.

14.03.3 Except as otherwise specified, all concrete and plastered surfaces are to be painted.

14.03.4 The Engineer will furnish a schedule of colors for each area and surface. All colors shall be mixed in accordance with the manufacturer's instructions.

14.03.5 Colors of priming coat (and body coat where specified, shall be lighter than those of finish coat. The Engineer shall have unlimited choice of colors.

14.03.6 Samples of all colors and finishes shall be prepared in advance of requirement so as not to delay work and shall be submitted to the Engineer for approval before any work is commenced. Any work done without such approval shall be redone to the Engineer's satisfaction, without additional expense to the Employer, samples of each type of paint shall be on separate 1 ft. x 1 ft. x 1/8 inch tempered hard hoard panels. Manufacturer's color chart shall be submitted for color specifications and selection.

14.04 MATERIALS AND EQUIPMENT'S

14.04.1 All materials shall be acceptable, proven, first grade products and shall meet or exceed the minimum standards of approved manufacturers.

14.04.2 Colors shall be pure, non-fading pigments, mildew-proof, sun-proof, finely ground in approved medium. Colors used on plaster and concrete surfaces shall be lime-proof. All materials shall be subject to the Engineer's approval.

14.04.3 Approved quality Distemper paint shall be used for painting where specified on the drawings as directed by the Engineer.

14.04.4 The plastic emulsion/weather shield paint or similar as approved by the Engineer shall be used where specified on the drawing as directed by the Engineer.

14.04.5 Other materials/ equipment's to be used are;

- Cement primer, Turpentine, Putty, Polish paper, Wood primer, Emery polish paper and Water
- Drop cloth and polythene sheets of suitable size & quality shall be used to protect other materials and surfaces.
- The masking material where-ever necessary shall be used in sufficient quantities to avoid falling of paint on unwanted surfaces.
- Grinding / buffing wheels, wire brush & emery paper.
- Electrical distribution panels switch boards & hand lamps.
- Kerosene, thinners, acetone etc. to remove oil / grease etc.
- Painting brush:
- Good quality brushes with long and flexible bristles free from any paint residue shall be used.
- Neat, clean & painted scaffoldings of good quality.
- Good quality ladders, platforms etc.
- Safety gears to be used by personnel like respirator, face mask, hand gloves, protective clothing etc.

All material shall be delivered to site in their original unbroken containers or packages and bear the manufacturer's name, label, brand and formula and will be mixed and applied in accordance with his directions.

14.05 DELIVERY STORAGE AND CONTAINER SIZES

Paints shall be delivered to the site in sealed containers which plainly show the type of paint, color (formula or specifications number) batch number, quantity, and date of manufacture, name of manufacturer and instructions for use. Pigmented paints shall be supplied in containers not larger than 20 liters. All materials shall be stored under cover in a clean storage space which should be accessible at all times to the Engineer. If storage is allowed inside the building, floors shall be kept clean and free from paint spillage.

14.06 SURFACE PREPARATION

a. All oil, grease, dirt, dust, loose mill scale and any other foreign substance shall be removed from the surface to be painted, polished and white washed by the use of a solvent and clean wiping material. Following the solvent cleaning, the surfaces shall be cleaned by scrapping, chipping, blasting, wire brushing or other effective means as approved by the Engineer.

b. All the surfaces to be painted shall be free from dust, dirt, fungus, lichen, algae etc. old paint, varnish and lime wash should always be removed by scraping and washing.

c. All surfaces shall be made smooth, prior to the application of primer by rubbing with Bathy (silicon carbide rubbing brick) and/ or sand paper, filling the voids putty (Zinc/ Chalk/ Plaster of Paris mixture).

d. In the event the surfaces become otherwise contaminated in the interval between cleaning and painting, re-cleaning will be done by the Contractor at no additional cost.

e. No work in this section shall be allowed until all surfaces or conditions have been inspected and approved by the Engineer.

14.07 APPLICATION

All paint and coating materials shall be in a thoroughly mixed condition at the time of application. All work shall be done in a workman like manner, leaving the finished surface free from drips, ridges, waves, laps, and brush marks. All paints shall be applied under dry and dust free conditions, Unless approved by the Engineer paint shall not be applied when the temperature of the metal or of the surrounding air is below 7 degrees centigrade, Surfaces shall be free from moisture at the time of painting.

All primary paint shall be applied by brushing. The first coat of paint shall be applied immediately after cleaning. When paint is applied by spraying, suitable measures shall be taken to prevent segregation of the paint in the container during painting operation.

Effective means shall be adopted for removing all free oil and moisture from the air supply lines of the spraying equipment.

A priming coat shall be applied to the cleaned and smooth surfaces first. Unless otherwise specified in the BOQ or approved by the Engineer, all surfaces shall have at least 3 coats of paint in addition to the priming coat.

Each coat of paint shall be allowed to dry or harden thoroughly before the succeeding coat is applied. Surfaces to be painted that will be inaccessible after installation shall be completely painted prior to installation. Only as much material should be mixed as can be used up in one hour. Over-thinning will not be permitted. After the first coat the surfaces will be soaked evenly four or five times and the second coat shall be applied after leaving for at least overnight.

a. Where shown on Drawings all exterior finishes shall be stucco plaster 3/4" thick on all external surface with 1:1:2 (One white cement, one Malir sand and two Makli crushed stone passing 8mm sieve and retained on 3mm sieve) applying in external walls in panels with horizontal and vertical grooves made with 10mm wide aluminum channel nailed in walls before application of plaster, applying a spray of retarder on the plastered surface and washing of the surface with water and sponge complete to give stone finish as per directions of Engineer.

b. For Interior finishes on concrete, masonry, door, windows, cabinets, grills etc. any of the listed types of paints, i.e.; *Whitewash, Oil,* Plastic or Matte Emulsion*, Cement-based, Enamel, Distemper, Textured, Bituminous, Epoxy, Anti-condensation, Luminous (fluorescent), Latex, Lead, Metallic, Rubber, Aluminum, Silicone, Zinc rich, Anti-corrosive,* Fungicidal Paint of the approved make and shade shall be applied to surfaces as shown on Drawings or as specified by the Engineer.

Walls, floors & ceiling and adjacent equipment's and piping shall be satisfactorily protected by drop clothes. Other precautionary measures should be taken during spray / brush painting to ensure at surrounding area /equipment is not affected.

The application should be as per manufacturer's instructions / specifications. Before opening the packed drum, it should be rolled on the floor and after opening the drum paints shall be stirred well so that no material/ pigments remains settled at the bottom. Suitably of the paint shall be checked as per requirement before opening.

The choice of method of application i.e. by brush or by spray gun will be decided by the Engineer. However, adjacent equipment / structures shall be suitably protected and care shall be taken to prevent intoxication of the surrounding area. The method of paint application depending upon the area shall be jointly discussed and decided with Engineer. Paint thickness (DFT) shall be as per the item scheduled. In case the dry film thickness of finish paint is observed less than the specified values, additional coat shall have to be applied free of charge.

Polishing

After fine sanding by a skilled operator, one coat of clear polish should be rubbed in by hand using a cloth or pad, be allowed to dry and buffed up with worn fine sand paper or steel wool to remove raised grain. A second coat of clear polish should then be applied.

14.08 JOB CONDITIONS

14.08.1 Observe manufacturer's recommended minimum and maximum temperature but do not apply

paint or finish to any surface unless ambient temperature is 10 degree C or above and less than 43 decree C. No painting shall be done above 90% relative humidity.

14.08.2 Adequately protect all finished work.

14.08.3 Remove and replace all items of finish hardware, device plates, accessories, lighting fixtures or other removable items.

14.08.4 In no case shall any finish hardware or other finished item that is already fitted into place be painted, unless otherwise specified

14.09 Inspection & check :

All the work is subject to the inspection of the Engineer or his authorized representative which shall be carried out in a manner, satisfactory to the Engineer. The contractor shall rectify any short comings pointed out by the said representative. The general inspection requirements are as follows:-

a. No paint shall be applied until the authorized inspection has ascertained that all prepared surfaces are satisfactorily cleaned and are in a condition to ensure the proper receipt of and adhesion of the coating.
b. The contractor shall furnish all gauges, instruments and the necessary measuring equipment's required for inspecting the work, test pieces, samples etc. at site and in the shop. The Engineer's authorized representative is intended to ensure that the material and workmanship are in accordance with this specification, but it will not relieve the contractor for any of his responsibilities for the ultimate workmanship and performances.

14.10 QUALITY ASSURANCE

All paint for any one surface shall be top quality, of one manufacturer of the specified. Deep tone accent colors shall be used and the unavailability of final coat colors may be the basis for rejecting materials for any one surface.

14.11 MEASUREMENT AND PAYMENT

All the painting and finishing on all surfaces, other than timber and steelworks which shall be deemed to be inclusive of painting and finishing in their own items of works, shall be measured per square Meter/ft in accordance with standard method of measurement and paid for at the unit rates entered in the Bill of Quantities and in accordance with the terms and conditions of this Contract.

Where separate quantities are not shown in the Bill of Quantities, these shall be deemed to have been included in the rate of the relevant items to be finished and painted and no separate payment shall be made for painting/finishing works of such items.

***** END OF SECTION *****

SECTION - 15

MISCELLANEOUS METAL WORK

15.01 SCOPE OF WORK

The Work covered in this section of the Specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with the fabrication and installation of miscellaneous metal works, complete in strict accordance with this section of the Specifications and the applicable Drawings and subject to the terms and conditions of the Contract.

15.02 GENERAL

All metal shall be well formed to shape and size, with sharp lines or angles. Shearing and punching shall be left clean to true lines and surfaces. Shop connections shall be welded or riveted and site connections bolted unless otherwise noted. Use flat headed countersunk rivets where riveted connections are exposed to view in finished work. Bolts shall be turned up tight and threads nicked to prevent loosening. All bolts shall be provided with washers.

For exposed connections with hair line joints which are flush and smooth, concealed fasteners shall be used wherever possible. If exposed fasteners are unavoidable, use countersunk flathead screws or bolts.

All metals shall be free from corrosion, scale, distortion and other damage, and only new material shall be used for fabrication purposes.

15.03 MATERIALS

15.03.1 Steel

a. All steel sections shall comply with BS 4, parts 1 and 2, and BS 4848. Steel shall be mild steel complying with BS 4360, Grades 43A, 43B and 43C as appropriate.

b. Steel tubes for structural and general engineering purposes shall comply with BS 1775.

c. Steel tubes and tubulars for balustrades shall comply with BS 1387 designation of either light, medium or heavy and the steel pipe fittings shall comply with BS 1740.

d. Galvanized MS tube shall comply with BS4 and BS 1387 medium grade.

e. Stainless steel sections shall be to BS 970, quality En. 58A. stainless steel pipes shall be to BS 3605.

f. All steel shall be supplied from a specifically approved source, from approved manufacturers, and certificates of origin and mill test certificates shall be supplied in all cases, proof of compliance with the relevant standards shall be a condition of approval.

15.03.2 Nuts, Bolts and Screws

a. Nuts and bolts etc. shall comply with BS 4190 and BS 1494 and shall have SI metric threads complying with BS 3643.

b. Stainless steel bolts are to be set bolts and shall comply with BS 4190. The stainless steel for bolts, nuts and washers shall comply with BS 970, quality En 58 A.M.

c. Self-tapping screws shall comply with BS 4194.

15.04 COORDINATION WITH OTHER TRADES

a. All work under this section shall be coordinated with the work to be done as specified under other sections of the Specifications and as well as with other trades.

b. The Contractor shall furnish all information and instructions required for work by other trades.

c. The Contractor shall drill, tap, cut and fit the work included herein as required to accommodate work of other trades in conjunction with it.

d. The Contractor shall be responsible for obtaining exact site dimensions and accurate execution of all parts of the work specified.

e. All the works shall be carried out exactly in accordance with the approved shop drawings.

15.05 SAMPLES

Samples or materials specified shall be submitted for approval when required by the Engineer.

15.06 FABRICATION

15.06.1 General Fabrication

a. All steel and other metals are to be cut, drilled, formed, bent, worked and otherwise fabricated to the details, forms and dimensions indicated on the approved shop drawings; setting out joints and fixings are to be such as to produce finished components that are perfectly square, sound and rigid. All members are to be of the sizes specified, and no alterations, additions or omissions in the size or arrangements of members may be made without Engineer's approval. The inclusion of gussets, bracing plates, fixing lugs, spacers, packings, etc. in the interests of rigidity or ease of fixing may be considered, but on a specific approval from the Engineer.

b. All open-ended members, including hollow sections, shall be capped off with welded plates or caps; no hollow surfaces which cannot be galvanized or maintained are to be left exposed to atmosphere, whether shown so on Drawings or not.

c. The provision of BS 449 shall apply generally to fabrication workmanship.

15.06.2 Joints

All steel joints specified as welded shall be cleanly and solidly welded, in general accordance with the provisions of BS 5135, using electrodes as specified in BS 639. All welds shall be continuous, solid, with no spot welding, and shall be ground off smooth flush and perfect on completion.

All joints specified as bolted, screwed or otherwise mechanically connected shall be properly set out to provide sufficient but not excessive tolerance, holes drilled accurately, and then soundly and solidly connected. All bolts, screws and connectors shall be either hot-dipped galvanized steel, stainless steel or non-ferrous metal, no untreated steel fixing device is to be used in any circumstances. Fixings shall be selected suitable for the particular purposes, and Engineer's approval obtained.

15.06.3 Tolerances

All metalwork shall be fabricated to overall dimensions so as to provide sufficient but not excessive tolerances between the components and adjoining work, and between adjoining metal components, bearing in mind building materials tolerances, thermal expansion, erection distortions and all other factors.

15.06.4 Drawings and Calculations

Detailed fabrication and shop drawings and, where appropriate, structural calculations shall be prepared by the Contractor for the approval of the Engineer for all the fabricated components. These shall be approved before commencement of work and should indicate all connections, fixing, methods of fabrication, and all other relevant details.

15.06.5 Finishes and Protection

All steel and other metal components specified for painting shall be finished in a smooth workmanlike fashion, free of irregularities of surface, burrs, galvanizing excess, mill marks, oil, grease, dirt, etc. ready for painting.

All metalwork shall be protected during transportation delivery, storage on Site, and after erection, by such measures as shall be agreed with the Engineer, to prevent damage of any type, in

particular scratching, denting, distortion, and other mistreatment. Materials so damaged will not be acceptable, and shall have to be replaced.

15.06.6 **Riveting**

Riveting where exposed shall be flush unless otherwise indicated on Drawings or directed by the Engineer.

15.06.7 **Bolting**

Bolting, where permitted, shall be done with proper size bolts. Nuts shall be drawn tight and thread nicked.

15.06.8 **Steel**

The use of Structural Steel in Buildings shall comply with BS 449 Part 2.

15.06.9 **Welding**

a. Welding of all steel shall comply with BS 5135. All welded joints which will be exposed shall be ground to a smooth finish. All welding shall be executed by experienced certified welders.

b. Welding shall be continuous except where tack-welding is specifically permitted. Tack welding will not be permitted on exposed surfaces.

c. Where galvanized items are to be welded, the weld and joint shall be ground smooth. Only complete welded assemblies may be hot pip galvanized. No cold galvanizing paint permitted cold galvanizing zinc.

d. No black bolts will be accepted. Only H.D. galvanized bolts shall be allowed.

15.06.10 **Shop Finishing**

a. Provide a 6 micron thick zinc coating for the items shown or specified to be galvanized using the hot dip process after fabrication.

b. Shop paint all ferrous metalwork except galvanized work and those portions of items which are to be embedded in concrete or masonry and surfaces and edges which are to be site welded.

c. Remove scale, rust and other deleterious materials before the shop coat of paint is applied.

d. Immediately after surface preparation, anticorrosion metal primer paint be applied in accordance with the manufacturer's instructions. Use painting methods which will result in full coverage of joints, corners, edges and all exposed surfaces.

15.06.11 **Installation**

a. Provide anchorage devices and fasteners where necessary for securing to finished work including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, rag-bolts, wood screws and other connectors as necessary.

b. Cut, drill and fit as necessary for installation. Set the work accurately in location, alignment and elevation, plumb, level and true. Provide temporary bracing or anchors in formwork for items which are to be cast or built into concrete, masonry or similar construction. Form right joints with exposed connections accurately fitted together. Do not cut or abrade members with finishes which cannot be completely restored on Site. Where cutting, welding and grinding are required for fitting and jointing of the work, restore finishes to eliminate any evidence of such corrective work.

c. Carry out all welds and carefully make good on completion.

d. Immediately after erection, clean all site welds, bolted connections and rough areas of the shop paint and coat all exposed areas with the same material as used for shop painting.

e. No site welding to galvanized item will be permitted.

15.06.12 **Storage and Handling**

a. All items described under this Section shall be handled, delivered and stored in a manner that will avoid damage, rust or deformation. Items shall be stored off-ground and shall be entirely covered with weatherproof coverings in storage area.

b. Items which become rusted or damaged because of non-compliance with these conditions will be subject to rejection, and such items shall be replaced without additional cost to the Employer.

15.06.13 **Protection**

a. Before arriving on Site, all surfaces of hot-dip galvanized method which are damaged, have rough spots or joints may be permitted to be by the Engineer be touched up, using an approved zinc primer coat. Damaged hot dip galvanized components will however generally be rejected. Primer shall be compatible for finish paint. Hot dip galvanized items shall not receive a shop coat of primer so that there may be a visual inspection on Site of such items by the Engineer.

b. Thoroughly insulate all non-ferrous items in contact with dissimilar metals, concrete, masonry and mortar with approved zinc-chromate coating or plastic membrane on contact surfaces before installation.

15.07 MISCELLANEOUS ITEMS

15.07.1 **Hollow Metal Frames and Doors**

Metal doors shall comprises of M.S. frames and shutters. All shapes and sizes of complete unit as well as components shall be strictly in accordance with details shown on the Drawings, fabricated, painted and fixed to hollow metal frame as per details shown on the Drawings.

a. **Frames**

i. All hollow metal frames shall be fabricated using 16 gauge M.S. sheets of best quality, free from all defects, and in accordance with the details indicated on the Drawings and Bill of Quantities.

ii. Frames shall be constructed as full welded units from approved manufacturers as per approved shop drawings.

iii. All corners mitred and back-welded and any exposed welds at all joints ground and dressed smooth.

iv. Anchors shall be provided as per approved details, 9” long, three to jambs and welded to frame at shop for embedding in blockwork.

v. All frames shall have channel spreaders. Frames cut, reinforced, mortised, drilled and tapped as required for application of all hardware. All frames shall be fabricated as per final approved hardware schedule.

vi. Rubber/Neoprene bumper or sound absorbers shall be installed 3 per strike jamb.

vii. All contact edges shall be closed tight.

viii. Finished work shall be strong and rigid, neat in appearance and free from defects, warps, bulges or buckles. Moulded members shall be clean-cut straight with true edges.

ix. All cut-outs shall be protected against mortar or plaster with mortar guards of approved gauge.

x. After the frame is fabricated, all tool marks shall be ground smooth, all exposed surfaces degreased and thoroughly cleaned of rust, oil and other impurities and coated with approved primer to enable the surface of the metal to resist corrosion and promote paint adhesion. The remaining irregularities specially welding shall be dressed smooth.

b. **Doors**

Single or double leaf doors shall be fabricated from 20 gauge M.S. sheets of best quality and free from all defects and in accordance with the details indicated on the Drawings and Bill of Quantities.

The doors shall be manufactured from approved manufacturer as per the approved shop drawings. The door shall be provided with hinges and ready to receive locks etc.

c. **Installation**

i. Doors and frames that are fabricated and brought on the Site shall be approved by the Engineer before installation. Any defective or substandard work shall not be acceptable.

ii. Doors and frames shall be installed in accordance with the manufacturer's drawings and recommendations, all to the satisfaction of the Engineer.

d. **Painting**

i. One coat of anti-corrosion primer paint shall be applied to all exposed surfaces before the door and frame is installed. After this another base coat of enamel paint should be given.

ii. After the door and frame has been installed properly, three coats of enamel paint of an approved quality and shade shall be finally applied to all exposed surfaces.

e. **Storage and Handling**

The Contractor shall be responsible for storage, handling and protection of the material on the job. Scratches, holes, dents and nicks and other marring of the paint film will have to be made good and touched up without any extra cost.

15.07.2 **Pipe Handrail**

M.S. pipe hand rail shall be fabricated and installed, as per details indicated on Drawings & Bill of Quantities, by approved manufacturers in accordance with approved shop drawings. The pipe handrail shall be of 2 ½" dia M.S. balusters, M.S. fixing brackets/plates and screws etc., painted and installed.

15.07.3 **M.S. Ladder**

M.S. ladder shall be fabricated and installed, as per details indicated on Drawings & Bill of Quantities, by approved manufacturers in accordance with approved shop drawings.

15.08 MEASUREMENT AND PAYMENT

Metal doors shall be measured per square meter and paid for at the unit rates entered in the Bill of Quantities, inclusive of hollow metal frame, anchors, hardware, painting, installation, complete in all respect.

M.S. pipe handrail shall be measured per-running foot and paid for at the unit rate entered in the Bill of Quantities, inclusive of M.S. balusters, M.S. fixing brackets / plates, screws etc., painting and installation, complete in all respect.

M.S. ladder shall be measured and paid for at the unit rate entered in the Bill of Quantities, inclusive of all materials etc., painting and installation, complete in all respect.

***** END OF SECTION *****

SECTION - 16

WATER RETAINING STRUCTURES

16.01 SCOPE OF WORK

The Work covered under this subsection of Specifications consists of furnishing all labor, tools, scaffolding, hoisting equipment, appliances and materials of every kind and character; and in performing all operations in connection with procurement, transportation and delivery, supply and installation of special provisions for water retaining structures to ensure water tightness in all possible respects in strict accordance with requirements of Drawings and Bill of Quantities as specified herein, and to the entire satisfaction of the Engineer and subject to the terms and conditions of the Contract.

16.02 GENERAL

a. Special consideration shall be given to the control of cracking and the provision of dense impervious concrete. Special consideration will also be given to the design of the concrete mix and to the supervision of the placing and compacting in order to provide a dense impermeable concrete. The mix shall be of the stiffest consistency having a workability which will ensure that it can be satisfactorily placed in the formwork and compacted without risk of segregation, honey-combing, sweating or bleeding. Special care shall be given to the method and order of placing the concrete and to the construction of joints in order to achieve full continuity and complete water tightness.

b. The Contractor shall maintain an accurate record of ambient temperature at Site.

c. Ambient temperature shall be measured using mercury thermometers or other thermometers acceptable to the Engineer.

d. Throughout the concrete work, the Contractor shall employ full time on the Works suitable number of qualified and experienced Engineers whose sole duties shall be as follows;

- Design of concrete mixes
- Control of quality of concrete
- Supervision of mixing, transporting, placing, compacting, finishing, curing and protecting concrete including thermal control of concrete pours.
- Supervision of sampling and testing.
- Preparation and submission of test certificates and reports.
- Compilation and keeping of record.
- Such other duties as the Engineer may direct.

16.03 CEMENT CONTENT

The minimum cement content for all water retaining structures shall be 385 kg/m3 and the maximum cement content of 500 kg/m3. The maximum water-cement ratio shall not exceed 0.42.

16.04 ADMIXTURES

a. Suitable admixtures from BCR, Sika, Fosroc, Betocrete C-16or Master Builders may be used in concrete mixes with the prior approval of the Engineer. The amount of admixtures added to each batch of concrete requires careful control and shall be added in the doses as recommended by the manufacturers and approved by the Engineer. The cost of the admixtures shall be deemed to be included in the rates.

b. For use of an admixture, the information required by the Engineer shall be submitted to him for each admixture for his approval.

16.05 JUNCTION OF FLOOR AND WALL

Where the walls are designed to be monolithic with the bottom slab and beam system, a continuous upstand section of the wall shall be cast at the same time integrally with slab. A suitable arrangement of the reinforcement and formwork shall be made to facilitate this. The height of this upstand, which shall not be less than specified shall be sufficient to enable the next lift of formwork to fit tightly and avoid leakage of the

cement paste from the newly deposited concrete. Such leakage, where it occurs is liable to cause porosity in the finished concrete and is not acceptable.

16.06 PIPES THROUGH WALLS AND FLOOR

When it is necessary for pipes to pass through a wall or bottom floor, it is preferable to cast the pipes into the panel when it is concreted. If this is not practicable, it will be necessary to box out. In either case, it is desirable that the position of the pipe shall not coincide with a joint. When an opening has been boxed out the sides of the opening shall be treated as construction joint.

All piping and fittings shall be tested as a unit for leaks immediately prior to concreting. The testing pressure above atmospheric pressure shall be fifty (50) percent in excess of the pressure to which the piping and fittings may be subjected but the minimum testing pressure shall be not less than 1.0 N/mm2 150 psi above atmospheric pressure. The pressure test shall be held for four hours with no drop in pressure except that which may be caused by air pressure.

No liquid, gas or vapor, except water not exceeding 32°C nor 0.135 N/mm2 pressure, is to be placed in the pipes until the concrete has thoroughly set.

The concrete cover of the pipes and fittings shall be not less than 1½ inch. The piping and fittings shall be assembled by welding, brazing, solder seating, or other equally satisfactory method. Screw connections shall be prohibited. The piping shall be so fabricated and installed that it will not require any cutting, bending, or displacement of the reinforcement from its proper locations.

Drain pipes and other piping designed for pressure of not more than 1 psi above atmospheric pressure need not be tested.

16.07 ARRANGEMENT OF REINFORCEMENT

Particular attention shall be given to the spacing of reinforcement at points so that access to the concrete surface can be provided to enable it to be prepared to receive the following batch of concrete.

The length of lap and anchorage provided shall be in accordance with the requirements of ACI 318-95.

16.08 FORMWORK

Ties used to secure and align the formwork shall not pass completely through any part of the water retaining structure unless effective precaution can be taken to ensure water tightness after their removal. The ends of any embedded ties shall have cover equal to that required for the reinforcement. The gap left from the end of the tie to the face of the concrete shall effectively be sealed. Any steel left in the structure shall be adequately protected against corrosion.

16.09 CONSTRUCTION

The degree of success in achieving a watertight structure depends on the quality of workmanship in making and placing concrete, good on site organization, proper ground water control, clean and dry excavation, careful storage of materials, close-fitting formwork, correctly fixed reinforcement and clean joints.

It is essential that the concrete, when placed, is thoroughly compacted to form a dense uniform mass. The mix shall be of adequate workability and compaction by vibration. Immediately after the removal of formwork, the concrete surface shall be carefully inspected and any defects made good as soon as possible.

16.10 CURING

Even after minimum curing period specified in the clause pertaining to curing in the Specifications for Plain and Reinforced Concrete, it may be desirable to prevent drying of the concrete and to restrict the range of temperature changes which it is subjected to.

16.11 INSPECTION AND REPAIR

As soon as possible after completion of the water retaining structures, the structure shall be examined for defects which may lead to water penetration or leakage. All openings exposed to the weather shall be covered and all water on the floors shall be removed and the surfaces allowed to dry before the inspection. Water retaining structures shall be tested in accordance with BS: 5337 or other approved standard.

Defects that are revealed through which water may penetrate or leak shall be repaired by the Contractor to the entire satisfaction of the Engineer. Where internal repairs are to be made, the areas of weakness shall be isolated by suitable means and any cracks sealed by an approved process by a specialist contractor experienced in this type of work.

16.12 INSPECTION AND MAKING GOOD

a. Inspection of Defects

(i) Surfaces exposed after stripping shall be inspected by the Concrete Engineer of the Contractor, together with the Engineer. The following standards shall be valid for the assessment of the concrete quality:

- The appearance of the concrete surface must conform to the specified classification of finish, refer to Subsection 3.04.2.
- The concrete surface must be uniformly smooth, even and free of ridges and other irregularities,
- The concrete must have a pore-free, dense surface on all sides with no evidence of segregation or inadequate compaction,
- No reinforcing bars may be exposed or signs be present, which indicate an inadequate concrete cover of the reinforcing bars,
- No hair cracks shall be visible.

(ii) During the inspection, the Engineer will determine the type and extent of defects to be eliminated and ascertain if cracks are still moving.

(iii) The Contractor is obligated, if necessary and applicable, undertake the following in accordance with para (iii) below:

- To expose reinforcing bars, which apparently have an inadequate concrete cover, in the area determined by the Engineer and to bend them inward through suitable measures.
- To caulk out honeycombs and similar defective spots, which are traceable to segregation of the concrete.
- To pressure-grout damaged areas, cracks, etc.,
- To seal all hair cracks of a measured width of more than 0.05 mm, with suitable and recognized epoxy resin material.
- To seal all holes resulting from the removal of formwork bolts and the like.
- To demolish and reconstruct such structural concrete members which cannot satisfactorily be repaired or which are otherwise unfit for the Works in the Engineer's opinion.
- To propose and apply a proven system or measures according to the type and extent of the defect, as set out in para (iii) below in order to achieve a result and appearance acceptable to the Engineer.

b. Patching & Repair

(i) Apply a cementitious repair material approved by the Engineer. The proprietary cementitious repair material, bonding agent and application method shall meet the following criteria:

- The repair material shall be cementitious and shall possess a similar thermal co-efficient to the base concrete.
- The repair material shall have shrinkage compensating characteristics.
- The bonding agent shall be compatible with both the existing concrete and the repair material.
- The system shall exhibit long term durability.

The proprietary cementitious repair material and bonding agent shall be stored, applied and cured in accordance with the manufacturer's requirements and recommendations.

Finish the cementitious repair material to a straight line with the existing surface, to the profile of the original undamaged concrete section.

The Engineer may direct that where the cover to the existing reinforcing is insufficient, the repair may protrude beyond the existing concrete face. The protruding edges of the repair shall then have a 45° chamfer, and shall be horizontal or vertical to provide a pleasing finish.

The Engineer's evaluation of the Contractor's proposed materials and application method shall be based on the above criteria.
The Contractor shall submit full details and specifications of his proposed materials and installation methods to the Engineer for approval prior to commencement of work.

This shall include certificates of approval from competent authorities to prove their suitability.

(ii) Patching work shall begin at the latest 24 hours after stripping, however it shall in no case be undertaken prior to carrying out the joint inspection of the concrete by the Contractor and the Engineer.

(iii) Patching and repair work shall be executed only through qualified personnel using high quality and recognized materials, e.g., concrete and cement or special mortar. A special bonding agent such as suitable epoxy resin and the like, of first class quality shall be used where appropriate, to also ensure good bonding and adequate denseness in the joints.

(iv) All costs for repair and patching work are to be borne by the Contractor.

c. Sealing of Cracks

(i) Cracks detected in concrete members cast by the Contractor, are to be sealed according to the directives of the Engineer, provided cracked structural concrete members are not rejected by the Engineer.

(ii) All cracks identified by the Engineer as requiring remedial work shall be sealed by injection of epoxy resin to a maximum depth of 4" from the exposed surface. The surface of the cracks must be cleaned. Injection nipples are to be provided at 6" to 12" intervals and the remaining surfaces of the cracks are to be sealed with a thixotropic epoxy resin compound. Prior to the injection, the crack shall be cleaned of dust etc. by blowing oil free and clean compressed air through all the injection nipples. In case of cracks in vertical or sloped walls, the injection must start at the lowest nipple.

(iii) The epoxy resin shall be Fosroc Nitokit TH System or product of equivalent or better performance and as approved by the Engineer. Epoxy injection shall be in accordance with the manufacturers written instructions. Note that on completion of injection and curing of the epoxy, the nipples are to be removed and the exposed surfaces ground or scraped smooth

(following heating with a hot air gun) to provide a smooth, even and tidy finish restoring the original profile).

16.13 MEASUREMENT & PAYMENT

All work done under this section shall be paid under relevant respective works; i.e. concrete, reinforcement, formwork, waterproofing etc.

***** END OF SECTION *****

SECTION - 17

POLYVINYLCHLORIDE (P.V.C) WATER STOPPER

17.01 SCOPE OF WORK

The work comprises of providing all labour, tools, equipments, to install, place and fabricate in position and locations rubber water stops together with all jointing and sealing materials as per recommendations, specifications of the Manufacturer and instructions. All embedment in concrete, lapping, turning, sealing shall ensure absolute water tightness subjected to any pressures. The workmanship and operation shall be perfect and guarantee leak proof at places wherever used in the structure.

17.02 MATERIAL REQUIREMENTS

Polyvinylchloride water stop shall be extruded from an elastomeric plastic compound, the basic resin of which shall be polyvinylchloride (PVC). The compound shall contain such additional resins plasticizers stabilizers or other materials needed to ensure that when the material is compounded and extruded to the shapes and dimensions shown, it will have physical characteristic when tested by U.S. Corps of Engineers Test Method specified below:-

Physical Characteristic	No. of Specimens Tested	Requirement	Test Method
Tensile strength using die III, not less than	5	1750 psi	568
Ultimate elongation using die III, not less than	5	350%	573
Low temperature brittleness, no sign of failure such as cracking or chipping at	3	(-) 35 F	570
Stiffness in flexure, 1/2" span, not less than	3	400 psi	571

Swell Bar is a flexible, hydrophilic waterstop based on synthetic rubber, with cross-sectional dimensions of 20 mm by 10 mm, applied with the help of adhesive which is used to secure the swell bar to the concrete substrate and around penetrations.

Swell bars of approved make shall satisfy provisions of a Type B (structurally integral) protection as defined in BS 8102: 2009 to waterproof construction joints and penetrations in underground waterproof reinforced concrete structures.

17.03 CONSTRUCTION REQUIREMENTS

Splices in the continuity or at the intersections of runs of PVC water stoppers shall be performed by heat sealing the adjacent surfaces in accordance with the Manufacturer's recommendations or as directed.

A thermostatically controlled electric source of heat shall be used to make all splices. The correct temperature at which splices should be made will differ. With the material used but should be sufficient to melt but not char the plastic. After splicing, a remoulding iron with ribs and corrugations to match the pattern of the water stoppers shall be used to reform the ribs at the splice. The continuity of the characteristic components of the cross section of the water stoppers design (ribs, tabular centre axis, protrusions, and the like) shall be maintained across the splice.

The expansion joints wherever indicated on drawings shall have centre bulb rubber water stops or its equivalent as indicated on drawings to be cast integrally with the in-situ-concrete of retaining walls, beams, columns, slabs or at any locations marked on the drawings incorporating junction places or as straight lengths with separate intersection pieces to be jointed at site as per Manufacturer's recommendations and Specifications. The water stops shall be installed so as to hold them securely in their correct position during

the placement of concrete. The concrete shall be fully and properly compacted around the water stops to ensure that no voids or porous areas remain. Where reinforcement is present adequate clearance shall be left between water stoppers and the reinforcement to permit proper compaction of concrete. No holes shall be made through any water stops. Hot or cold volcanising for jointing places of water stoppers at site shall be done with the prior Approval in accordance with the Manufacturer's recommendations and specifications.

17.04 MEASUREMENT

Measurement will be made of the number of Linear feet/meter of Polyvinylchloride water stoppers of the size and gauge shown on the drawings acceptably placed in the work. In computing the quantities, no allowance will be made for laps.

17.05 RATE AND PAYMENT

Payment will be made for the number of Linear feet/meter measured as provided above at the contract unit price per Ft/M. for Furnishing and installing polyvinylchloride water stoppers and shall include full compensation for splicing materials, splicing, sealant and all other work related to the section.

***** END OF SECTION *****

SECTION 18

WATERPROOFING OF TANKS AND BELOW-GRADE STRUCTURES

18.01 SCOPE OF WORK

The Work covered in this section of the Specifications consists of furnishing all plant, labor, equipment, appliances and materials and performing all operations in connection with the supply and installation of waterproofing of basements, pools, tanks and below grade structures, complete in strict accordance with this section of the Specifications and the applicable Drawings, Bill of Quantities and subject to the terms and conditions of the Contract.

18.02 GENERAL

The Contractor shall be completely responsible for the supply and proper installation of the specified waterproof membrane system, or its equivalent, to make the basement structure absolutely watertight. All membrane material shall be new and shall comply with the specified material requirements. The Contractor shall produce testing certificates to verify that the membrane meets the specification and is suitable for the end use intended.

The Contractor shall engage a qualified waterproofing specialist as a sub-contractor to supply, install and protect the waterproof membrane system, all in accordance with the membrane manufacturer's recommendations. The waterproofing specialist shall be approved by the Engineer and shall be selected on the basis of past track record, technical reliability, capability and willingness to supply technical assistance, and reputation for standing behind his product and work. The Contractor shall submit the name of his Specialist Contractor at the time of tender.

All basement and below-grade structures (including lift pits, water tanks, fuel tanks, etc) shall be protected by a water proof membrane all round, of the type complying with clause 14.07.

The Contractor shall be responsible for the implementation and maintenance of a temporary dewatering system to keep the Site dry at all times for proper installation of the membrane system. Where relief holes and/or relief panels are required to be left in the basement structure to prevent hydro-static uplift during the construction stage, these shall be cast back with full water proofing treatment following completion of the superstructure and/or when directed by the Engineer.

18.03 PERFORMANCE GUARANTEE

The Contractor shall provide a ten (10) year guarantee for water tightness of the basement, swimming pools, tanks and/or other below-grade structures (including lift pits), effective from the date of completion of the whole Works. The guarantee shall be submitted in the specified format and shall be subject to the approval and acceptance by the Employer.

Should any leak, moist lines, points or patches occur during the guarantee period, the Contractor shall immediately carry out the necessary remedial works, to restore the water tightness of the structure, at no cost to the Employer.

The Contractor shall make good damages to all finishes (such as plaster, paint, panelling, tiling, etc.) electrical or other installations, or other property, caused by water leakage or dampness. Alternatively, he shall reimburse the Employer for making good such damages.

18.04 SHOP DRAWINGS

The Contractor shall provide the Engineer with comprehensive shop drawings showing all details and procedures for the relevant parts of the Works. Reasonable time shall be allowed for checking by the Engineer in programming the production of shop drawings. Delays caused by the late submission of shop drawings or repeated amendments of drawings due to inadequate or inaccurate drawings will not be recognised as a reason for extension to the contract time.

The manufacturer's standard application details shall be used only as a guide for the preparation of shop drawings. The Contractor is deemed to have taken due consideration of the particular requirements of this contract based on the tender documents. Where necessary, the Contractor is expected to improve upon the

manufacturer's standard details to suit the project requirements and such amendments shall be shown in shop drawings for approval by the Engineer. The Contractor shall not be entitled to extra contract cost and/or time in this respect.

18.05 CONCRETE CONDITIONING

The membrane material shall be compatible with the surface of concrete. The use of curing compounds, release coatings on concrete forms, or admixtures in the concrete that interfere with the adhesion of the barrier material to concrete shall not be permitted.

Curing compounds shall not be used on concrete surfaces unless the Contractor can conduct field tests to demonstrate that complete removal of the compound can be achieved before application of the membrane. Alternatively, the Contractor may perform field tests to establish the compatibility of the compound with the membrane materials and the concrete surface.

Release agents such as oil, wax, grease and silicone which transfer to the concrete surface during placement, and contribute to poor adhesion between membrane system and concrete, shall not be used. The use of proprietary paint systems applied to forms and formulated to prevent contamination of the concrete surface, or the use of polyethylene lined forms, may be considered.

Special purpose admixtures, such as water-immiscible chemicals intended to retard evaporation of water during cure, may create adhesion problems and shall not be used.

18.06 CONCRETE SURFACE PREPARATION

i. Surface defects, including tie holes, unless otherwise specified in the Contract Documents, shall be repaired immediately after form removal. All honeycombed and defective concrete areas shall be removed down to sound concrete which shall then be cleaned. If chipping is necessary, the edges shall be perpendicular to the surface or slightly undercut. No feather edges shall be permitted.

ii. Unless specifically recommended by the membrane material manufacturer, normal mix Portland cement-based patching materials shall not be used for the repair of small surface voids and rutted cracks on account of their relatively poor adhesion to cured concrete. Such repair shall be effected with suitable resin-based materials composed of the same resin found in the protective membrane material mixed with inert fillers, but the specific recommendation of the membrane system manufacturer shall be obtained before using such materials for patching. Coarse aggregate shall be omitted.

iii. Large surface voids and rutted cracks shall be dry packed with graded aggregate and pressure grouted with suitable non-shrink cementitious mortar.

iv. The quantity of mixing water shall be limited to that necessary for handling and placing. The patching material shall be thoroughly mixed to the extent that it is the stiffest consistency that will permit placing.

v. The area to be patched and a band at least 150mm wide surrounding it shall be dampened to prevent absorption of water from the patching mortar. After surface water has evaporated from the area to be patched, an approved bonding agent shall be well brushed into the prepared surface. The premixed patching mortar shall be thoroughly consolidated into place, struck off so as to leave the patch slightly higher than the surrounding surface and left undisturbed for at least 1 hour to allow for some initial shrinkage before being finally finished. The patched area shall be kept damp for 7 days.

vi. Proprietary compounds may be used in lieu of, or in addition to, the foregoing patching procedures. Such compounds must be used strictly in accordance with the manufacturer's recommendations. Specific approval from the membrane manufacturer shall be obtained before proprietary compounds are used for patching. These materials shall be compatible with the membrane system and the concrete, and not interfere with good adhesion between the two.

vii. Fins, protrusions or similar irregularities projecting from the concrete surface shall be removed back to the surface by chipping, bush-hammering, needle-gunning, or wire brushing. Care shall be exercised to obtain a reasonably planar surface for application of the membrane system. Sharp offsets in the surface, such as those caused by formwork misalignment, shall be mechanically abraded to provide gradual and smooth transitions between the offset surfaces.

viii. The Contractor shall employ a suitable method of repair to stop any seepage or flow of water into or through the concrete structure prior to application of the membrane system. The method of repair shall depend on the type of defects present in the concrete and the source of water.

ix. Generally, surfaces shall be dry and must be newly exposed concrete, free of chemical contaminants and loose, weak or unsound materials.

18.07 MATERIAL

i. The waterproofing membrane shall be applied in double layers, each layer shall be a self-adhesive 2.0 mm thick water-proofing sheet membrane, "Aquafin-Latex" or equivalent, consisting of a non-woven polyester, coated on both sides with an elastomeric bitumen compound. The upper surface of the membrane is covered with polyethylene film with 8 cm strip of siliconized release paper and the lower surface is fully covered with siliconized release paper to protect the adhesive side of the rolls during storage and is removed just prior to application. Joining of seams shall be only by hot air welding without any use of adhesives or solvents. Proper accessories such as preformed corners, outlets, pipe collars and terminations shall be used. The waterproofing membrane shall conform to ASTM Standards D-146, D412 and D751.

ii. The 3mm thick waterproofing membrane shall have high biaxial strength, elongation and puncture resistance. It shall be resistant to most chemicals including all ground chemicals and be root-impenetrable. All joints shall be hot air welded with double seams with a test channel for integrity verification.

iii. The waterproofing membrane shall be terminated at the top of vertical walls, pile caps, etc. by heat-welding to double anchor strips or mechanical fastening by using an adhesive underlay (Heat-seal or an approved equivalent). The adhesive underlay shall be capable of providing an excellent bond between the waterproofing membrane and substrate. Termination using only liquid-applied sealants is not acceptable.

iv. The water-proofing membrane for walls shall be covered with cement-sand mortar layer protected by block wall, as shown on the Drawings.

v. Prior to commencement of waterproofing treatment, the Contractor shall submit shop drawings for each waterproofing detail and endorsed by the manufacturer or his approved representative. These are to be approved by the Engineer. The shop drawing shall be on a CAD-recognisable format and A1 or AO size.

18.08 METHOD OF CONSTRUCTION

Generally, the application procedures shall be consistent with the Manufacturer's recommendations.

The procedure of work shall be as follows unless otherwise modified by the Engineer to suit the site and project requirements.

a) At formation level, install proper drainage system including dewatering system, drain channels, sumps and pumps, to ensure dry site conditions. Lay stone soiling and concrete screed as specified. Concrete surface shall be smooth wood float finish.

b) The concrete surface shall be prepared in accordance with the requirements of the clause headed "Concrete Surface Preparation" in this Specification. The surface shall be free of sharp projections such as nail heads, concrete ribs, etc.

c) The waterproofing shall be a well-designed system installed by a single Specialist Waterproofing Contractor strictly according to the recommendations of the manufacturer.

d) The waterproofing membrane shall be identified with the manufacturer's inscriptions on the packaging.

e) The waterproofing membrane shall be rolled out lengthwise and aligned with an adjoining membrane to form an overlap joint of 50mm. A special hand operated hot-air welding gun or versions of the automatic welding machine shall then be used to fuse the membranes together and weld the overlap.

f) If required, single anchor strips shall be welded to the waterproofing membrane bi-directionally to provide structural anchoring to the base slab and create watertight compartments at not more than 100 sq.m grid.

g) The waterproofing membrane may be terminated to pile caps, ground beams using double anchor strips or an adhesive underlay.

h) If an adhesive underlay is used for termination, the concrete surface shall be primed with an approved primer prior to the installation of the adhesive underlay. The waterproofing membrane shall be terminated by using an adhesive underlay to bond the membrane to the structure and thereafter mechanical fastening it. The minimum widths for the termination using adhesive underlay shall be 250mm at ground beams, pile caps. The membrane shall be terminated using the same termination methods.

i) The waterproofing membrane shall be terminated at the top of the vertical walls at least a 300mm minimum above ground level by only using double anchor strips.

j) For horizontal below ground areas, the waterproofing membrane shall be protected with a minimum 25mm thick 1:3 cement and sand screed render prior to the commencement of further construction activities.

k) For vertical surfaces, the waterproofing membrane shall be covered with the approved protection material prior to backfilling.

18.09 Membrane Flashing

Flashing shall be provided at the line or joint where the membrane will terminate, particularly at the diaphragm walls and pile foundations. The flashing material used shall be of approved and durable type, and shall be resistant to weathering and mechanical damage. The flashing material shall be compatible with all other material employed in the membrane system and shall not cause chemical reactions when in contact with the latter.

The surface of adjoining building elements that are used to form the terminus of the waterproofing membrane shall meet the same requirements as the surfaces that receive the barrier. A treated timber nailer or equivalent device shall be used to mechanically secure the top edge of the flashing material according to the manufacturer's recommendations. Reglets shall not be used as a substitute for a nailing strip or device.

Flashing materials shall be the same as or compatible with those used in the waterproofing system. Compatibility shall be determined by the membrane manufacturer.

18.10 JOINTS

The waterproofing specialist shall give careful consideration to the design of membrane details at expansion, contraction and construction joints in the concrete substrate to minimise damage to the membrane due to differential movement.

Where the movement of soil substrate supporting horizontal membrane is likely to occur, the waterproofing specialist in association with the Contractor shall take appropriate measures as necessary to ensure the integrity of the membrane is not compromised.

18.11 MEMBRANE PROTECTION

Membrane protection shall be applied immediately following the application and testing of the waterproofing membrane. No membrane material shall be left permanently exposed for any period of time after installation.

The Contractor shall take immediate steps to cover up the Works following the application of membrane protection. If for any reason the Works cannot be covered up immediately, the Contractor shall be responsible for taking all necessary and approved measures required either to protect the membrane material from damage or if damage of the material has occurred, to make good all such damage, for the duration of exposure of the Works prior to covering up.

18.12 WATER TESTING

Water tightness test of below-grade holding structures shall be carried out in full compliance with BS 8007 Section 9, all at the Contractor's expense within contract period. Any leaks found shall be rectified at the Contractor's expense and re-tested to the Engineer's satisfaction.

Where required by the Engineer, water testing shall be carried out to check the performance of horizontal membrane applications. The area to be tested shall be flooded with at least 25mm of water. Drains shall be plugged and kerbings (temporary or permanent) shall be formed to retain the water for a period of at least 24 hours. Any leaks found during this period shall be repaired in accordance with the manufacturer's recommendations and the area shall then be retested. Before repairing the surfaces, they shall be dry.

Where it is impractical to water test an area because the slope of the substrate would produce excessive water depths, the membrane shall be tested by allowing water to run continuously over the area for a period of at least 8 hours. During the 8 hour period, the whole area shall be kept completely immersed.

Where water testing is not possible because of job conditions, location, etc, a thorough inspection shall be carried out to check all laps, terminations and flashings for any evidence of 'fish mouths', incomplete adhesion or other conditions that may be detrimental to the watertight integrity of the membrane.

18.13 WATERPROOFING TO TANKS AND LIFT PITS

Lift Pits and Non-Potable Water Tanks

a) All lift pits (bases and walls up to Ground Floor level) shall be constructed using waterproof concrete. The waterproofing shall be effected by incorporation of an approved waterproofing additive.

b) The internal faces of lift pits in contact with the ground and of concrete tanks holding non-potable water, including the underside of tank roofs, shall be made watertight with Industries or other approved equivalent.

c) Preparation of the concrete substrate and the method of application shall be carried out strictly in accordance with the manufacturer's directions. The substrate shall be well saturated with water but the concrete surface is to be kept matt damp and free of ponding before mortar application. The sealing mortar shall be applied in 3 coats of 1.0 - 1.5mm each. The preceding coat shall be allowed to set before applying the next coat but the time lapse between successive coatings shall not be more than 2 days. The total dry coat thickness of Tricolastic sealing mortar or equivalent (3 coats combined) shall not exceed 3mm.

Potable Water Tanks

a) The waterproofing system provided to internal face of concrete tanks holding potable water for consumption shall be of a type which is non-toxic and approved for such use. Flexible waterproofing coating Flexolastic or approved equivalent shall be used for waterproofing of potable water tanks as per manufacturer's recommendation.

b) The Contractor shall allow for 9" wide central bulb water-stop for all walls installed in accordance with the earlier requirements of the Concrete Specification.

18.14 MEASUREMENT AND PAYMENT

The waterproofing of basement raft and walls shall be measured per square meter /feet and paid as per unit rates entered in the Bill of Quantities inclusive of all overlaps, complete in accordance with the terms and Conditions of Contract.

PVC water stopper/ swell bars shall be measured per running meter/ feet and paid at per unit rates entered in the Bill of Quantities of accepted lengths a complete with accordance with the terms and Conditions of the Contract.

***** END OF SECTION *****

SECTION – 19

SOAK PIT

19.01 PERCOLATION TEST

Prior to construction of the Soak Pitl, this Contractor shall be required to perform a percolation test to determine the absorption capacity of the soil. The test shall be conducted as follows:

a) A test pit shall be dug approximately 5 feet in diameter and to such a depth as to reach porous soil, but not less than 8 feet.

b) In the bottom of this pit a 12" square and 12" deep hole shall be made.

c) The hole shall be filled with water for a depth of 7 inch. For pre-watering purposes, the water level shall be allowed to drop to 6 inches, before time of recording is started.

d) After the level of the water has dropped to 6 inches, the time required for the water level to drop every inch shall be recorded, till the level is 2 inch.

e) The hole shall again be refilled and the test repeated.

f) After the test, the thickness of the porous soil below the point of percolation shall be determined by using a soil auger, and the depth indicated in the test report.

g) If sub-soil water is encountered, the test report shall indicate the level of the same

The final number and size of the soakage pits shall be provided to the Contractor after the result of the percolation test are received.

19.02 CONSTRUCTION

Size: The soakage Pit shall be constructed as shown on the drawing. The size and quantity of the soakage pits shall be finally determined after receipt of the percolation test results by the Engineer Incharges. Soakage pit shall not penetrate ground water table.

Excavation: The excavation of the soakage pit shall be greater in diameter than the outside diameter of the vertical side walls to allow for the footing. To prevent soil collapse, excavation of the soil at an angle may be required.
Annular Space: The annular space between the outside of the vertical walls and the excavation shall be filled with broken stone, coarse gravel or other suitable material.
Bottom: The soak Pit bottom shall be open, with an outer ring to support the side walls.
Side Walls: The side walls shall be made of brick up as shown in drawings
Top: The Soak Pit top shall be of 100mm thick 1:2:4 RCC and shall be provided with one 24" x 24" RCC Cover with C.I. frame, as approved by the Engineer Incharge.
Reinforcement: Reinforcement to construct a structurally sound structure shall be provided as per good engineering standard**.**

19.03 MEASUREMENT AND PAYMENT

Payment shall be made per unit rate for the complete soak well as specified in the BOQ, and shall be deemed to include the cost of the percolation test, excavation, backfilling, all masonry & concrete works, soak-pit fillers, manhole cover and other works required to complete the soak well in all respects

***** END OF SECTION *****

SECTION 20

TUBE WELL

20.01 SCOPE OF WORK

The Specifications are for the drilling of tube wells equipped with pumps. The Contractor shall provide all labour, transport, plant, tools, equipment and materials and appurtenances, and shall perform all works necessary; to satisfaction of Engineer In charge, including but not limited to the following:

a) Construct and complete successfully drilled tubewells including lowering oftubewell assembly with PVC casing and Screen and end cap,
b) gravel pack at appropriate intervals and back fill, close near surface water table aquifer,
c) cleaning and development of tube wells,
d) pump test for 3 hours
e) chlorinate tubewell,
f) Construct the concrete structure for the tube well
g) install the pumping system
h) Proceed to water security approval by an independent /authorized lab

Refer to drawings and bills of quantities for complementary information. Please note, that all works, all supplementary materials, linings, accessories, preparation of the surfaces, fixing elements, any types of joints and any other items in connection with the Works not referred to or described in the Bill of Quantities but deemed necessary, should be executed according to the technical card of the material manufacturer and should be carried out in accordance with the Design Drawings, Specifications should be included in the price.

20.02 TUBE WELL CONSTRUCTION

A typical tube well section / well section are shown in annex 10. Basic methods of drilling are indicated below for following as basic guide, mostly to maintain a few key dimensional specifications.

I. DRILLING METHODS

The preferred method of drilling in consolidated compact formations is rotary or percussion with air and/or foam flush. Boreholes will be drilled 6 1/2 inches drill bits..

In unconsolidated loose, unstable, collapsing formations, rotary with appropriate drilling stabilizer will be used. In such a case the drilling diameters will be 6 ½ inches. If other chemical fluids or solids are used to arrest collapsing of formations, the Contractor has to use proper tube well development methods and tube well cleaning methods to ensure the tube well water is safe for drinking purposes. The Contractor will use such fluids or solids with the agreement of the Engineer.

Boreholes will be constructed with PVC casing, screen and sand trap. Quality of all these materials used should be in conformity with the drinking water standards.

20 m of slotted screen for Shallow tube well and 20 up to 40 m for Deep Tube Well will be installed in tube wells. All cost of using proper drilling fluids and solids is inclusive of the rate per feet quoted. No additional payments will be made

II. TUBE WELL DEPTH

Tube wells shall be drilled to such depths as to penetrate below the shallow water table aquifers and tap the first potential deeper aquifer or aquifers in confined/semiconfined conditions. The minimum discharge for each tube wells is 0.25 gps to sustain continuous pump testing for 3 hours to ensure reliable operation of pumps fitted on them. The depth to be drilled should be, minimum twenty feet (20) feet below the main aquifer to provide proper installation of a hand pump and to provide a sand trap of 10 feet. If the discharge is less than 0.1 gallons/sec., a decision to abandon the tube well or continue to drill deeper will be at the discretion of the Contractor, validated by the Engineer incharge. Any drilling beyond 30 feet of the major strike which has supplied water greater than 0.1 gallon/ sec, Supervision Firm will not pay for the excess drilling and installation of

casings etc.

III. TUBE WELL DIAMETER

1. Tube wells will be drilled with telescopic diameters.
2. 2The first 20 feet from the surface will have concrete grouting for sanitary protection.
3. For this the bore hole will be reamed to minimum diameter of 6 inches and concrete grouting placed in the annular space between the casing and open tube well wall Tube well will be drilled with 6 1/2 inches bit. The reaming diameter will be based on the type of temporary casing the implementing partner will use.
4. The implementing partner must take into account the depths he has to drill and lower temporary casing to complete the drilling. This cost must be built in the quoted unit cost for drilling.
5. The client will not be responsible for any loss of temporary casing which the Contractor is unable to pull out or lost due to snapping or breaking from the completed tube wells.

IV. SCREEN

1. The Contractor will use proprietary; factory-made UPVC slotted screens, the slot size and screen length depending on the aquifer materials and aquifer thickness. The Implementing partner will propose a scheme of equipment to the supervision firm who will take the responsibility of the design of the tube well. The Contractor will then assemble and place screen and casing at appropriate.
2. Slotted screens should be of ISO standard and have the following specifications: PVC Class 9/10, drinking water standards, nontoxic and in standard lengths of ten 10) feet in length, diameter of 4 inches, slot width 0.8 mm and not more than 1mm, and open area as percentage of internal surface area 9.26% per linear meter. Depending on the aquifer, the Implementing partner may choose an appropriate slot width other than 0.8 mm

V. CASING PIPE AND SAND TRAP

1. Casing pipe should be of ISO standard and have the following specifications: UPVC Class 10, drinking water standards, non toxic and in standard lengths of ten (10) feet in length, diameter of 4 inches wall thickness 5 mm.
2. The tube wells will be fully cased up to bottom of the tube well. The threads both male and female are properly cleaned with a brush and cloth before they are joined. If the pipes used are with bell and socket, these are cleaned using fluids and cemented with recommended solvent cement by the manufacturers of the casing pipes and screen. Wait for recommended time for the joint set firmly before lowering it into the tube well.
3. The Contractor will take all necessary precautions during the transportation and storage of casing pipes from their warehouse to drilling site to prevent distortions, bending or deformation of the pipe that could result in eccentricity along the length of the pipe

VI. TUBE WELL DEVELOPMENT

On completion of drilling, the Contractor will choose a suitable and appropriate tube well development method. The tube well shall be developed for a period of one hour in order to obtain a maximum yield of water that is free of suspended matter. Developing shall be carried out by airlift pumping and surging, jetting and block surging, or other techniques the implementing partner feels is more appropriate and efficient to suit the hydro-geological and drilling conditions prevailing in that tube well. All tube wells shall be presented for testing free of any bridging or obstruction to the total depth

VII. PUMPING AND REVOVERY TEST

1. Pumping test will be for three hours for step draw down test at 0.25, 0.5 and 1 gps. Based on the estimated discharge, the Contractor will certify the tube well as either "successful"

or "lost"

2. The minimum discharge is 0.1 gps. Pump test data should be recorded in a standard format approved by the Engineer Incharge. If the discharge is below 0.1 gps then the tube well will be regarded as "Lost"

3. The Contractor shall have on the site a 900 V-notch weir, preceded by a tank with baffles, for the measurement of flows. Small flow (less than 0.25 liters/second) can be measured by timing the filling of a vessel of known volume. The Implementing partner shall also have on site an operating electric dip meter, calibrated in centimeters, and with visual/audible indicator of when the water level is reached.

4. Readings of flow and water level shall be taken at the intervals defined on the test pumping form. For accurate measurement, an electrical/ sonic water level indicator with graduated tape for taking water level readings. Recovery readings shall be taken for a minimum of 1 hour, during which period airlifting or pumping equipment shall not be removed from the tube well.

VIII. WATER QUALITY TESTING

The Contractor shall make sampling and quality analysis for arsenic and other common pollutant of water from every bore hole.

***** END OF SECTION*****

SECTION - 21

S UB SOIL DRAINAGE PIPING

21.01 SCOPE OF WORK:

The work will include, providing, laying, fixing and instalation etc, complete in all respect; of Sub Soil Drainage Piping around/ alongside foundation of the Main building as shown in drawing and as per the approval of Engineer Incharge.

21.02 PIPE MATERIAL:

Subsoil drainage pipe shall be uPVC, coiled, perforated corrugated pipes. Fittings and pipe shall be from single source of manufacture. Pipe shall be manufactured in conformity with DIN 1187.

Diameter of perforation shall be 0.1" to 0.15" and density of holes shall be 40% of total pipe surface area.

21.03 INSTALLATION:

Each pipe shall be examined on arrival; defective pipes shall not be used. Drain shall be laid in straight lines and to even gradients between the levels shown, with pipes and fittings, of the type and diameter as shown on the drawings. Great care shall be exercised in setting out and determining the levels of the pipes and the Contractor shall provide suitable instruments, set up and maintain sight rails, and bench marks etc., necessary for the purpose. Cut pipe shall have smooth regular ends at right angles to length of pipe. All pipes to be cut with an approved cutter. All drains shall be kept free from earth, debris, superfluous cement and other obstructions during laying and until the completion of the Contract when they shall be handed over in a clean condition. Pipes shall be laid with the sockets leading upstream.

No pipes shall be laid on their collar or on blocks, tiles or other temporary supports.

Drainage line shall be accurately laid and shall be perfectly true to line and gradient from point to point in both vertical and horizontal planes.

Special fittings required in the installation not generally cast by manufacturers shall be got specially cast by Contractor matching with the shell thickness specified.

Branch connection shall be made with "WYE" and long "TEE-WYE" fittings. Short bends, common offsets and double hubs will not be permitted. Short "Tee-Wye" fittings are to be used in vertical piping only. All fittings shall conform to code requirements.

Sub Soil Water chamber will be constructed at locations shown in the drawings to the dimensions, sizing, levels, material as specified in the drawings and BOQ.

Pumps installed in sub soil water chambers shall follow the specifications of sump pumps (*Section 8*)

21.04 TESTING AND INSPECTION:

1. The entire drainage and vent system shall be subjected to testing after installation to ensure a leak-proof installation under operating conditions.
2. All the openings in the piping system shall be tightly closed by inserting test plugs of heavy rubber gasket that fit snugly all around the opening. The highest point will

be left open to supply water and may be raised if necessary by temporary jointing to develop a minimum head of five (5) meters of water at each section of the system. Water is filled to the point of overflow and any drop in the level of water will indicate a leak that will be found by inspection. The water level will be checked for no drop for at least 15 to 30 minutes.

3. No section will be tested at a pressure more than 6m of water. High stacks will be tested in sections, starting from the top section and then connecting top section to next lower section.

4. The drainage pipe and building sewer will also be inspected for slopes which must conform to the slopes specified. The slopes will be checked with precision angle measuring instrument like universal protector, plumb and level. Any portion found not laid according to the given slope will be rectified at the Contractor's expenses.

5. This Contractor shall furnish & pay for all devices, materials, supplies, labour and power required in connection with all tests. All tests shall be made in the presence of and to the satisfaction of the Engineer Incharge.

6. This Contractor shall also be responsible for the work of other trades that may be damaged or disturbed by the tests, or the repair or replacement of his work and he shall, without extra charge to the Employer, restore to its original condition, work of the trades so damaged and disturbed, engaging the original contractors to do the work of restoration.

7. Defects disclosed by the tests shall be repaired, or if required by the Engineer Incharge, defective work shall be replaced with new work without extra charge to the Employer. Test shall be repeated as directed, until all work is proven satisfactory.

8. This Contractor shall notify the Engineer Incharge, Employer and others having jurisdiction at least ten days in advance of making the required tests, so that arrangements may be made for their presence to witness the tests.

9. The Contractor shall submit test certificates to the Engineer Incharge & obtain his certification that the tested piping system have passed the prescribed tests.

*****END OF SECTION*****

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

Establishment of Thar Institute of Engineering, Sciences and Technology-TIEST, Islamkot
(Constituent College of NED University)

BIDDING DOCUMENTS

VOLUME-III (BILL OF QUANTITIES-BOQ)

EXTERNAL WATER SUPPLY & EXTERNAL SEWERAGE WORK OF (CIVIL DEPARTMENT, MECHANICAL DEPARTMENT MAIN GATE & PROJECT OFFICE)

AT

THAR INSTITUTE OF ENGINEERING, SCIENCES AND TECHNOLOGY-TIEST, ISLAMKOT

JANUARY 2024

ESS.I.AAR

Suite No. 314, 3rd Floor Mashriq Centre, Sir Shah Sulaiman Road, Gulshan-e-Iqbal, Karachi
Ph: (92-21) 34941059, Fax: (92-21) 34890770

BILL OF QUANTITIES OF

EXTERNAL WATER SUPPLY & EXTERNAL SEWERAGE WORK OF (CIVIL DEPARTMENT, MECHANICAL DEPARTMENT MAIN GATE & PROJECT OFFICE)

AT

THAR INSTITUTE OF ENGINEERING, SCIENCES AND TECHNOLOGY-TIEST, ISLAMKOT							
SUMMARY							
S. No.	**Description of Works**	**Cost of Scheduled Items (Rs.)**	**Add % Above/Below on Schedule Items**		**Cost of Non-Scheduled Items (Rs.)**	**Difference as per GOS notification 11-10-2022**	**Total Cost (Rs.)**
1	**2**	**3**	**4**		**5**	**6**	**7=3+4+5+6**
	PART- A EXTERNAL WATER SUPPLY						
i	Under Ground Water Tank	649,266	_____ %			231,794	
ii	Construction of Pump Room						
a	Civil Work	1,653,732	_____ %			556,020	
b	Electrical Work	127,776	_____ %				
iii	External Water Supply	746,222	_____ %			217,544	
iv	Installation of Water Pumps (2 No's)	256,998	_____ %			50,376	
	PART- B EXTERNAL SEWERAGE WORK						
i	External Sewerage Work	6,242,518	_____ %			1,709,434	
ii	Septic Tank & Soakpit	2,157,337	_____ %			765,307	
						TOTAL COST	
						ADD 5% SRB	
						SUB TOTAL	

Amount in Words:

_____

CONSTRUCTION OF UNDER GROUND WATER TANK

BILL OF QUANTITIES OF

CONSTRUCTION OF U.G.W.T AT THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY

AT

THARPARKAR

CIVIL WORKS

Ref. No. / NSI	Item no	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
		SCHEDULE ITEM				
SECTION - 1 EARTH WORK						
S.No. 18 (c) /P-4	1.1	Excvation in foundation of building bricks and other structure i/c dag belling dressing refilling arround the structure with excvated earth watering and ramming lead upto 5 ft. (c) In hard soil or soft murum.	5534.85	%oCft	3554.38	19,672.95
					TOTAL COST	**19,672.95**
SECTION -2 PLAIN CEMENT CONCRETE						
S.No. 5(i)/P-15	2.1	Cement concrete plain including placing compacting, finishing and curing, complete (includingscreening and washing of stone aggregate without shuttering). (a) Ratio 1:4:8	335.45	%Cft	11288.75	37,867.55
S.No. 6(a) P-17	2.2	Reinforcement concrete work including all labour and material except the cost of steel reinforcement and its labour for bending and binding which will be paid separately. This rate also includes all kind of forms, moulds, lifting shuttering, curing, rendering and finishing the exposed surface (including Screening and washing of shingle) R.C.C work in roof slab beams columns rafts lintels staircases and other structural members laid in situ or pre-cast laid in position complete in all respects, ratio (II) Ratio 1:2:4	1442.91	Cft	337.00	486,262.02
					TOTAL COST	**524,129.57**
SECTION -3 MISCELLANEOUS						
S.No 91 /P-108	3.1	Providing anti-termite treatment by spraying/ sprinkling / spreading Neptachlar 0.5% or equivalent. Emulsion as an over all Pre Construction treatment in slab type construction along external foundation trenches of the building over complete parimeter of the foundation trench etc. as per directions of engineer incharge.	1584.39	Sft	9.74	15,431.91
S.No.70 P-107	3.2	Vertical damp proof course of 3/4" thick cement plaster 1: 2with bitumen at (20 Lbs. Per % Sft.)	877.80	%Sft	2,760.99	24,235.97
S.No.3/P-55	3.3	Providing & fixing in Position in C.C foundation 1:3:6 Ladder of M.S Angle iron 2" x 2" x 1/4" 1' Apart with M.S Bar 3/4" Dia Spaced 1' apart painting 3 coats with anticorrosive steel paitn etc complete.	29.70	Rft	799.00	23,730.30

Ref. No. / NSI	Item no	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
S.No.4/P-55	3.4	Providing and fixing C.I Ventilator (weight not less then 80 Lbs/each)in tank roof of approved design with water tight joint i/c painting etc complete.	2.00	Each	4870.00	9,740.00
S.No.2/P-56	3.5	Providing "expansion joint" in concrete work of 9" wide corugated PVC waterstop (with bulb)i.e soldering cost of material and labour etc complete.	250.80	Rft	86.00	21,568.80
S.No.1 P-35	3.6	Providing C.I Manhole Cover & Frame i/c Cost of Material etc.	1.54	Cwt	6,985.00	10,756.90
					TOTAL COST	**105,463.88**
					SUB TOTAL SCHEDHULE ITEM	**649,266.40**
		NON SCHEDULE ITEM				
SECTION-1 REINFORCEMENT WORK						
NSI	1.1	Providing and laying deformed (minimum yield point 60,000 psi) reinforcement bars with & including the cost of straightening, cutting, bending, binding, placing in position in all kinds of RCC work in foundation, basement, plinth and any floor of building and as per direction of engineer in charge.	5236.01	Kg		
					TOTAL COST	

CONSTRUCTION OF PUMP ROOM

BILL OF QUANTITIES OF
CONSTRUCTION OF PUMP ROOM AT THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY
AT
THARPARKAR

CIVIL WORKS

Ref. No. / NSI	Item no	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
		SCHEDULE ITEM				
SECTION - 1 EARTH WORK						
S.No. 18 (c) /P-4	1.1	Excvation in foundation of building bricks and other structure i/c dag belling dressing refilling arround the structure with excvated earth watering and ramming lead upto 5 ft. (c) In hard soil or soft murum.	775.00	%oCft	3554.38	2,755
S.No. 21/P-4	1.2	Filling, watering and ramming earth in floor with surplus earth from foundation lead upto the one chain and lift upto 5 ft. (for plinth)	170.67	%0Cft	1512.50	258
S.No. 22/P-4	1.3	Filling, watering and ramming earth under floor with new earth (Excavated from outside) lead upto one chain and lift upto 5 feet.	429.33	%0Cft	3630.00	1,558
S.No.13 (b)/P-3	1.4	Earth work compaction (Soft ordinary or hard soil)(b) Laying earth in 6 layers levelling and dressing and watering for compaction etc. complete.	600.00	%0Cft	354.00	212
S.No.92 (b)/P-109	1.5	Providing Anti -termmite treatment by spraying /sprinkling /spreading Neptachlar 0.5% Emulsion as an overall pre -construction treatment in slab type construction under the slab and along attached perches or entrances etc, complete as per directions of Engineer Incharge.	120.00	P.Sft.	9.74	1,169
					TOTAL COST	**5,952**
SECTION -2 PLAIN , REINFORCED CONCRETE & REINFORCEMENT WORK						
S.No. 5(i)/P-15	2.1	Cement concrete plain including placing compacting, finishing and curing, complete (includingscreening and washing of stone aggregate without shuttering). (a) Ratio 1:4:8	94.17	%Cft	11288.75	10,630
S.No. 5(h) P-15	2.2	Cement concrete plain including placing compacting, finishing and curing, complete (including screening and washing of stone aggregate without shuttering). Ratio (1: 3:6)	382.50	%Cft	12595.00	48,176
S.No 19 b (ii) / P-17	2.3	Erection and removal of centering for R.C.C or plain concrete works of Partal wood vertical	940.00	%Sft	3127.41	29,398

Ref. No. / NSI	Item no	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
S.No. 6(a) P-17	2.4	Reinforcement concrete work including all labour and material except the cost of steel reinforcement and its labour for bending and binding which will be paid separately. This rate also includes all kind of forms, moulds, lifting shuttering, curing, rendering and finishing the exposed surface (including Screening and washing of shingle) R.C.C work in roof slab beams columns rafts lintels staircases and other structural members laid in situ or pre-cast laid in position complete in all respects, ratio (II) Ratio 1:2:4	262.50	Cft	337.00	88,463
S.No 2 /P-15	2.5	Dry rammed shingle brick ballast or stone ballast 1.5" to 2"guage	60.00	%Cft	3327.50	1,997
S.No 16 (c) /P-42	2.6	Provide & lay topping of concrete 1:2:4, including surface finishing & dividing in panels : 2" thick (For Under Floor)	120.00	%Sft	3275.50	3,931
					TOTAL COST	**182,593**
SECTION -3 BRICK MASONRY WORK						
S.No 5(I)/P-21	3.1	Pacca brick work in ground floor in (e) Cement sand mortar. 1:6	475.13	%Cft	12674.36	60,219
					TOTAL COST	**60,219**
SECTION -4 SURFACE RENDERING						
S.No 13(b) /P-52	4.1	Cement plaster 1:6 upto 12' height (b) 1/2" thick (For Internal Side)				
	a	Ground Floor	844.50	%Sft	2206.60	18,635
S.No 11(a) /P-52	4.2	Cement plaster 1:4 upto 12' height (a) 3/8" thick (For Ceiling)				
	a	Ground Floor	236.00	%Sft	2197.52	5,186
S.No 32 /P-55	4.3	Cement plaster 1:6 upto 12' height. (c) 3/4" thick. (For External)				
	a	Ground Floor	700.00	%Sft	2590.5	18,134
					TOTAL COST	**41,954**
SECTION -5 ROOFING & WATERPROOFING						
S.No 9 /P-71	5.1	Bitumen coating to plastered or cement concrete surface.	1067.75	%Sft	778.09	8,308
S.No 14 /P-18	5.2	Reinforced cement concrete spout i/c fixing in position 2-1/2"x6"x5"	5.00	No,s	261.25	1,306
					TOTAL COST	**9,614**
SECTION -6 PAINTING & VARNISHING						
S.I. No. 40(a) /Ch-9	6.1	Preparing the surface and painting with plastic emulsion paint of approved make I/c rubbing the surface with sand Paper, filling the voids with chalk / plaster of paris and then painting etc. complete.	844.50	%Sft	1080.75	9,127
S.I. No. 23/P-53	6.2	Primary coat of Chalk under distemper (for ceiling)	236.00	%Sft	442.75	1,045
S.I No. 24/P-53.	6.3	Distempering (c) three coats.(for ceiling)	236.00	%Sft	1079.65	2,548

Ref. No. / NSI	Item no	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
S.No 38(A) +(B x 2)/P-56	6.4	Preparing the surface and painting with weather coat i/c rubbing the surface with rubbing brick / sand paper filling the voids with chalk/plaster of pairs and then painting with weather of approved make (new surface) three coat	700.00	%Sft	2567.95	17,976
S.No 5(d) /P-70	6.5	Painting new surfaces:- (d) Preparing surface and painting guard bars, gates of iron bars, gratings, railings (including standards braces, etc). And similar open work.				
		(a) Priming coat.	64.00	%Sft	521.95	334
		(b) Each subsequent coat of paint.	64.00	%Sft	374.44	240
					TOTAL COST	**31,269**
SECTION -7 FLOOR FINISHES						
S.No 72 /P-49	7.1	Laying floor of approved with glazed tile 1/4" thick in white cement 1:2 over 3/4" thick cement mortar 1:2 complete.	4537.67	%Sft	27678.86	1,255,974
					TOTAL COST	**1,255,974**
SECTION -8 CARPENTRY AND JOINERY						
S.No 17 /Ch-31	8.1	Providing and fixing iron steel grill door with angle iron frame of 1 1/2" x 1 1/2" x 1/4" and flat iron of 3/4" x 1/4" with approved design and locking arrangement embeded in Masonry as per instructions of Engineer in charge.	28.00	Sft	231.60	6,485
S.No 84(B) /P-108	8.2	Supplying & fixing in position Aluminium channels framing for slidding windows & ventilators of Alcop made with 5 mm thick tinted glass glazing (Belgium) & Aluminium fly screen I/c handles stoppers & locking arrangement etc. complete.	32.00	Sft	1,647.69	52,726
					TOTAL COST	**59,211**
SECTION -9 METAL WORK						
S.No 26 /P-93	9.1	Supplying & fixing in position iron/steel grill of 3/4" x 1/4" size flat iron of approved design including painting 3 coats etc. complete (weight not to be less than 3.7 Lbs./Sq . Foot of finished grill).	32.00	Sft	180.50	5,776
					TOTAL COST	**5,776**
SECTION -10 MISCELLANEOUS						
S.No 91 /P-108	10.1	Providing anti-termite treatment by spraying/ sprinkling / spreading Neptachlar 0.5% or equivalent. Emulsion as an over all Pre Construction treatment in slab type construction along external foundation trenches of the building over complete parimeter of the foundation trench etc. as per directions of engineer incharge.	120.00	Sft	9.74	1,169
					TOTAL COST	**1,169**
					SUB TOTAL COST OF SCHEDULE ITEM	**1,653,732**
		NON SCHEDULE ITEM				
SECTION-1 REINFORCEMENT						

Ref. No. / NSI	Item no	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
NSI	1.1	Providing and laying deformed (minimum yield point 60,000 psi) reinforcement bars with & including the cost of straightening, cutting, bending, binding, placing in position in all kinds of RCC work in foundation, basement, plinth and any floor of building and as per direction of engineer in charge.	952.55	Kg		
NSI	1.2	Providing & fixing Centrifuagal pumping set comprising of submersible pump with 2 HP 2850/2900 RPM, 220/230 V AC electric motor capable to discharge 500 US GPH (Gallons per Hour) of clear water at head of 280 to 350 ft, including errection clamp, cable, motor control unit,non returen valve complete in all respect as approved by the engineer incharge as required.	2.00	Each		
TOTAL COST OF NON SCHEDULE ITEM						

BILL OF QUANTITIES OF
CONSTRUCTION OF PUMP ROOM AT THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY
AT
THARPARKAR

ELECTRICAL WORK

SCHEDULE ITEM

S.NO	ITEM #	DESCRIPTION OF WORK	UNIT	QTY	RATE	AMOUNT
1	124	**Wiring:-** Wiring for light or fan point with (3/.029) PVC insulated wire in 20mm (3/4") PVC conduite recessed in the wall or column as required	Point	36	1130	40,680
2	126	Wiring for plug point (3/.029) PVC insulated wire in 20mm (3/4") PVC conduite recessed in the wall or column as required	Point	8	985	7,880
3	10	P/Laying (Main or Sub Main) Pvc insulated with size 2-7/.029 copper conductor in 20mm (3/4") PVC conduite recessed in the wall or column as required (for pp, circuit & garden light wiring).	Mtr	250	222	55500
4	41	P/Laying (Main or Sub Main) Pvc insulated with size 4-7/.052 (10mm²) copper conductor in (1.5") dia PVC conduite recessed in the wall, column as required (From DB to motor)	Mtr	15	858	12,870
5	102	**Cable Work:-** P/Laying (Main or Sub Main) PVC insulated & PVC sheathed with 4 core copper conductor under ground 600/1000 volts size 16mm²	Mtr	8	1300	10,400
6	224	Providing and fixing three pin 10/15 A plug & socket.	No.	2	151	302
7	228	Providing and fixing bakelite / Plastic ceiling rose with two terminals	No.	2	72	144
					TOTAL SCHEDULE ITEM	**127,776**

BILL OF QUANTITIES OF
CONSTRUCTION OF PUMP ROOM AT THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY
AT
THARPARKAR

ELECTRICAL WORK

NON SCHEDULE ITEM

S.NO	DESCRIPTION OF WORK	UNIT	QTY	RATE	AMOUNT
1	**Fittings & Fixtures:-** Providing and fixing LED down light 4" 9w good quality complete in all respect or as approved by the E/I as required.	Pcs	10		
2	Providing and fixing LED pool light 4w good quality complete in all respect or as approved by the E/I as required.	Pcs	4		
3	Providing and fixing LED wall bracket light 6w good quality complete in all respect or as approved by the E/I as required.	Pcs	40		
4	Providing and fixing LED tube light 2 X 36w good quality complete in all respect or as approved by the E/I as required.	Pcs	12		
5	Providing and fixing LED bolard light 4w good quality complete in all respect or as approved by the E/I as required.	Pcs	24		
6	Providing and fixing wall bracket fan 16" sweep good quality including making connection complete in all respect or as approved by the E/I as required.	Pcs	6		
7	Providing and fixing exhaust fan 12" sweep good quality including making connection complete in all respect or as approved by the E/I as required.	Pcs	6		
8	**Accessories:-** Providing and fixing 4 gang switch clipsal or equivalant flush type on metal board or as approved by the E/I as required.	Pcs	2		
9	**Wiring For Earth Point:-** Wiring for earthing point with (1 mm²) PVC insulated wire recessed in the wall or column as required. (For L, F & Plug Point)	Mtr	30		
10	Wiring for earthing point with (1.5 mm²) PVC insulated wire recessed in the wall or column as required. (For Power & circuits)	Mtr	12		
11	**Earthing:-** Providing and fixing Earthing set with 2'x2'x1/8" copper plate buried in the ground at a depth of 12 feet or less if water comes out from the ground level (salt & charcoal, or earthing chemical powder) etc. making the pit 12 feet deep by excavation of all type of soil (except soft or hard rock) including fixing of 2x8 SWG copper wire in 1/2" dia GI conduit complete in as respect including fixing tee and making pit with cover complete as required.	Job	7		
12	Supply and errection of Grounding connecting points.	Each	7		
	DB				

S.NO	DESCRIPTION OF WORK	UNIT	QTY	RATE	AMOUNT
	Providing & Fixing, testing,commissioning cubical type metal distribution board flush type with locking arrangement duly powder quoted paint including all fastening material including wiring with suitable gauge Pvc / Pvc wire complete in all respect (Pel, Libra, Rco, Karimi, Industrial Power Tech, Global Tech).				
13	**Incoming:-** 01 Nos 20 A TP MCCB (Terasaki or equivalant) 03 Nos Indicating lamps **Out going:-** 3 Nos 10 A SP MCB (Terasaki or equivalant)	Job	1		
				TOTAL NON SCHEDULE ITEM	

EXTERNAL WATER SUPPLY

BILL OF QUANTITIES OF

EXTERNAL WATER SUPPLY OF THAR INSTITUTE OF ENGINEERING, SCIENCES & TECHNOLOGY-TIEST AT THARPARKAR

Ref. No. / NSI	Item no	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)
SCHEDULE ITEM						
Highways work S.N 1 P-1	1	Cleaing and grubbing the site by cutting ,uprooting and removing all rubbish and shrubs including disposal to (out side limits) designated Places.	%Sft	11940.06	97.07	11,590
PHS.I No 2-P-61	2	Excavation for pipe line in trenches and pits in sandy soils i/c trimming and dressing sides to true alignment and shape levelling of beds of trenches to correct level and grade , cutting joint holes and disposal of surplus earth within a one chain as directed by Engineer insharge . Providing fence guard lights flags and temporary crossings for non-vehicular traffic where ever required lift up to 5ft. (1.52m) and lead upto one chain (30.5m)	%0Cft	19900.10	3750.00	74,625
PH S.I No1/P-26	3	Providing laying and fixing in trench ic fitting jointing and testing etc complete in all respect the high Density polythylene PE pipes (HDPE-100) for W/S confirming ISO 427/DIN8074/8075 b.S 3580 & PSI 3051 h)110mm	Rft	615.75	224.00	137,927
PH S.I No1/P-26	4	Providing laying and fixing in trench ic fitting jointing and testing etc complete in all respect the high Density polythylene PE pipes (HDPE-100) for W/S confirming ISO 427/DIN8074/8075 b.S 3580 & PSI 3051 (PN-8) f)75mm	Rft	244.35	109.00	26,635
PH S.I No1/P-26	5	Providing laying and fixing in trench ic fitting jointing and testing etc complete in all respect the high Density polythylene PE pipes (HDPE-100) for W/S confirming ISO 427/DIN8074/8075 b.S 3580 & PSI 3051 (PN-8) d)50mm	Rft	1249.81	59.00	73,739
S.I No 29/P-26	6	Supplying and filling sand under floor and plugging in walls.	% Cft.	2784.53	1141.25	31,778

Ref. No. / NSI	Item no	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)
S.I No 5/P-51	7	Providing Chamber 3 3/4' x 3 1/2' (1143x1067 mm) inside diamension 8' (2.44 meter) deep as per approved design for sluice value 27" to 30" dia with 30" dia inside cost iron cover and frame (wt=3 cwt) fixed in RCC 1:2:4 slab 6" thick (with 5 Lbs steel per cft) 9" (299 mm) thick burnt brick masonary wall set in 1:6 cement mortar 6" thick cement concrete 6" thick cement concrete 1:3:6 in foundation 1" thick cement concrete 1:2:4 flooring 1/2 thick cement concrete 1:2:4 flooring 1/2" thick cement plaster 1:3 to all inside wall surface and to top i/c providing and fixing M.S foot rest at every one foot beyond 2 1/2 ft depth curing, excavation, back filling and disposal of surplus earth etc. complete.	Each	9.00	37255.00	335,295
S.I No 24/P-77	8	Refilling the excavated stuff in trenches 6" thick layer i/c watering ramming to full compaction etc complete.	%0Cft	19794.23	2760.00	54,632
					TOTAL SCHEDULE ITEM COST	**746,222**
NON SCHEDULE ITEM						
NSI	1	Providing, fixing, testing commisioning and installing double acting flanged Gate Valve & air relief valve with extra flanges required from approved manufactureres of Japan / Europe/				
	a)	110 mm	Each	2.00		
	b)	75mm	Each	1.00		
	c)	50mm	Each	5.00		
					TOTAL NON SCHEDULE ITEM COST	

INSTALLATION OF WATER PUMPS

BILL OF QUANTITIES OF

INSTALLATION OF WATER PUMPS OF THAR INSTITUTE OF ENGINEERING, SCIENCES & TECHNOLOGY-TIEST AT THARPARKAR

Ref. No. / NSI	Item no	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)
SCHEDULE ITEM						
PHS.I No O-1-P-41	1	Boring for tube well in all water bearing soils from ground level upto 100 ft. or 30.5 meter depth i/c sinking and with drawing of casing pipe. e)200 mm (8" dia)	Rft	100.00	535.00	53,500
PHS.I No 8b-P-43	2	Supplying & fixing M.S bail plug	Each	1.00	2607.00	2,607
PHS.I No 12-P-44	3	Supplying and installing PVC blind pipe 'B' Class of approved design quality and make i/c necessary sockets etc. complete. b) 100 mm (4" dia)	Rft	80.00	179.10	14,328
PHS.I No 9-P-43	4	Supplying and installing PVC strainers 'B' class of approved design quality and make i/c necessary sockets etc. complete. b) 100 mm (4" dia)	Rft	20.00	209.95	4,199
PH S.I No5/P-43	5	Providing storng substantially built wooden locked box with compartments for preserving 2Lbs (1Kg) Sample of stratn.	P.Sample	1.00	3530.00	3,530
S.I No 5/P-51	6	Providing Chamber 3 3/4' x 3 1/2' (1143x1067 mm) inside diamension 8' (2.44 meter) deep as per approved design for sluice value 27" to 30" dia with 30" dia inside cost iron cover and frame (wt=3 cwt) fixed in RCC 1:2:4 slab 6" thick (with 5 Lbs steel per cft) 9" (299 mm) thick burnt brick masonary wall set in 1:6 cement mortar 6" thick cement concrete 6" thick cement concrete 1:3:6 in foundation 1" thick cement concrete 1:2:4 flooring 1/2 thick cement concrete 1:2:4 flooring 1/2" thick cement plaster 1:3 to all inside wall surface and to top i/c providing and fixing M.S foot rest at every one foot beyond 2 1/2 ft depth curing, excavation, back filling and disposal of surplus earth etc. complete.	Each	1.00	37255.00	37,255
PH S.I No1/P-26	7	Providing laying and fixing in trench ic fitting jointing and testing etc complete in all respect the high Density polythylene PE pipes (HDPE-100) for W/S confirming ISO 427/DIN8074/8075 b.S 3580 & PSI 3051 (PN-8) f)75mm	Rft	120.00	109.00	13,080
					TOTAL COST SCHEDULE ITEM X 2	**256,998**
NON SCHEDULE ITEM						
NSI	1	Preparation and making gravel pack around the tube well fixtures with supply of designed graded pea gravels free from any substance harmful to pipe and health confirmed by test (Passing through #10 mesh and retained on #40 mesh) including sieving, washing etc. complete as per standard specification and accepted by the Engineer-in-charge.	Rft	100		
NSI	2	Providing, fixing, testing commisioning and installing double acting flanged 3" Dia Gate Valve & 2-1/2" air relief valve with extra flanges required from approved manufactureres of Japan / Europe/	Each	1		
NSI	3	Providing & fixing Submersible pumping set comprising of submersible pump with 2 HP 2850/2900 RPM, 220/230 V AC electric motor capable to discharge 500 US GPH (Gallons per Hour) of clear water at head of 280 to 350 ft, including errection clamp, cable, motor control unit, complete in all respect as approved by the engineer incharge as required.	Each	1		
					TOTAL COST OF NON SCHEDULE ITEM X 2	

EXTERNAL SEWERAGE LINE

BILL OF QUANTITIES OF

EXTERNAL SEWERAGE LINE AT THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY AT THARPARKAR

Ref. No. / NSI	Item no	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)
SCHEDULE ITEM						
PHS.I No 2-P-61	1	Excavation for pipe line in trenches and pits in sandy soils i/c trimming and dressing sides to true alignment and shape levelling of beds of trenches to correct level and grade , cutting joint holes and disposal of surplus earth within a one chain as directed by Engineer insharge . Providing fence guard lights flags and temporary crossings for non-vehicular traffic where ever required lift up to 5ft. (1.52m) and lead upto one chain (30.5m)	%0Cft	63813.02	3750.00	239,299
PH Schedule D, S.I No 2/ 24	2	Providing R.C.C pipe with collars slass "B" and digging the trenches to required depth & fixing inposition including cutting , fitting & jointing with maxphalt composition & cement mortor 1: 1 and testing with water pressure jto a head of 4 feet a bove the top of the heghest pipe & refilling with excavated staff.				
	i)	(c) 6" dia R.C.C pipe class "B"	P.Rft.	220.00	199.25	43,835
	ii)	(d) 9" dia R.C.C pipe class "B"	P.Rft.	2600.71	250.60	651,737
	iii)	(e) 12" dia R.C.C pipe class "B"	P.Rft.	727.61	401.97	292,476
PH Schedule D, S.I No 3/ 48	3	Constructing manhole or inspection chamber for the required dia of circular sewer and 12' depth with walls of B.B in cement mortor 1:3 cement plastered 1:3, 1/2" thick, inside of walls and 1" (25 mm) thick over benching and channel i/c fixing C.I manhole cover with frame of clear opening 2' x 2' (457x457 mm) of 4.5 cwt. embaded in 9" thick R.C.C 1:2:4 two way reinforced i/c fixing 1" (25 mm) dia M.S steps 6" (150 mm) wide projecting 4" (102 mm) from the face of wall at 12" (305 mm) C/C duly painted etc, complete as per standard specification and drawing.				
	i)	4" to 9" dia 4'-6"x3'x12'	Each	68.00	55411.00	3,767,948
	ii)	15" dia 4'-6" x 3'-6"'x12'	Each	19.00	59370.00	1,128,030
S.I No 24/P-77	4	Refilling the excavated stuff in trenches 6" thick layer i/c watering ramming to full compaction etc complete.	%0Cft	43185.92	2760.00	119,193
					TOTAL COST OF SCHEDULE ITEM	**6,242,518**

CONSTRUCTION OF SEPTIC TANK & SOAKPIT

BILL OF QUANTITIES OF
SEPTIC TANK & SOAK PIT
AT
THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY
AT THARPARKAR

Ref. No. / NSI	Item no	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)
SCHEDULE ITEM						
S.No. 18 (c) /P-4	1	Excvation in foundation of building bricks and other structure i/c dag belling dressing refilling arround the structure with excvated earth watering and ramming lead upto 5 ft. (c) In hard soil or soft murum.	%0Cft	80640	3554.38	286,626
S.I No 1-P-86	2	Excavation of well in dry upto 20' below ground level and disposal of soil within one chain. (a) In ordinary soil or sand.				
i	a	From 0' to 5' depth	% 0 Cft.	936	2247.58	2,105
ii	b	From 10.1' upto 15' depth.	% 0 Cft.	936.41	2641.00	2,473
S.I No 2-P-86	3	Dry sinking of well including loading and removing excabated material.				
i	a	From 15.1' upto 20' depth.	% 0 Cft.	466.59	15125.00	7,057
ii	b	From 20.1' upto 25' depth.	% 0 Cft.	466.59	18150.00	8,469
S.No. 5(i)/P-15	4	Cement concrete plain including placing compacting, finishing and curing, complete (includingscreening and washing of stone aggregate without shuttering). (a) Ratio 1:4:8	%Cft	684.68	11,288.75	77,292
S.No. 6(a) P-17	5	Reinforcement concrete work including all labour and material except the cost of steel reinforcement and its labour for bending and binding which will be paid separately. This rate also includes all kind of forms, moulds, lifting shuttering, curing, rendering and finishing the exposed surface (including Screening and washing of shingle) R.C.C work in roof slab beams columns rafts lintels staircases and other structural members laid in situ or pre-cast laid in position complete in all respects, ratio (II) Ratio 1:2:4	Cft	4828.04	337.00	1,627,049
S.No.70 P-107	6	Vertical damp proof course of 3/4" thick cement plaster 1: 2with bitumen at (20 Lbs. Per % Sft.)	%Sft	4057.93	2,760.99	112,039
S.No.1 P-35	7	Providing C.I Manhole Cover & Frame i/c Cost of Material etc.	Cwt	4.90	6,985.00	34,227
					TOTAL COST OF SCHEDULE ITEM	**2,157,337**
		NON SCHEDULE ITEM				
NSI	1	Providing and laying deformed (minimum yield point 60,000 psi) reinforcement bars with & including the cost of straightening, cutting, bending, binding, placing in position in all kinds of RCC work in foundation, basement, plinth and any floor of building and as per direction of engineer in charge	Kg	19271.86		
NSI	2	Supplying, filling, spreading & and leveling stone boulders of size range 9" to 12" in recharge pit, in the required thickness, for all leads & lifts, all complete as per direction of Engineer-in-charge.	Cft	933.17		
					TOTAL NON SCHEDULE COST	

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

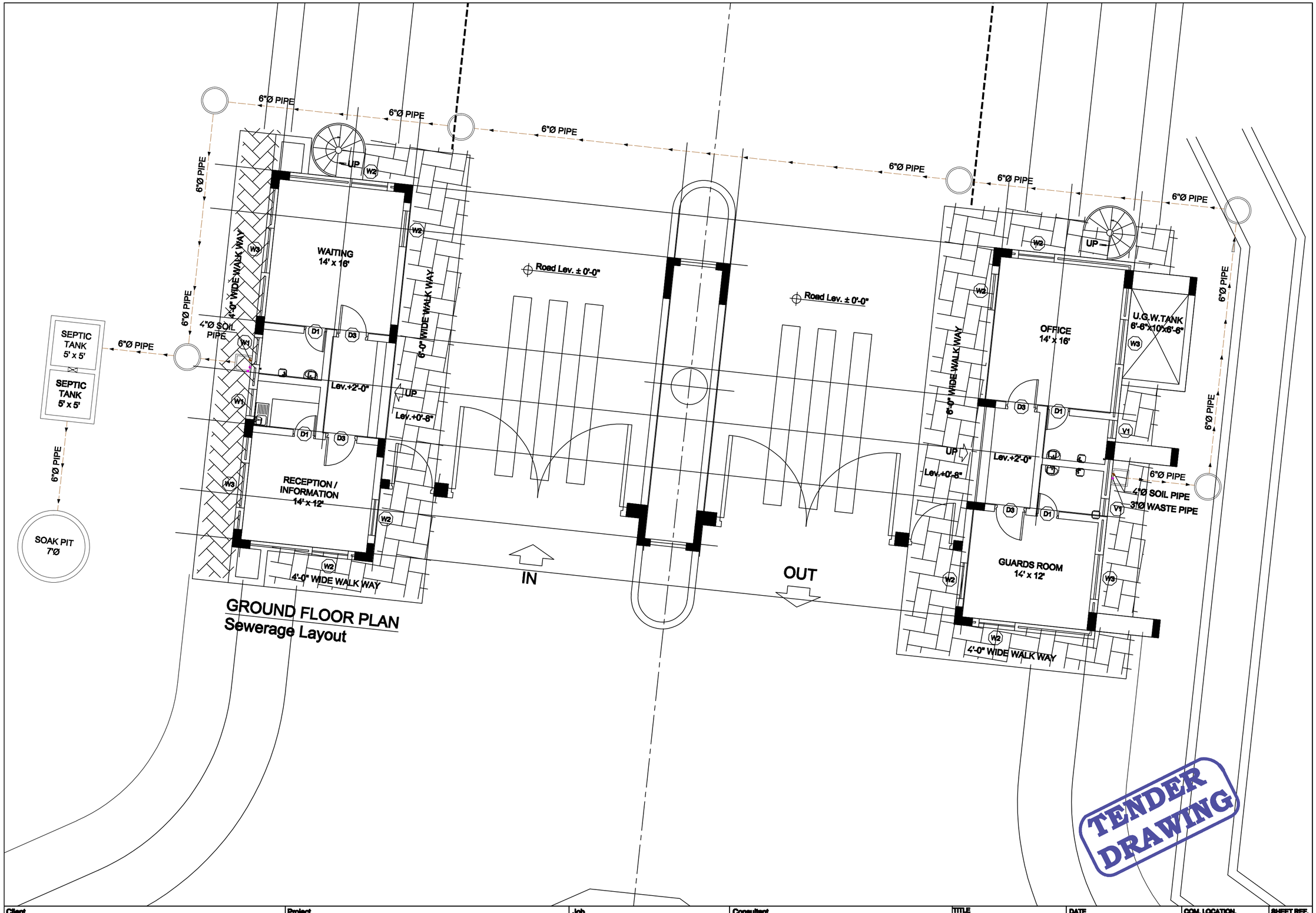
ESTABLISHMENT OF THAR INSTITUTE OF ENGINEERING, SCIENCES AND TECHNOLOGY-TIEST, ISLAMKOT

(CONSTITUENT COLLEGE OF NED UNIVERSITY)

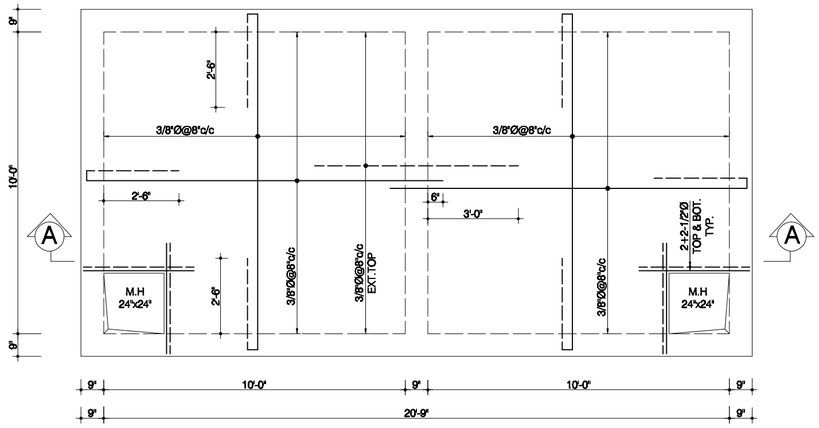
CONSTRUCTION OF EXTERNAL WATER SUPPLY & EXTERNAL SEWERAGE WORK OF CIVIL DEPARTMENT, MECHANICAL DEPARTMENT, MAIN GATE & PROJECT OFFICE AT THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY

VOLUME-IV TENDER DRAWINGS

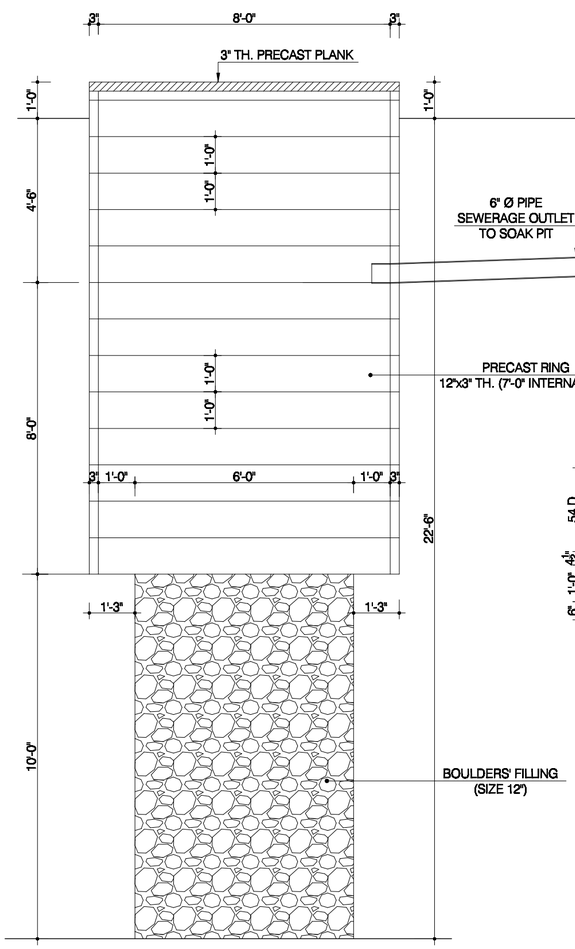
Client NED UNIVERSITY OF ENGINEERING & TECHNOLOGY	**Project** THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR	**Job** EXTERNAL SEWERAGE WORK	**Consultant** ESS -I- AAR PLANNING , ENGINEERING & SERVICES CONSULTANTS SUITE NO. 314, 3- RD. FLOOR MASHRIQ CENTER SIR SHAH SULAIMAN ROAD , GULSHAN - E - IQBAL BLOCK NO. 14, KARACHI , P. O. BOX NO. 7606	**TITLE** EXTERNAL SEWERAGE LAYOUT (CIVIL & MECHANICAL BUILDING) DRAWN: HUMAIR SCALE: N.T.S	**DATE** 25-01-2024 ISSUE / DESCRIPTION / DATE	**COM. LOCATION.** CHKD. BY JOB NO.	**SHEET REF.** SEWERAGE SE-01

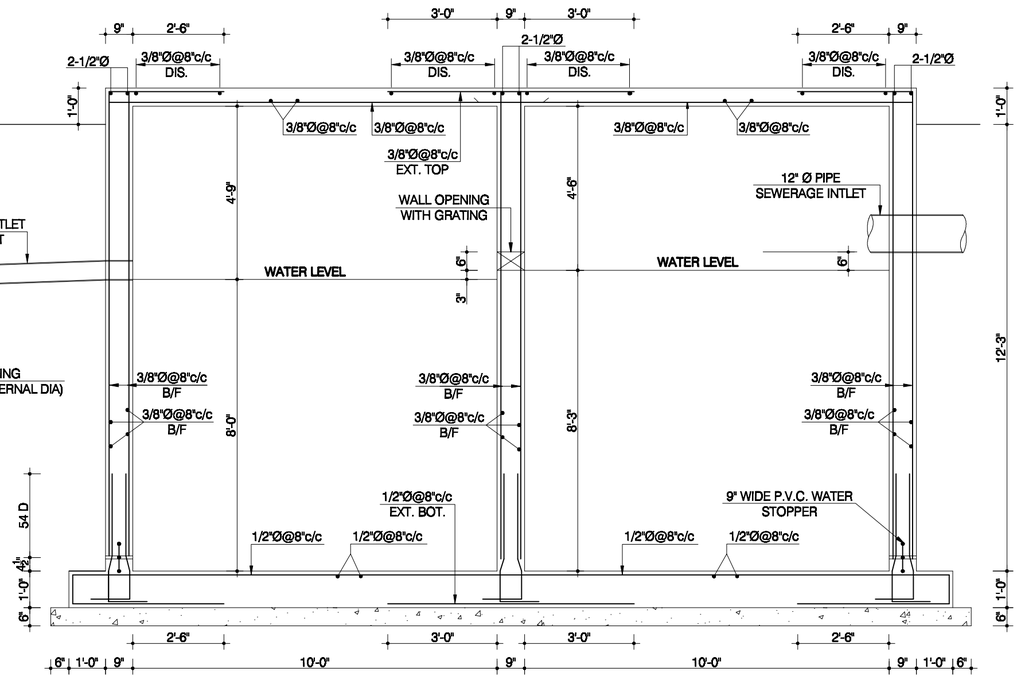


Client NED UNIVERSITY OF ENGINEERING & TECHNOLOGY	**Project** THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR	**Job** EXTERNAL SEWERAGE WORK	**Consultant** ESS -I- AAR PLANNING , ENGINEERING & SERVICES CONSULTANTS SUITE NO. 314, 3- RD. FLOOR MASHRIQ CENTER SIR SHAH SULAIMAN ROAD , GULSHAN - E - IQBAL BLOCK NO. 14, KARACHI , P. O. BOX NO. 7608	**TITLE** EXTERNAL SEWERAGE LAYOUT (CIVIL & MECHANICAL BUILDING)	**DATE** 25-01-2024 ISSUE / DESCRIPTION / DATE	**COM. LOCATION.**	**SHEET REF.** SEWERAGE
				DRAWN HUMAIR **SCALE** N.T.S		**CHKD. BY** / **JOB NO.**	SE-02

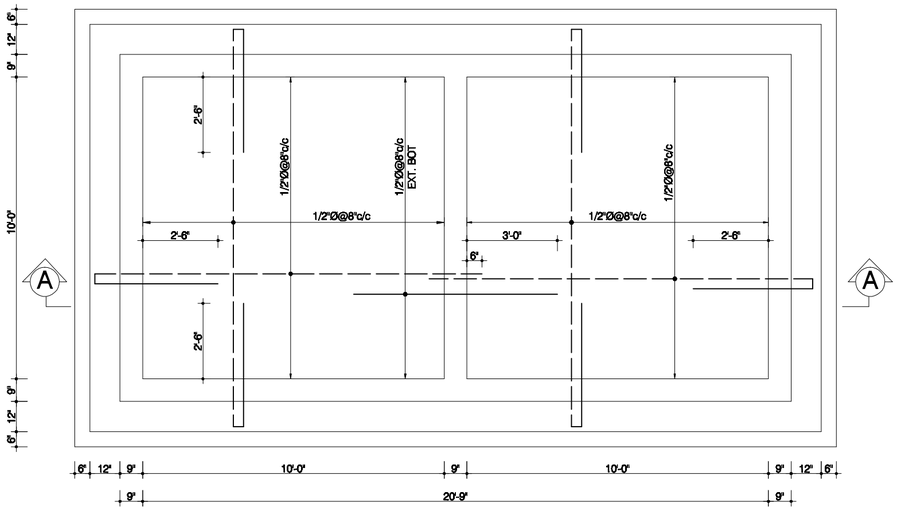


6"TH. TOP SLAB REINFORCEMENT

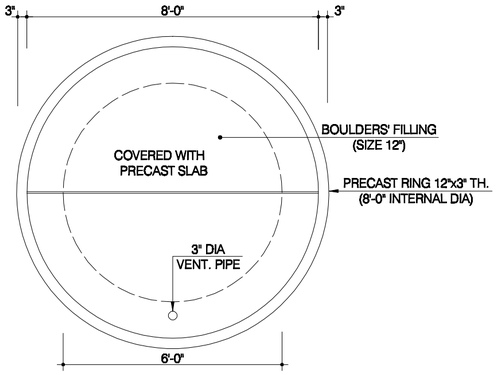




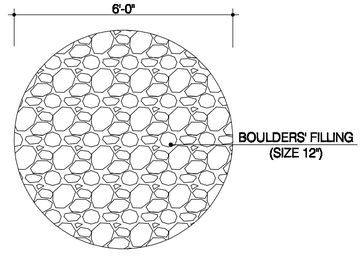
SECTION - A A



12"TH. BOTT.SLAB REINFORCEMENT



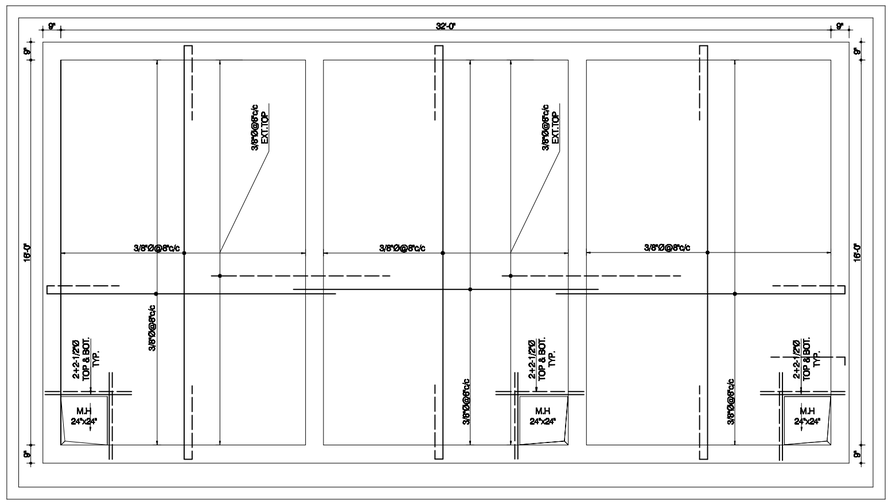
PLAN OF SOAK PIT (AT TOP LEV



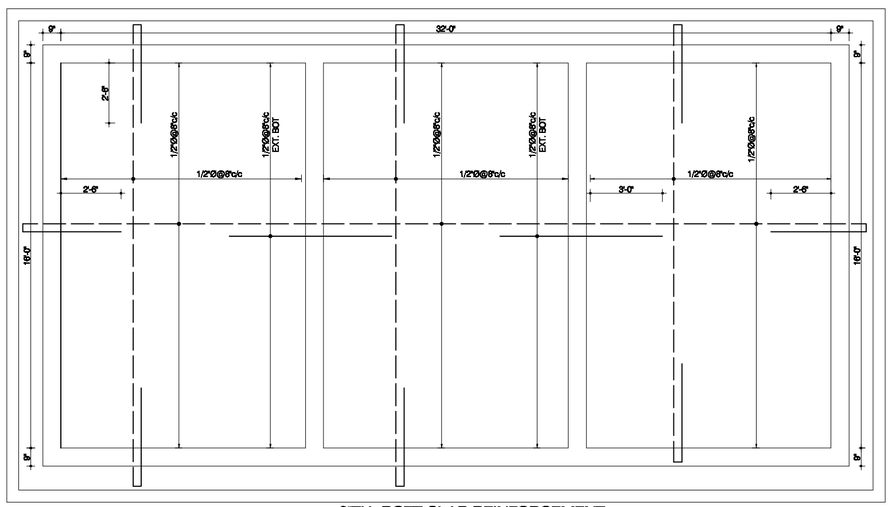
PLAN OF SOAK PIT (AT BOT. LEV

TENDER DRAWING

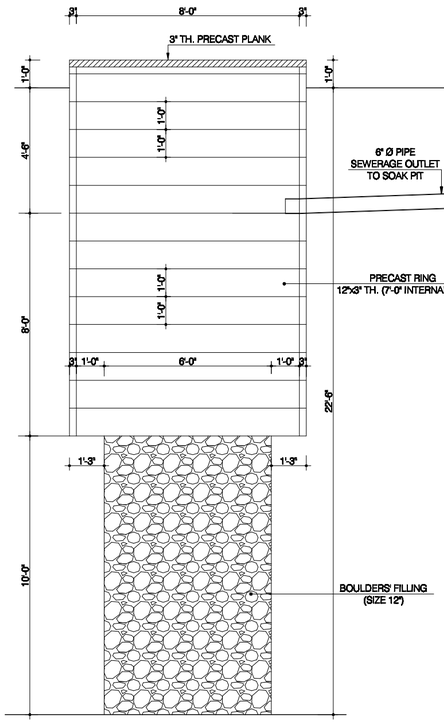
Client NED UNIVERSITY OF ENGINEERING & TECHNOLOGY	**Project** THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR	**Job** EXTERNAL SEWERAGE WORK	**Consultant** ESS -I- AAR PLANNING , ENGINEERING & SERVICES CONSULTANTS SUITE NO. 314, 3- RD. FLOOR MASHRIQ CENTER SIR SHAH SULAIMAN ROAD , GULSHAN - E - IQBAL BLOCK NO.14, KARACHI, PH. 021-34941059, P. O. BOX NO. 7608	**TITLE** DETAILS OF SEPTIC TANK AND SOAK PIT -01 **DRAWN** HUMAIR **SCALE** N.T.S	**DATE** 25-01-2024 ISSUE / DESCRIPTION / DATE **CHKD. BY** **JOB NO.**	**COM. LOCATION.** **SHEET REF.** SEW. S-03

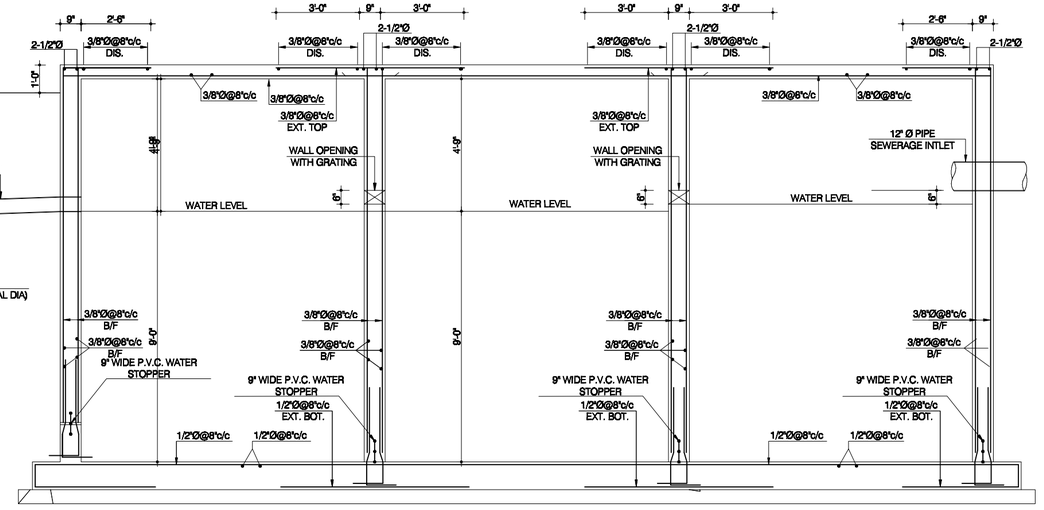


6"TH. TOP SLAB REINFORCEMENT

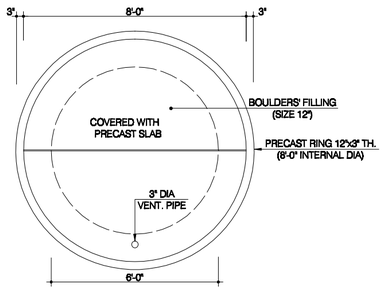


6"TH. BOTT SLAB REINFORCEMENT

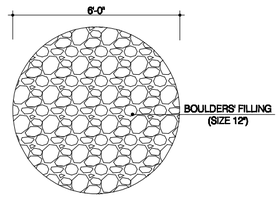




SECTION - A A



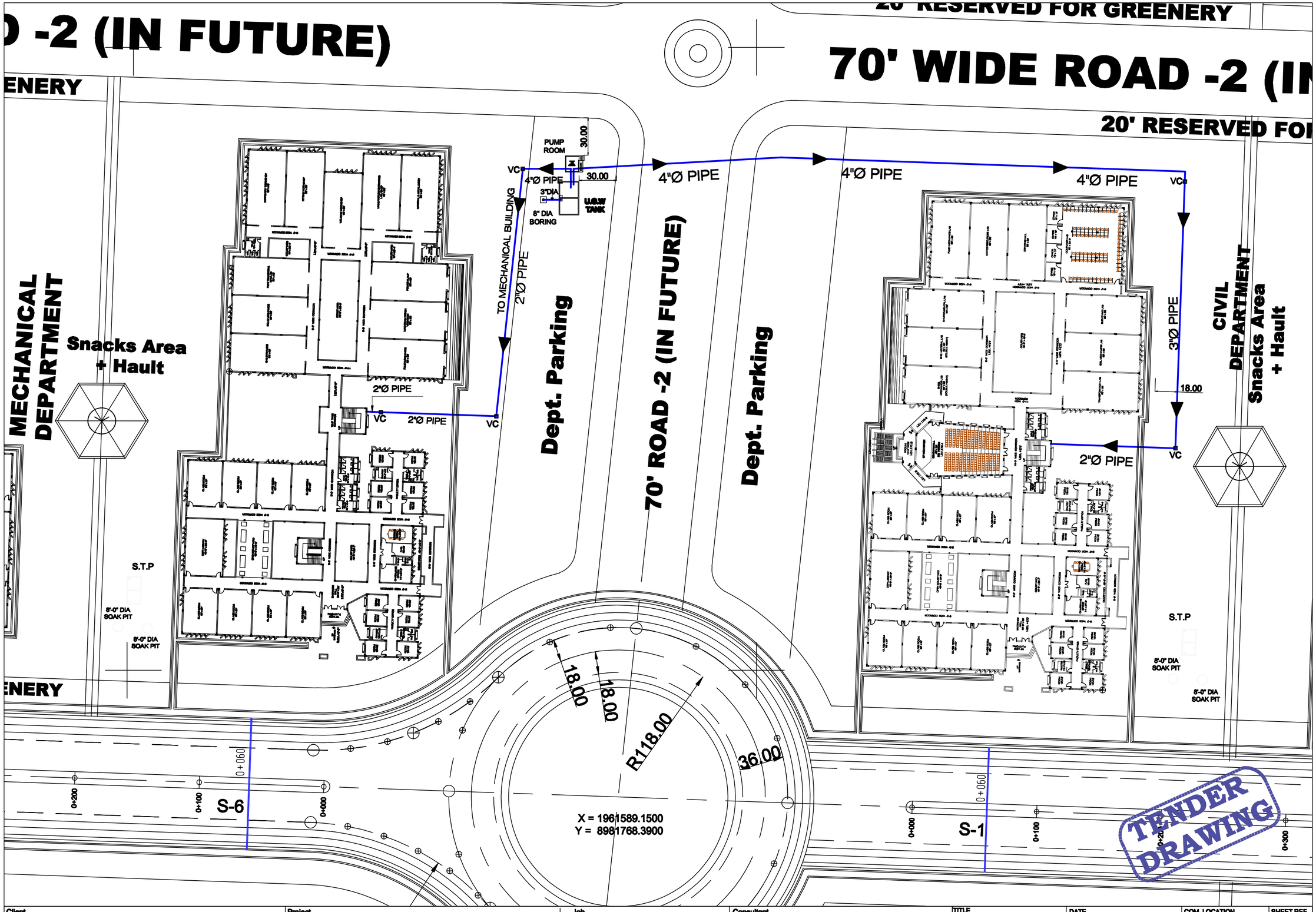
PLAN OF SOAK PIT (AT TOP LEV



PLAN OF SOAK PIT (AT BOT. LEV

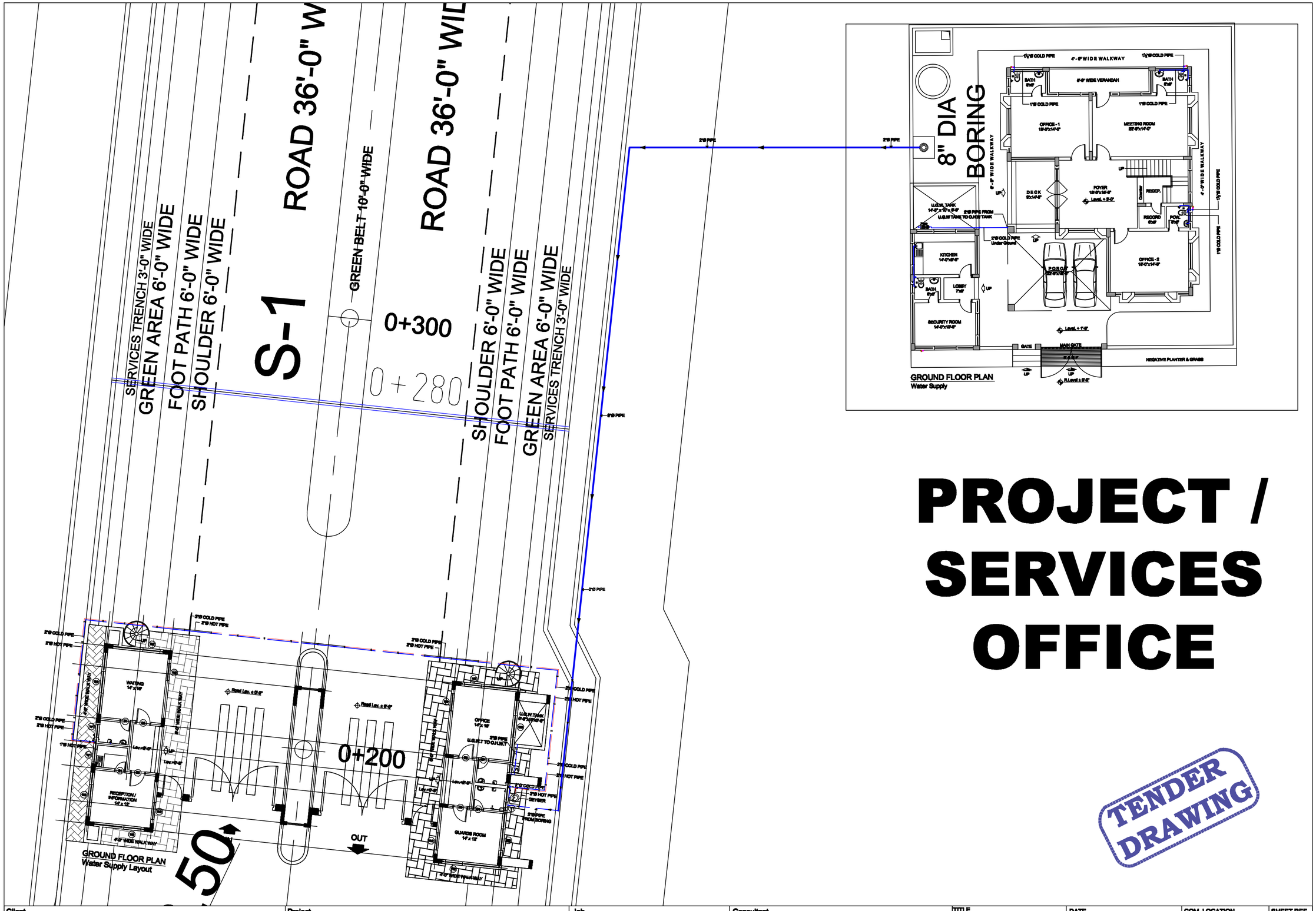
TENDER DRAWING

Client NED UNIVERSITY OF ENGINEERING & TECHNOLOGY	**Project** THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR	**Job** EXTERNAL SEWERAGE WORK	**Consultant** ESS -I- AAR PLANNING , ENGINEERING & SERVICES CONSULTANTS SUITE NO. 314, 3- RD. FLOOR MASHRIQ CENTER SIR SHAH SULAIMAN ROAD , GULSHAN - E - IQBAL BLOCK NO.14, KARACHI, PH. 021-34941059, P. O. BOX NO. 7608	**TITLE** DETAILS OF SEPTIC TANK AND SOAK PIT-02	**DATE** 25-01-2024	**COM. LOCATION.**	**SHEET REF.** SEW.
				DRAWN HUMAIR / **SCALE** N.T.S	ISSUE / DESCRIPTION / DATE	**CHKD. BY** / **JOB NO.**	S-04



Client	Project	Job	Consultant	TITLE	DATE	COM. LOCATION.	SHEET REF.
NED UNIVERSITY OF ENGINEERING & TECHNOLOGY	THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR	EXTERNAL WATER SUPPLY	ESS -I- AAR PLANNING , ENGINEERING & SERVICES CONSULTANTS SUITE NO. 314, 3- RD. FLOOR MASHRIQ CENTER SIR SHAH SULAIMAN ROAD , GULSHAN - E - IQBAL BLOCK NO. 14, KARACHI , P. O. BOX NO. 7608	EXTERNAL WATER SUPPLY LAYOUT PLAN (CIVIL & MECHANICAL) BUILDING	25-01-2024		W.S
				DRAWN: HUMAIR	SCALE: N.T.S	CHKD. BY	JOB NO. / W.S - 01

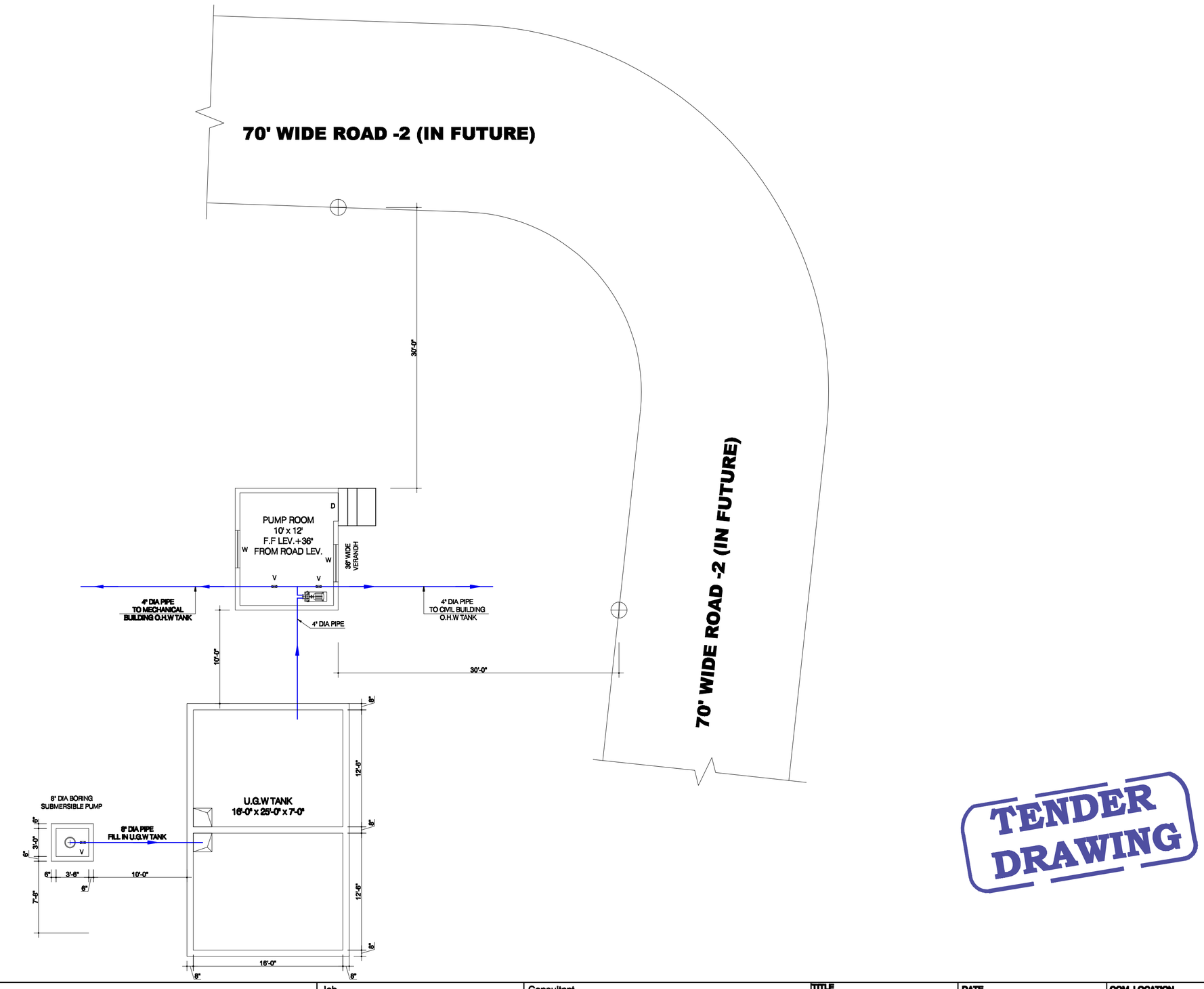
ISSUE	DESCRIPTION	DATE



PROJECT / SERVICES OFFICE

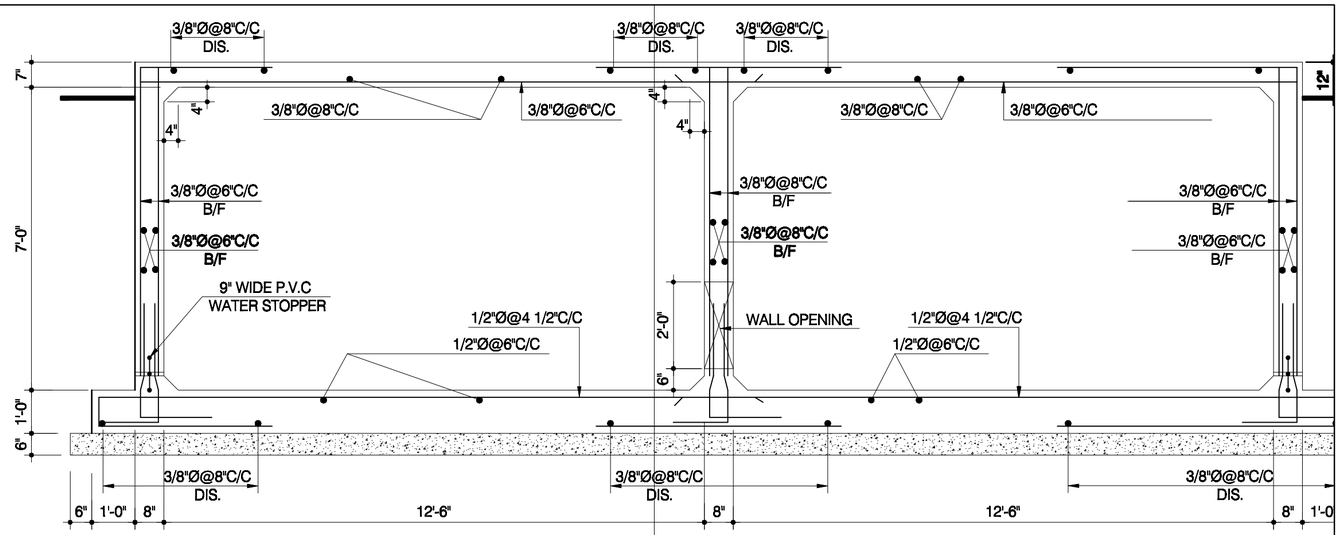
TENDER DRAWING

Client: NED UNIVERSITY OF ENGINEERING & TECHNOLOGY	Project: THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR	Job: EXTERNAL WATER SUPPLY	Consultant: ESS -I- AAR PLANNING , ENGINEERING & SERVICES CONSULTANTS SUITE NO. 314, 3- RD. FLOOR MASHRIQ CENTER SIR SHAH SULAIMAN ROAD , GULSHAN - E - IQBAL BLOCK NO. 14, KARACHI , P. O. BOX NO. 7608	TITLE: EXTERNAL WATER SUPPLY LAYOUT PLAN (CIVIL & MECHANICAL) DRAWN: HUMAIR SCALE: N.T.S	DATE: 25-01-2024 ISSUE / DESCRIPTION / DATE	COM. LOCATION.	SHEET REF. W.S CHKD. BY JOB NO. W.S-02

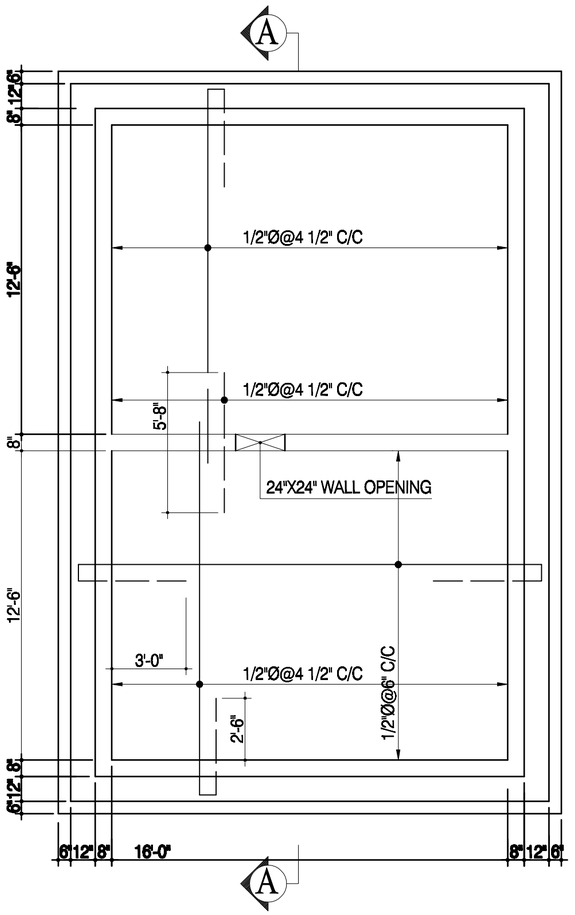


TENDER DRAWING

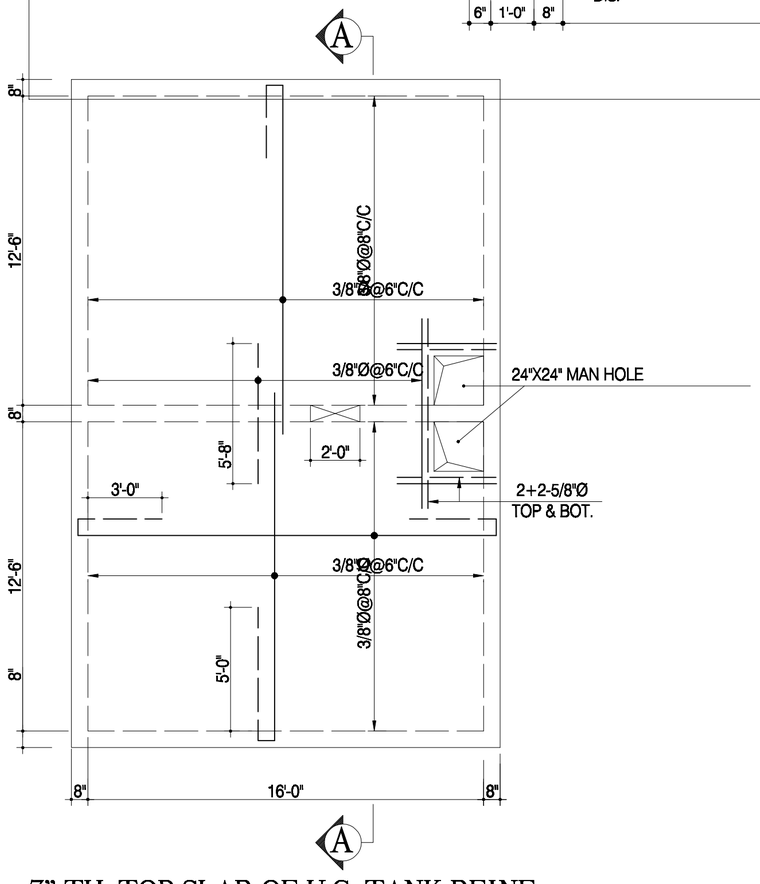
Client	**Project**	**Job**	**Consultant**	**TITLE**	**DATE**	**COM. LOCATION.**	**SHEET REF.**
NED UNIVERSITY OF ENGINEERING & TECHNOLOGY	THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR	EXTERNAL WATER SUPPLY	ESS -I- AAR PLANNING , ENGINEERING & SERVICES CONSULTANTS SUITE NO. 314, 3- RD. FLOOR MASHRIQ CENTER SIR SHAH SULAIMAN ROAD , GULSHAN - E - IQBAL BLOCK NO. 14, KARACHI , P. O. BOX NO. 7606	PUMP ROOM & BORING LOCATION PLAN	25-01-2024		WS.
				DRAWN: HUMAIR	SCALE: N.T.S	CHKD. BY	JOB NO.
				ISSUE / DESCRIPTION / DATE			WS 03



SECTION A-A



12" TH. BOTTOM SLAB OF U.G. TANK REINF.



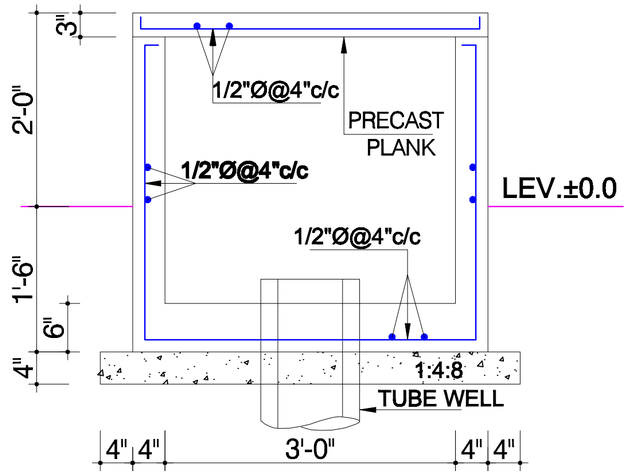
7" TH. TOP SLAB OF U.G. TANK REINF.

TENDER DRAWING

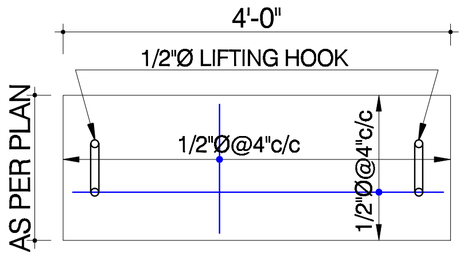
Client: NED UNIVERSITY OF ENGINEERING & TECHNOLOGY	Project: THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR	Job: U.G.W TANK	Consultant: ESS -I- AAR, PLANNING , ENGINEERING & SERVICES CONSULTANTS, SUITE NO. 314, 3- RD. FLOOR MASHRIQ CENTER SIR SHAH SULAIMAN ROAD , GULSHAN - E - IQBAL BLOCK NO. 14, KARACHI , P. O. BOX NO. 7608	TITLE: TOP AND BOTT. SLAB OF U.G. TANK & SECTIONS	DATE: 25-01-2024	COM. LOCATION. / SHEET REF. WS.

DRAWN	SCALE	ISSUE	DESCRIPTION	DATE	CHKD. BY	JOB NO.
HUMAIR	N.T.S					WS-04

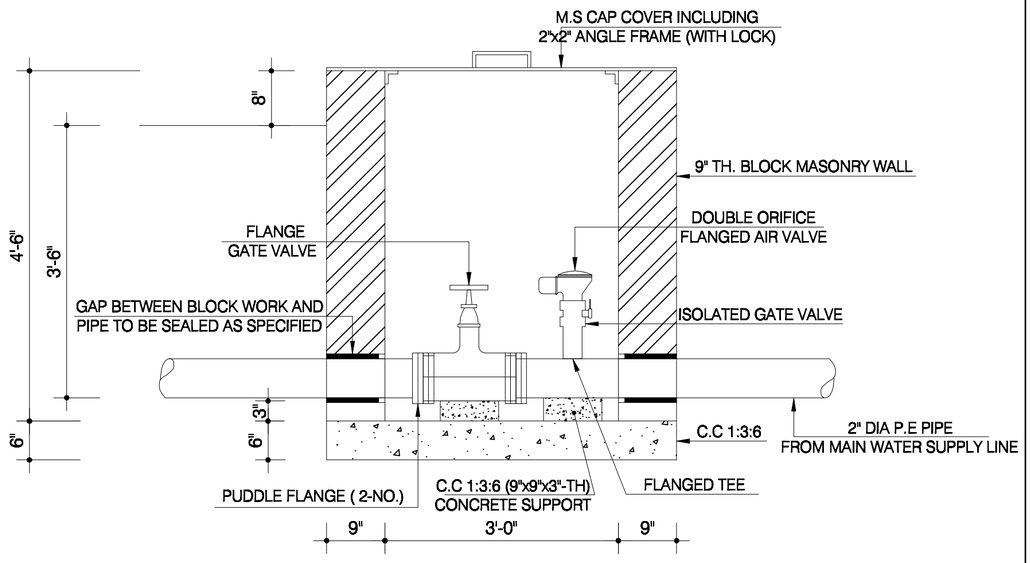
TENDER DRAWING



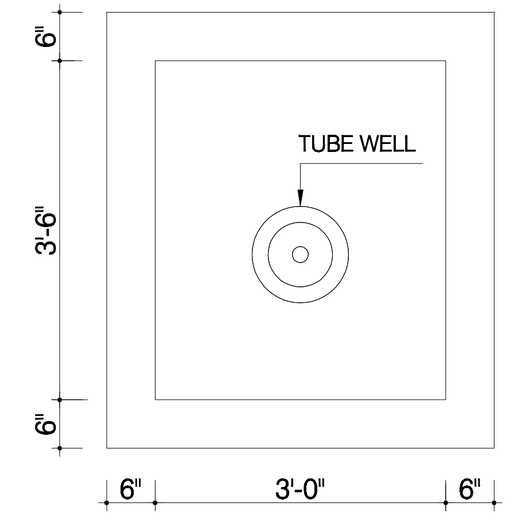
SECTION OF TUBE WELL CHAMBER



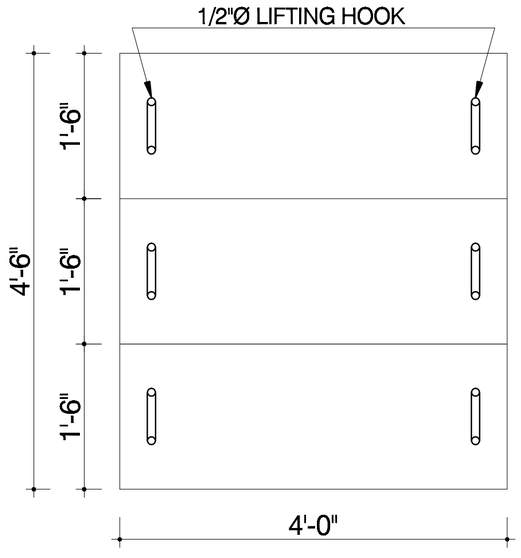
3"-TH. PRECAST PLANK
(TUBE WELL)



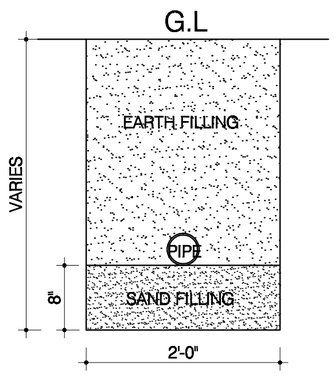
SECTION A-A



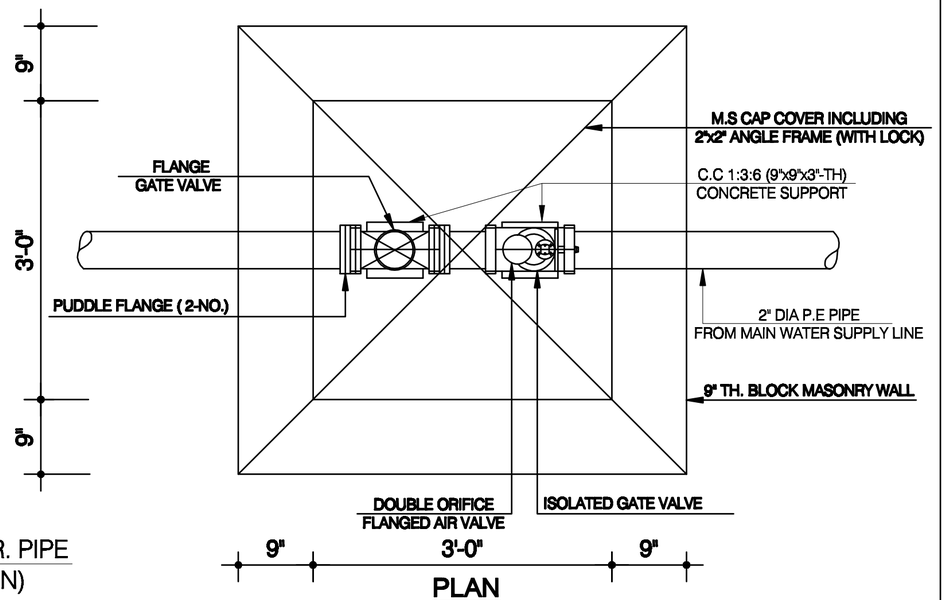
PLAN OF TUBE WELL CHAMBER



PLAN OF PRECAST PLANK
TUBE WELL CHAMBER



TYP. ARRANGEMENT OF WATER. PIPE
IN TRENCH (CROSS SCETION)

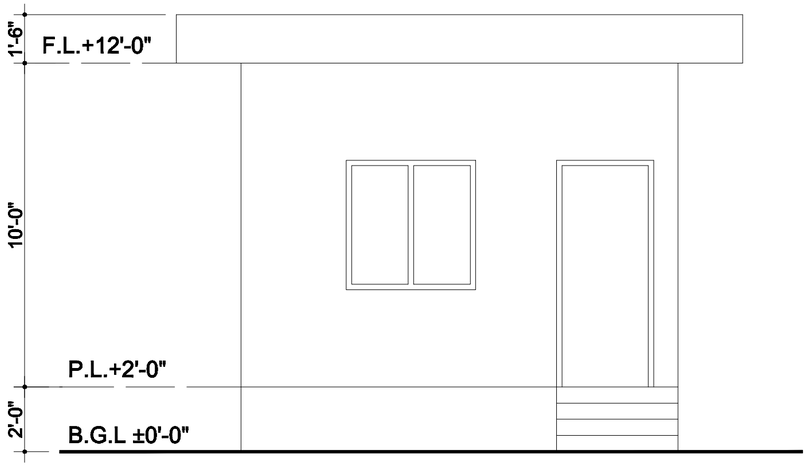


PLAN

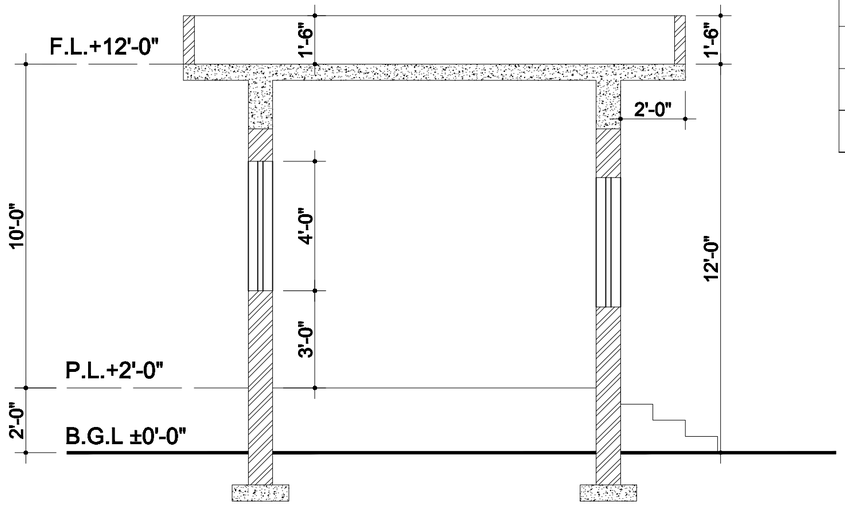
Client NED UNIVERSITY OF ENGINEERING & TECHNOLOGY	**Project** THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR	**Job** EXTERNAL WATER SUPPLY	**Consultant** ESS -I- AAR PLANNING , ENGINEERING & SERVICES CONSULTANTS SUITE NO. 314, 3- RD. FLOOR MASHRIQ CENTER SIR SHAH SULAIMAN ROAD , GULSHAN - E - IQBAL BLOCK NO. 14, KARACHI , P. O. BOX NO. 7608	**TITLE** DETAIL OF AIR VALVE & GATE VALVE CHAMBER & TUBE WELL CHAMBER& PIPE TRENCHES **DRAWN** HUMAIR **SCALE** N.T.S	**DATE** 25-01-2024 ISSUE / DESCRIPTION / DATE	**COM. LOCATION.** **CHKD. BY** **JOB NO.**	**SHEET REF.** W.S WS-05

SCHEDULE OF DOORS, WINDOWS & VENTILATORS.

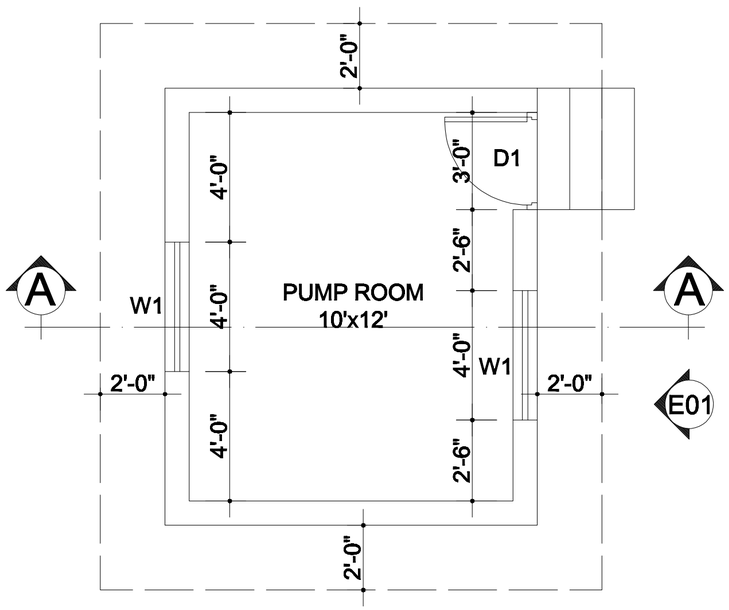
MARK	SIZE	MATERIAL	NO.S OF GROUND FLOOR	REMARKS.
D1	3'-0"x7'-0"		01	
W1	4'-0"x4'-0"		02	



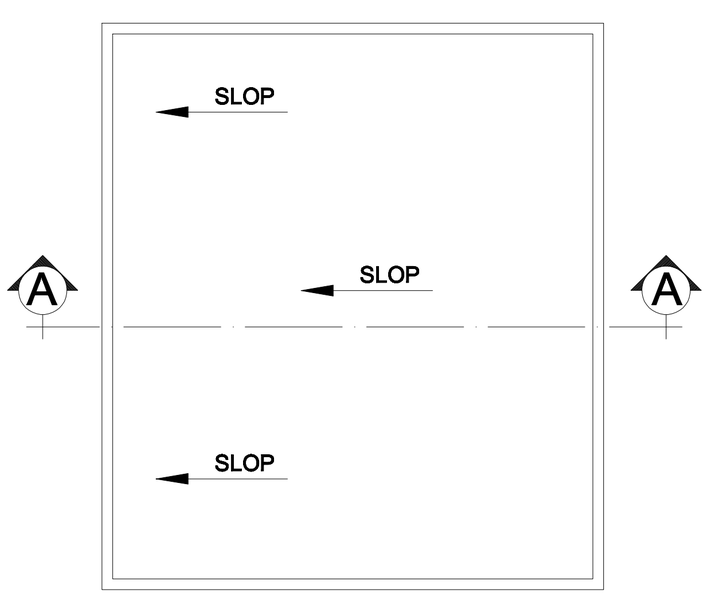
ELEVATION-01



SECTION - AA



GROUND FLOOR PLAN



ROOF PLAN

TENDER DRAWING

Client: NED UNIVERSITY OF ENGINEERING & TECHNOLOGY	Project: THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR	Job: EXTERNAL WATER SUPPLY & SEWERAGE	Consultant: ESS -I- AAR PLANNING , ENGINEERING & SERVICES CONSULTANTS SUITE NO. 314, 3- RD. FLOOR MASHRIQ CENTER SIR SHAH SULAIMAN ROAD , GULSHAN - E - IQBAL BLOCK NO. 14, KARACHI , P. O. BOX NO. 7608	TITLE: PUMP ROOM & ELEVATION &SECTION DRAWN: HUMAIR SCALE: N.T.S	DATE: 25-01-2024 ISSUE / DESCRIPTION / DATE CHK'D. BY JOB NO.	COM. LOCATION.	SHEET REF. WS. WS-06

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

No. DR (Estab)/(1003)/1990 Dated: 12/02/ 2016.

OFFICE ORDER

The University Administration has constituted the Procurement Committee comprising of the following officers for Construction, Renovation and Rehabilitation of work and Services

1.	**Prof. Dr. Abdul Jabbar Sangi** Professor Dept. of Civil Engg.	Convener
2.	**Engr. Khurshid Akhtar** Deputy Director of Services (Civil) Services Department	Member
3.	**Engr. Sadia Jabeen** Senior Civil Engineer (HEJ) University Karachi	Member

Ag. REGISTRAR

12/2/16

To:

The Convener & all members

Copy for information to:

1. Dean (CEA)
2. Chairman, Dept. of Civil Engg.
3. Director of Services
4. Director Finance
5. Resident Auditor

Saleem

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

No. DR (Estab)/(1003)/5730 Dated: 27/05/ 2016

OFFICE ORDER

In supersession of this office order No. DR (Estab)/(1003)/11418 dated 02-11-2015, the University Administration has constituted the Complaint Redressal Standing Committee comprising of the following officers to address complaints regarding all procurement issues in the University in pursuance of Clause 31(1) of the SPPRA rules:

1.	**Prof. Dr. Saad Ahmed Qazi** Dean (ECE)	Convener
2.	**Independent Professional from the relevant field**	Member
3.	**Nominee of Accountant General Sindh**	Member

27/5/2016

Ag. REGISTRAR

To:

The Convener & all members

Copy for information to:

1 Dean (ECE)
2 Director Planning & Projects
3 Director Finance
4 Director, Procurement Cell
5 Ag. Resident Auditor

FOUNDED BY QUAID-I-AZAM MOHAMMAD ALI JINNAH

DAWN

Tuesday
February 13, 2024
Sha'aban 2, 1445
KARACHI
Rs 35.00
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Vol. LXXVIII No. 44
Regd. No. SS-022
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NED UNIVERSITY
OF ENGINEERING & TECHNOLOGY

Director Procurement

PROCUREMENT CELL
University Road, Karachi-75270

Tel: 9926 1261 - 68 (Ext: 2471 & 2501) Fax: 9926 1255
Email: dp@neduet.edu.pk Website: http://www.neduet.edu.pk

No DP/RGT-172285/8379/982 Date: FEBRUARY 12, 2023

SAY NO TO CORRUPTION

NOTICE INVITING TENDER

NEDUET invites Sealed Bids from interested Bidders having adequate Experience in carrying out Projects of Similar Nature for following work:

Construction of External Water Supply & External Sewerage Work of (Civil Department, Mechanical Department, Main Gate & Project Office) at Thar Institute of Engineering Sciences & Technology - TIEST Mithi, Tharparkar, Sindh

Tender No. PC / NED / RGT / Sewerage / 8379 / 2024

Estimated Cost	Time of Completion
Rs. 36.227 Millions	09 Months

ELIGIBILITY CRITERIA:

- Registration with Pakistan Engineering Council in Category C-5 or above and at least in Specialization Codes CE-08 (I, II) and CE-11 (i, viii). The Contractor should enclose PEC Registration Certificate valid upto June 2024
- The Bidder should be registered with FBR and Sindh Revenue Board - SRB for both Income and Sales Tax, with Company Name appearing on the Active Taxpayer List (ATL). The Contractor should also submit Copy of Registration Certificate of NTN and SNTN and Print from ATL.
- The Bidder shall submit Affidavit of No Litigation History, Affidavit of Non-Blacklisting, Affidavit of Never indulge in any Corrupt, Fraudulent and Collusive Practices. The Bidder shall also submit Affidavit that the Information and Documents provided with this Pre-Qualification Document are Correct.
- Having an Experience for Execution and Completion of Projects of similar nature in Remote Areas particularly in Desert Area or Far Flung Destinations.

Method of Procurement:

Single Stage - One Envelope Procedure under SPPRA Rules

Tender Documents Issuance Schedule:

The Tender Documents can be collected from Office of Assistant Director Procurement - II, NEDUET upon Payment of Rs. 5,000/- (Non-Refundable) from 16.02.2024 up to 04.03.2024 during Office Hours. Payments are to be made in favour of "Director Finance-NEDUET, Karachi" in the shape of Pay Order / Bank Draft.

Tender Documents Submission Schedule:

All Bids must be accompanied by a Bid Security Equivalent to 2% of the Total Bid Price in the form of Pay Order / Bank Guarantee from the Scheduled Bank. Interested Firms are requested to submit their duly completed Bids on or before 11:00 am on 05.03.2023 at Office of Assistant Director Procurement - II, NEDUET. The Bids will be opened on the Same Day at 11:30 am at the Same Venue in the presence of Representatives of Bidders.

The Bids received after the prescribed Time and Date shall NOT be entertained. Incomplete Bids will be rejected as per provision of SPPRA Rules. If the Opening Date is declared as Holiday then the Proposals will be opened on Next Working Day at Same Time and Venue.

NEDUET reserves the right to Accept or Reject any or all Bids in pursuance to provisions under of SPPRA Rules. Bidders are requested to give their Best and Final Price as "No Negotiations" is permitted. Bidding Documents containing detailed Terms and Conditions are also available at Websites: https://www.neduet.edu.pk and http://www.ppms.pprasindh.gov.pk.

Director, Procurement

منگل 2 رشعبان المعظم 1445ھ 13 رفروری 2024ء

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THE DAILY JANG KARACHI

روزنامہ جنگ کراچی

TUESDAY FEBRUARY 13, 2024

بانی ... میر خلیل الرحمٰن

جلد 88 منگل 2 رشعبان المعظم 1445ھ 13 رفروری 2024ء نمبر 44

NED UNIVERSITY
OF ENGINEERING & TECHNOLOGY

Director Procurement

PROCUREMENT CELL

University Road, Karachi-75270

Tel: 9926 1261 - 68 (Ext: 2471 & 2501) Fax: 9926 1255
Email: dp@neduet.edu.pk Website: http://www.neduet.edu.pk

No DP/RGT-172285/8379/992 Date: FEBRUARY 12, 2023

SAY NO TO CORRUPTION

نوٹس برائے طلبی ٹینڈر (NIT)

NEDUET کو مندرجہ ذیل کام کیلئے ملتے جلتے منصوبوں پر کام کرنے کا مناسب تجربہ رکھنے والے اور دلچسپی رکھنے والے اداروں سے سربمہر پیشکشیں مطلوب ہیں۔

Construction of External Water Supply & External Sewerage Work of (Civil Department, Mechanical Department, Main Gate & Project Office) at Thar Institute of Engineering Sciences & Technology - TIEST Mithi, Tharparkar, Sindh

Tender No. PC / NED / RGT / Sewerage / 8379 / 2024

Estimated Cost	Time of Completion
Rs. 36.227 Millions	09 Months

اہلیت کا معیار:

- کیٹگری C-5 یا اس سے زائد میں اسپیشلائزیشن کوڈ CE-09 (I, II) اور CE-11(I, VII) پاکستان انجینئرنگ کونسل کے ساتھ رجسٹریشن، کنٹریکٹر کو پیشکش کے ساتھ جون 2024 تک موثر رجسٹریشن سرٹیفکیٹ منسلک کرنا ہوگا۔
- بولی دہندہ FBR اور سندھ ریونیو بورڈ SRB کے ساتھ انکم ٹیکس اور سیلز ٹیکس کے لئے رجسٹرڈ ہونا چاہئے اور کمپنی کا نام ٹیکس ادا کرنے والے فعال اداروں کی فہرست (ATL) میں موجود ہونا چاہئے۔ کنٹریکٹر کو NTN اور SNTN، رجسٹریشن سرٹیفکیٹس کی کاپیاں اور ATL (جس میں کنٹریکٹر کا نام موجود ہو) کا پرنٹ بھی فراہم کرنا ہوگا۔
- بولی دہندہ اس امر کا حلف نامہ کہ ادارہ کسی تنازعے میں ملوث نہیں ہے، اور اس امر کا حلف نامہ کہ ادارہ کبھی بلیک لسٹ نہیں ہوا، اس امر کا حلف نامہ کہ ادارہ کبھی بدعنوانی، دھوکہ بازی، سازش، اشتعال کا مرتکب نہیں ہوا ہے۔ بولی دہندہ اس امر کا بھی حلف نامہ دے کہ بڈ کی ایپلیکیشن کی دستاویزات میں دی گئی معلومات درست ہیں۔
- بولی دہندہ لازمی طور پر دور دراز کے علاقوں خصوصاً ریگستانی علاقوں میں ملتے جلتے منصوبوں پر کام کرنے اور انہیں مکمل کرنے کا تجربہ رکھتے ہوں۔

حصول کا طریقہ کار: SPPRA کے قوانین کی بنیاد پر سنگل اسٹیج ایک لفافے کے طریقہ کار

ٹینڈر کی دستاویزات جاری کرنے کا شیڈول

ٹینڈر کی دستاویزات دفتر اسسٹنٹ ڈائریکٹر پروکیورمنٹ ۔ NEDUET-II سے 16.02.2024 سے 04.03.2024 کے دوران دفتری اوقات میں مبلغ 5,000 روپے کی (ناقابل واپسی) ادائیگی پر حاصل کئے جاسکتے ہیں۔ ادائیگی بصورت پے آرڈر، ڈیمانڈ ڈرافٹ بنام ڈائریکٹر فنانس NEDUET کراچی ہونی چاہئے۔

ٹینڈر جمع کرانے کا شیڈول

تمام پیشکشیں لازمی طور پر پیشکش کی کل رقم کے 2% کے مساوی بڈ سیکورٹی بصورت پے آرڈر کسی شیڈولڈ بینک کی جاری کردہ بینک گارنٹی کے ساتھ دی جائیں۔ دلچسپی رکھنے والی فرموں سے درخواست ہے کہ اپنی مکمل کردہ پیشکشیں 05.03.2024 کو صبح 11 بجے تک دفتر اسسٹنٹ ڈائریکٹر پروکیورمنٹ ۔ NEDUET-II میں جمع کرائیں۔ پیشکشیں اسی روز اسی جگہ پر بولی دہندگان کے نمائندوں کی موجودگی میں صبح 11:30 بجے کھولی جائیں گی۔

مقررہ تاریخ اور وقت کے بعد آنے والی پیشکشیں قبول نہیں کی جائیں گی۔ نامکمل پیشکشوں کو SPPRA کے قوانین کی بنیاد پر مسترد کردیا جائے گا۔ پیشکشیں کھلنے والے دن اگر کسی قسم کی کوئی چھٹی ہوجاتی ہے تو پیشکشیں کام کے اگلے روز اسی جگہ اور اسی وقت پر کھولی جائیں گی۔

NEDUET، SPPRA کے قوانین کی بنیاد پر کسی بھی پیشکش کو قبول یا مسترد کرنے کا حق محفوظ رکھتی ہے۔ بولی دہندگان سے درخواست ہے کہ وہ اپنی بہترین اور حتمی قیمتیں دیں کیونکہ اس سلسلے میں بات چیت کی اجازت نہیں ہے۔ ٹینڈر کی دستاویزات میں تفصیلی طور پر تمام شرائط و ضوابط موجود ہیں، ویب سائٹ https://www.neduet.edu.pk اور http://www.ppms.pprasindh.gov.pk پر بھی موجود ہیں۔

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SAY NO TO CORRUPTION

ٽينڊر گھرائڻ جو نوٽيس(NIT)

NEDUET کي هيٺ ڏنل ڪم لاءِ سڃڻي قسم جي منصوبن لاءِ ڪم ڪرڻ جو مناسب تجربو رکندڙ ۽ تجربو رکندڙ ادارن کان مهربند آڇون گھريل آهن.

Construction of External Water Supply & External Sewerage Work of (Civil Department, Mechanical Department, Main Gate & Project Office) at Thar Institute of Engineering Sciences & Technology - TIEST Mithi, Tharparkar, Sindh

Tender No. PC / NED / RGT / Sewerage / 8379 / 2024

Estimated Cost	Time of Completion
Rs. 36.227 Millions	09 Months

اهليت جو معيار:

- پاڪستان انجنيئرنگ ڪائونسل کان ڪيٽيگري سي-6 يا ان کان مٿي اسپيشلائيزيشن ڪوڊ CE-08 (I, II) ۽ CE-11 (I, VII) سان گڏ موثر رجسٽريشن، جون 2024 تائين موثر رجسٽريشن سرٽيفڪيٽ شامل ڪرڻ گھرجي.
- آڇ ڏيندڙ فيڊرل بورڊ آف ريونيو ۽ سنڌ ريونيو بورڊ کان انڪم ٽيڪس ۽ سيلز ٽيڪس رجسٽر لاءِ رجسٽر ٿيل هجي ۽ ڪمپني جو نالو ٽيڪس ادا ڪرڻ واري فعال ادارن جي فهرست (ATL) ۾ موجود هئڻ گھرجي. ٺيڪيدار کي NTN ۽ SNTN رجسٽريشن سرٽيفڪيٽ جون ڪاپيون ۽ ATL (جنهن ۾ ٺيڪيدار جو نالو هجي) جي پرنٽ فراهم ڪرڻي پوندي.
- آڇ ڏيندڙ ان امر جو حلف نامو ڏئي ته ادارو ڪنهن به ڇڪتاڻ ۾ ملوث ناهي، ڪنهن به اداري ۾ بليڪ لسٽ ناهي ۽ ڪنهن به اداري ۾ بدعنواني، دوکيبازي، سازشي ڪمن ۾ ملوث ناهي. آڇ ڏيندڙ ان امر جو حلف نامو ڏئي ته پري ڪواليفڪيشن دستاويز ۾ ڏنل معلومات درست آهي.
- آڇ ڏيندڙ لازمي طور پري وارن علاقن خاص طور تي ريگستاني علاقن ۾ منصوبن تي ڪم ڪرڻ ۽ انهن کي مڪمل ڪرڻ جو تجربو رکي ٿو.

حاصل ڪرڻ جو طريقو: SPPRA جي قانونن جي بنياد تي سنگل اسٽيج هڪ لفافو جو طريقو.

ٽينڊر جا دستاويز دفتر اسسٹنٽ ڊائريڪٽر پروڪيورمينٽ-II، NEDUET مان 16.02.2024 کان 04.03.2024 جي دفتري وقت دوران مبلغ 5000 روپين جي (ناقابل واپسي) ادائگي تي حاصل ڪري سگھجي ٿا. پي آرڊر/بينڪ ڊرافٽ جي صورت ۾ ڊائريڪٽر فنانس NEDUET ڪراچي جي نالي هئڻ گھرجي.

ٽينڊر جمع ڪرائڻ جو شيڊول

سمورين آڇن سان لازمي طور تي آچيل رقم جي 2 سيڪڙو جي مساوي پي آرڊر جي صورت ۾ يا سيڪيورٽي پاڪستان جي ڪنهن به شيڊيول بينڪ مان جاري ڪيل بينڪ گارنٽي گڏ جمع ڪرائڻ گھرجي. دلچسپي رکندڙ فرمز کي گذارش ڪجي ٿي ته پنهنجي مڪمل ڪيل آڇ 05.03.2024 تي صبح 11 وڳي تائين دفتر اسسٹنٽ ڊائريڪٽر پروڪيورمينٽ-II، NEDUET ۾ جمع ڪرائڻ. آڇون انهي ڏينهن انهي جڳهه تي آڇ ڏيندڙن جي نمائندن جي موجودگي ۾ صبح 11:30 وڳي کوليون ويندیون.

مقرر ڪيل تاريخ ۽ وقت کان پوءِ ايندڙ آڇون قبول نه ڪيون ويندیون. اٿيورين آڇن کي SPPRA جي قانونن جي بنياد تي رد ڪيو ويندو. آڇن کولڻ واري ڏينهن جيڪڏهن ڪنهن به قسم جي ڪا موڪل هوندي ته آڇون ايندڙ ڪم واري ڏينهن تي انهي جڳهه ۽ وقت تي کوليون ويندیون.

NEDUET، ايس پي پي آر اي جي قانونن جي بنيد تي ڪنهن به آڇ کي قبول يا رد ڪرڻ جو حق محفوظ رکي ٿي. آڇ ڏيندڙن کي گذارش ڪجي ٿي ته هو پنهنجا بهترين ۽ حتمي قيمتون ڏين چو ته ان سلسلي ۾ ڪالهه پوڪهه جي اجازت ناهي. ٽينڊر جا دستاويز جن ۾ تفصيلي شرط ۽ ضابطا موجود آهن، ويب سائيٽ www.ppra.gov.pk ۽ www.neduet.edu.pk تي پڻ دستياب آهن.

ڊائريڪٽر پروڪيورمينٽ