

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY PROCUREMENT CELL

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“Say No to Corruption”



Director Procurement

No. DP/RGT-188278/8506/
September 26, 2025

412

Notice Inviting Tender EPADS

NEDUET invites sealed bids on Single Stage One Envelope procedure from interested Bidders having adequate experience in carrying out projects of similar nature for following work:

S#	Name of Work	Tender Schedule – Date and Time				Estimated Cost (Million)	Time of Completion
		Issue / Sale		Submission	Opening		
		From	To				
1	Construction of Building for the Department of Mechanical Engineering at Thar Institute of Engineering, Sciences & Technology-TIEST at Tharparkar. (1 st Floor) Tender No. PC/NED/RGT/Construction/8506/2025	03.10.2025	20.10.2025	21.10.2025 10:00 A.M.	21.10.2025 10:30 A.M.	161.216	12 Months

Eligibility:

- Registration with Pakistan Engineering Council in Category C-4 or above and at least in specialization codes CE-09, CE-10, CE-11, ME-02, EE-02 and EE-11. The contractor should enclose valid PEC Registration Certificate.
- Valid Registered License from Electrical Inspector for Electrical Works issued from Government of Sindh.
- 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.
- Affidavit on (non-judicial stamp paper) of no litigation history, non-blacklisting, never indulge in any corrupt, fraudulent and collusive practices, also undertaking that the information and documents provided with are correct. The date of issuance of said stamp paper and bidder signature on it should be later than the date of publication of this NIT.
- Having an experience for execution and completion of projects of similar nature in remote areas particularly in desert area or far-flung destinations.
- Bids must be submitted exclusively through EPADS; manual bids will not be accepted. However, the bidder must ensure that the original and physical bid security reaches the office of the Deputy Director Procurement on or before the tender opening. any clause in this tender document asking for manual submission must be replaced and read as “through EPADS”

Bid Security @ 2% of bid cost in shape of Payorder should be in favor of Director Finance, NED University. Bidding documents can be obtained and shall be submitted through EPADS as per above schedule. 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 <https://www.portalsindh.eprocure.gov.pk>. NEDUET reserve the right to accept or reject any or all bids in pursuance to provisions under of SPPRA Rules.

For Director Procurement



**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)

First Floor (Adl. Works)

**Construction of Building for the Department of Mechanical
Engineering at Thar Institute of Engineering, Sciences &
Technology-TIEST at Tharparkar**

JULY, 2025



Head Office (Karachi): Suite No. 314, 3rd Floor, Mashriq Center, Gulshan-e-Iqbal Block-14, Karachi

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**INVITATION
FOR
BIDS**

INVITATION FOR BIDS

Date: _____
Bid Reference No.: _____

1. The Director Procurement, NED University of Engineering & Technology invites sealed bids, under Single Stage-Single Envelope bidding procedure, from eligible firms or persons licensed by the Pakistan Engineering Council in the category C4 or above & registered in relevant disciplines CE-09, CE-10, CE-11, ME-02, EE-02 and EE-11 for the Works **“Construction of Building for the Department of Mechanical Engineering at Thar Institute of Engineering, Sciences & Technology-TIEST at Tharparkar”** which will be completed in 12 months.
2. Eligible Bidders may obtain further information, inspect and acquire the Bidding Documents from the Office of the Employer, at office of The Director Procurement, NED University of Engineering & Technology, Karachi.
3. The Bidders shall submit their bid through EPADS on or before the last date and time mentioned for the bid submission
4. All bids must be accompanied by a Bid Security equivalent to 2% of the 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 10:00 am, _____, 2025 at office of The Director Procurement, NED University of Engineering & Technology, Karachi. The bids will be opened on the same day at 10:30 am at the same venue in the presence of University Procurement Committee and the representatives of contractors.

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 2020-2021 and had sufficient allocations for CFY 2024-2025 under ADP No. 1003 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 sinlge 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 ENVELOPE BIDDING 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-4 or above and at least in specialization codes CE-09, CE-10, CE-11, ME-02, EE-02 and EE-11. The contractor should enclose PEC Registration Certificate, valid for December 2025.

- 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
- Affidavit on (non-judicial stamp paper) of no litigation history, non-blacklisting, never indulge in any corrupt, fraudulent and collusive practices, also undertaking that the information and documents provided with are correct. The date of issuance of said stamp paper and bidder signature on it should be later than the date of publication of the NIT
- 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.	<i>General Experience of Infrastructure Works Projects executed of over Rs. 160.00 Million (05 Marks for one Projects and 05 Marks for each additional project)</i>	10
2.	<i>Projects of Similar Nature Executed With Universities (05 Marks for each project) Projects of Similar Nature in Hand Preferably With Universities</i>	10
3.	<i>(05 Marks for each project)</i>	10
4.	<i>Experience of working with NED University as a Contractor / Supplier Etc. (2.5 Marks for each project)</i>	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 average annual turnover is equal to Rs. 175.00 Million - One (01) additional point is given for every Rs. 5.00 Million increase in the average annual turnover. - Full Points are given in case of turnover exceeding Rs.200.00 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. 175.00 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.200 Million
c)	Years Available Bank Credit Line	10	- Five (05) Points are given if the available bank credit line is equal to Rs. 175.00 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.200 Million
Total Marks Allocated			30

4. Personnel Capabilities

- Brief Discussion of Personnel Capabilities**

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	3
2.	Site Engineer	2
3.	Lab Technician	2
4.	Quantity Surveyor	2

5.	Surveyor	2
6.	Site Supervisor (Civil)	2
7.	Site Supervisor (Electrical)	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	Lift Set for Concrete	2
3	Concrete Vibrator	2
4	Tractor Trolley	2
5	Excavator	2
6	Rebar / Steel Cutting and Bending Machine	1
7	Steel Formwork (Shuttering Plates, Scaffolding, pipes and accessories) <i>0.5 mark for each lot of 30,000 sft</i>	2
8	Earth Rammer	2
9	Electric Generator (<i>Minimum capacity 50 KVA</i>)	2
10	Survey Equipment	1
11	Wooden Formwork <i>0.5 mark for each lot of 30,000 sft</i>	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 28 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, inter alia, 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

Bidding Data Sheet**1.1 Name and address of the Employer:****1.1 Name of the Project & Summary of the Works:**

Construction of Building for the Department of Mechanical Engineering at Thar Institute of Engineering, Sciences & Technology-TIEST 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. 1003 of CFY 2024-2025 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 (appendix –B)
(If required and only in case of International Bidding)
- (c) Price Adjustment under Clause 70 (appendix –C)
- (d) Bill of Quantities (appendix –D)
- (e) Estimated Progress Payments (appendix –J)

BDS-2

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**

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) .

LTB-2

- (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.....

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;

LPB-2

- (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	Project Director-TIEST
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	12 months from the date of receipt of Engineer's Notice to Commence.
9.	Defects Liability Period	49.1	12 months (365 days) 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	10 % 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	-----
-----	-----
-----	-----

**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 as per policy for ADP works.

Not Applicable

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 summarised 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.

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):

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

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.

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						

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).

Appendix-H to Bid

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.

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	

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	
2 nd Quarter	
3 rd Quarter	
4 th Quarter	
.....	
.....	
.....	
.....	
.....	
Bid Price	

**ORGANIZATION CHART
FOR THE
SUPERVISORY STAFF AND LABOUR**

(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 times 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:
Signature:
[Seal]

Name of Contractor:
Signature:
[Seal]

FORMS

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

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

**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.

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.

Witness:

1. _____

Corporate Secretary (Seal)

2. _____

Name, Title & Address

Guarantor (Bank)

Signature _____

Name _____

Title _____

Corporate Guarantor (Seal)

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

(Seal)

Signature of Employer

(Seal)

Signed, Sealed and Delivered in the presence of:

Witness:

(Name, Title and Address)

Witness:

(Name, Title and Address)

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)

**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 favour 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 WITNESSETH 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 Internationale 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.*

* 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 INTERNATIONALE DES INGENIEURS-CONSEILS

CONDITIONS OF CONTRACT FOR WORKS OF CIVIL ENGINEERING CONSTRUCTION

**PART I GENERAL CONDITIONS
WITH FORMS OF TENDER AND AGREEMENT**

NOT TO BE

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

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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 _____.

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/JCR.

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

The following Sub-Clause 10.4 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 of Acceptance, 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 neighbourhood 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-Clause 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 60.11 is 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 from a 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 10-15 % 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:-

$$P_n = A + b \frac{L_n}{L_o} + c \frac{M_n}{M_o} + d \frac{E_n}{E_o} + \dots\dots\dots$$

Where:

P_n 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;

L_n, M_n, E_n , 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

L_o, M_o, E_o , 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, 77.1 and 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.

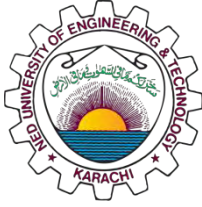
78.1 Details to be Confidential

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.

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**NED UNIVERSITY OF
ENGINEERING & TECHNOLOGY
KARACHI**



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

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VOLUME-II (TECHNICAL SPECIFICATIONS)

First Floor Adl. Work

**Construction of Building for the Department of
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JULY, 2025



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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 Programme 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 Programme/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, 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 Specimens
C40	
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 of 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
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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;

<u>Sieve Number/Size</u>	<u>Percentage (by weight) passing</u>
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)

<u>Sieve Number/Size</u>	<u>Percentage (by weight) passing</u>
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 m³ 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:-

<u>Materials</u>	<u>Percentage by Weight</u>
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.

If 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/mm ² (66,700 psi)
over 16 mm (5/8")	425 N/mm ² (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-faced 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 $\pm 12\text{mm}$.
- Maximum deviation laterally from defined position immediately after stripping formwork and prior to any pre-stressing (if used) $\pm 12\text{mm}$ 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

CEMENT CONCRETE BLOCK 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 block masonry portions of structures and partition walls including but not limited to furnishing of precast solid or hollow cement concrete blocks, 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 blockwork, 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

7.02.1 Portland Cement

All Portland cement for concrete block and mortar shall conform to the stipulations and requirements specified in "Section 4 – Specifications of Plain and Reinforced Concrete".

7.02.2 Sand and Coarse Aggregates

All sand and coarse aggregates for the cement concrete blocks and sand for mortar shall be obtained from approved quarries and shall conform to the requirements specified herein below:

a. Sand

Sand shall be clean, and shall be of the same quality as the sand obtained from approved quarries for concrete works. It shall be hard, strong, durable, soft and free from flaky particles, injurious amounts of dust, alkali, organic matter or other deleterious substances and shall comply with all the requirements for concrete. The Contractor will be required to screen and wash the sand to remove any foreign matter in it. The sand or fine aggregate shall be graded as specified in the section on concrete or in the manner approved by the Engineer.

Coarse Aggregate

Coarse aggregate shall be gravel obtained by screening the gravel or hard crushed stone and shall comply with the requirements for aggregates for concrete. The Contractor shall screen the aggregate through 9 mm and 5 mm sieve as many times as may be necessary to obtain such material as shall be retained on the 5 mm sieve. The grading shall be approved by the Engineer and may be modified if required. A representative sample of the aggregate collected by the Contractor from time to time shall be tested by the Engineer and if the sample would not conform with the approved grading as required by the Engineer, the entire gravel collected by the Contractor will be liable to be rejected.

The aggregate shall be free from soft, friable, porous, flaky, elongated or laminated pieces. The aggregate shall also be free from dirt, silt, clay, shale, alkali or organic matter. It shall be sufficiently strong to utilize the full strength of cementing material.

7.02.3 Water

Water used for making concrete blocks, mortar, laying of masonry, or any other operation of constructions shall be potable water free from objectionable quantities of silt, organic matter,

alkali, salts and other impurities and shall comply with the requirements of water for mixing and curing of concrete and shall be tested and approved by the Engineer.

7.02.4 **Admixtures**

- a. Mortar plasticizers shall comply with the requirements of BS 4887.
- b. Admixtures used in the manufacture of blocks shall comply with BS 5075.

7.02.5 **Mortar**

Pre mixed mortars shall comply with the general requirements for materials and mix proportions shall be as given in this Specification.

7.02.6 **Damp-Proof Course**

Flexible damp-proof course materials shall comply with BS 743 where applicable and shall comprise of the following:

- i) bituminous roofing felt not less than 3 mm thick, or
- ii) polyethylene sheeting not less than 0.5 mm thick or
- iii) any other approved material

The damp-proof membrane shall be laid on an even bed of cement sand mortar (1:1) and lapped 6" at all joints. The damp-proof membrane shall cover the full width of the blocks.

7.02.7 **Bonding Ties**

Bonding Ties shall be expanded metal strips as shown on the Drawings or as directed by the Engineer.

7.02.8 **Wall Ties**

Wall ties shall comply with BS 1243 and shall be hot dip galvanized steel as approved by the Engineer.

7.03 **STRENGTH OF CONCRETE BLOCK**

Crushing strength shall be min 13 MPa (1900psi) unless otherwise required, considering overall dimension on the axis on which test is performed.

7.04 **MAKING OF CONCRETE BLOCKS**

7.04.1 All solid and hollow blocks shall be machine moulded of required sizes as shown on Drawings and approved by the Engineer and shall generally conform to the requirements of British Standard 2028, 1346:1968 "Precast Concrete Blocks" unless specified otherwise. The ingredients shall be well worked into the moulds, vibrated, tamped and pressed to ensure that the blocks are dense and free from voids.

7.04.2 In case of the hollow blocks, the cavities shall be true to the shapes and sizes specified and shall have uniform wall thickness on the outside of the cavities. The cavities in hollow blocks shall not be more than 25% of the total volume.

7.04.3 For casting, the moulds shall be placed on a level platform cast from 2" thick 1:3:6 concrete. The finished blocks shall be true to shape i.e. every face shall be perfect rectangle exactly parallel to the opposite face and exactly perpendicular to the adjoining faces. All the blocks shall be free from cracks, spalls, chips, rugged edges or other defects detrimental to their use. Blocks with broken edges or which are skew will not be allowed to be used on the Work and must be removed from the Site of Work within 24 hours of their being rejected.

- 7.04.4 The blocks must not be lifted from the platform till they have been cured for a period of 2 days in addition to 10 hours required for setting. After 2 days the blocks must be removed and stacked to reasonable height as directed by the Engineer. The block stacks are to be kept wet for a period of 8 days and then shall be allowed to dry in shade for at least twenty (20) days before they are used in the Work. The blocks cast on different dates must be separately stacked. The date of casting and number of blocks in each stack shall be properly marked with non-washable paint.
- 7.04.5 The average compressive strength of any five solid blocks at random shall be not less than 1000 pounds per sq. inch.
- 7.04.6 The average moisture content of all the concrete masonry units shall not exceed 30% of the total water absorption of units. The shrinkage of cement concrete blocks is much greater at the time it dries for the first time after moulding and subsequent curing. It is, therefore, essential that the Contractor shall take full care to see that blocks are sufficiently and thoroughly dried so that their initial shrinkage is completed before the blocks are laid in the Works. Not only well dried blocks shall be used, but the blocks shall also be laid dry without wetting except with slightly moistened surfaces on which mortar is to be applied to obviate absorption of water from the mortar and even during curing of the mortar joints. The walls shall be slightly moistened and shall not be allowed to be excessively wet till they receive any plaster or render.
- 7.04.7 The blocks shall be stored in such a manner as to avoid any contact with moisture on the Site of Works. The blocks shall be stock piled on platforms or other supports free from contact with the ground. If necessary, cover for protection against wetting shall be provided. The blocks right from casting to curing, drying, stock piling and their subsequent placing in masonry walls shall be handled with care.

7.05 MORTAR

- 7.05.1 All mortar for masonry shall be in proportion of one part of cement to six parts of sand (fine aggregate) or as directed by the Engineer. The ingredients shall be mixed by volume in purpose made gauge boxes. All mortar shall be mixed in a mechanical mixers. Hand mixing, when permitted by the Engineer shall be done on clean, hard platform of only such quantities as required for immediate use with just sufficient water to produce mortar of stiffest consistency and sufficient workability.
- 7.05.2 Cement shall be Portland cement as specified under the section "Plain and Reinforced Concrete" as per BS 12.
- 7.05.3 Fine aggregate (sand) shall be clean, hard, durable, soft and free from flaky particles as specified herein above shall be subject to the approval of the Engineer. Mortar shall be mixed only in sufficient quantities for immediate use and all mortar not used within 30 minutes after addition of water to the mix shall be rejected. Re-tempering of mortar will not be allowed.
- 7.05.4 The dry materials (cement and sand) shall be dry mixed for approx. two (2) minutes and for three minutes after addition of water making total minimum time of five (5) minutes in a mortar mixer. When hand mixing is permitted, dry mix, rake well, turn over materials for each batch before adding water, until uniform colour of mixed materials indicated through distribution of cementitious material. After dry mixing is complete, add water until the correct consistency is obtained.

The sand shall meet the following B.S. Specifications:

- a. Sand for mortar shall comply with the requirements of BS 1200.
- b. The grading of sand for general purpose mortars shall be within the limits of Table 1 of BS 1200. The grading of sand for reinforced blockwork mortars shall be within the limits of Table 2 of BS 1200.

- c. The clay/silt content, when determined in accordance with BS 812, shall not exceed 3%.
- d. The Chloride and Sulphate contents shall not exceed the limits given in aggregates for concrete.

7.06 LAYING OF BLOCK MASONRY

- 7.06.1 All block work shall be set out and built to the respective lengths, dimensions, thickness & heights shown on the Drawings.
- 7.06.2 All block work should be true to lines, plumb and level. Chases, grooves, raglet block and raked out joints shall be kept free from mortar and debris.
- 7.06.3 Block work shall be carried up in a uniform manner, no one portion being raised more than 3 ft. above another at one time unless special circumstances render this impracticable. All perpend, quoins etc. shall be kept strictly true and square and the whole properly bonded together. The maximum height which is to be built in one day is 5 ft.
- 7.06.4 All horizontal and vertical joints shall be completely and solidly filled with mortar as and when the blocks are laid.

The thickness of joints shall generally be ½” and at no point more than 5/8”. All cross joints shall also be filled well.
- 7.06.5 Any mortar which falls on the floor from the joints or removed due to raking of joints shall not be reused and must be cleaned and removed from Work-Site at the end of the day.
- 7.06.6 Where masonry abuts R.C.C. columns or walls, it shall be anchored thereto by means of 3/8” diameter bars at a vertical spacing of 16” and as shown on the Drawings or as instructed by the Engineer.
- 7.06.7 Masonry shall be cured for at least ten (10) days from the day it is laid.
- 7.06.8 Mortar already spread which becomes diluted by rain shall be removed and replaced before continuing with the work.
- 7.06.9 Hollow blocks where used shall be placed in a manner as shown on the Drawings and/or as directed by the Engineer.
- 7.06.10 Block walls shall be built in stretcher bond, accurately special with each breaking joints with the course below. Intersections of block walls shall be properly bonded in alternative courses.
- 7.06.11 Generally, blockwork where exposed shall be flush jointed as the work proceeds. Joints of those facings which are to receive external or internal plastering shall be raked out ¾” deep when the mortar is still fresh so as to provide proper bond for the plaster.
- 7.06.12 All hollow blocks shall be filled at sides of openings and intersections with concrete mix having a compressive strength at 28 days of not less than that of the block.
- 7.06.13 A solid or pre-filled course of blockwork shall be provided at sill level of openings and under bearing of all in situ concrete.
- 7.06.14 Pointing of exposed blockwork shall be as shown in the Drawings or as directed by the Engineer. Pointing shall be done as the work proceeds.
- 7.06.15 Unless otherwise shown on the Drawings or specified, the spaces around frames and other built-in-items shall be solidly filled with mortar, except the joints that are to be caulked shall be raked out ¾” deep.

- 7.06.16 Work required to be built in with masonry including anchors, wall plugs and accessories shall be built in, as the work progresses. Wood plugs and blocking shall not be built into masonry.
- 7.06.17 No masonry to be erected when temperature of outside air is below 40°F unless suitable means as approved are provided to heat material protected from cold and frost and ensure that material will harden without freezing.
- 7.06.18 When the masonry is to receive plaster on one side and pointing on the other, the block shall be placed in such a way that the better face shall be on the side of pointing.

7.07 COORDINATION

- 7.07.1 The Contractor shall provide chases and openings in block work required under other sections to sizes and locations as shown in the Drawings.
- 7.07.2 The Contractor shall cooperate with other trades in setting built-in items, take special care in cutting, fitting, setting units so that built-in members are in their true, respective positions.
- 7.07.3 The Contractor shall also coordinate during blockwork for the items provided in other sections such as door frames, hold fasts, miscellaneous metal work occurring in the masonry and sleeves, anchors, supports, nailing strips, braces, jambs etc. to be built-in the masonry.
- 7.07.4 Special care shall be taken in building walls of door frames. Contractor shall see that frames are square and in plumb. Check frames before building blockwork around or against them. The Contractor shall see that electric conduits are not housed into frames so as to prevent extension of frame anchors.
- 7.07.5 The Contractor shall be responsible for any damage or abortive work due to lack of coordination on his part or due to negligence of his Site supervisory staff in coordination of various sections of Works and no compensation shall be made to the Contractor on such account. The Contractor shall reinstate/make good such affected works at his own cost.

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 blocks 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 all 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 is 1.5 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 fiber, 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 solignum 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 and 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 all 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

- 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.
- 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.
- All doors windows & ventilators shall be of type and size indicated on drawings and shall conform to the requirements shown and specified herein.
- 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.
- 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

GLAZING

11.01 SCOPE OF WORK

The work under this section of the Specifications consists of furnishing all labor, equipment, tools, appliances, scaffoldings and providing glass gaskets, sealants, compound and other materials required for performing all operations in connection with the installation and setting of all types of glass, glazing and glass blocks complete in every respect in accordance with the Drawings or as directed by the Engineer. The scope of this section of Specifications is covered with detailed Specifications as laid down herein.

11.02 APPLICABLE STANDARDS

Latest editions of following British Standards are relevant to these specifications wherever applicable.

BSI (British Standards Institution)

- 952 Glass for glazing
- 5051 Security glazing Part I&I)
- CP.152 Glazing

11.03 GENERAL

- a. Glazing sealant shall be as recommended by the manufacturer for the particular application.
- b. Spacer shims (distance pieces) shall be elasticized polyvinyl chloride (PVC). Thickness shall be equal to space shown on drawings between glass and rebates, bead or cleat. Depth shall give not less than inch cover of glazing sealant.
- c. Contractor shall submit samples for each type of glass, minimum 4 ft. x 4 ft. in size with protective edges. Samples of glazing sealant minimum 0.1 liter of specified types shall be submitted. Samples of minimum of three glass blocks shall also be submitted.
- d. Contractor shall submit 1 foot long sample of each type of glazing gasket.
- e. Contractor shall also submit printed materials manufacturer's installation instructions for specified glazing gaskets, compounds sealants and accessories including description of required equipment and procedures and precautions to be observed.

11.04 DELIVERY STORAGE AND HANDLING

- a. Contractor shall deliver materials in manufacturer's original, unopened containers clearly labeled with manufacturer's name and address, material, brand, type, class and rating as applicable.
- b. Contractor shall store the materials in original unopened containers with labels intact/protected from ground contact and from elements which may damage glass.
- c. Contractor shall handle the materials in a manner to prevent breakage of glass and damage to surfaces.

11.05 MATERIALS

11.05.1 General

Glass shall be free from all blemishes, bubbles, distortions and other flaws of any kind and shall be properly cut to fit the rebates so as to have a uniform clearance of 1.6 mm round the panes between the edges of glass and the rebates. All glass shall be best quality from reputable manufacturer (USA/Sweden) as approved by the Engineer.

11.05.2 **Glass**

Glass for windows, and ventilators and louvers shall be of specified thickness and of approved quality.

Clear and Tinted Plate Glass

Clear plate glass shall be imported glass complying with BS 952 Part I M Table 2, Ordinary Glazing Quality.

The single glazing shall comprise of 5 mm thick clear/ tinted plate glass.

The double glazing shall comprise of an assembly of two glass panels of clear plate glass each 6 mm thick, with a 12 mm separator between them and hermetically sealed

Clear Laminated Glass

Clear Laminated glass shall comply with BS 952, ASTM C1036 or C1048. The thickness shall be 11 mm.

Glass Bricks

Glass bricks/ blocks shall be best quality imported glass bricks/ blocks, to the approval of the Engineer and shall comply with BS 1207.

11.05.3 **Glazing Sealants and Compounds**

Contractor shall provide material colored to match frame in which glass is installed. Provide only compounds known to be fully compatible with surfaces, which they will contact as follows:

- Two component polysulfide glazing sealant.
- One component acrylic glazing
- Acrylic-latex glazing sealant consisting of modified latex rubber and acrylic emulsion, non-hardening, non- staining and non-bleeding.
- Cleaners, Primers and sealer as recommended by the sealant manufacturer.

11.05.4 **Accessories**

All sealants, neoprene gaskets, tapes, cords, bedding materials, etc. shall be those recommended by the manufacturer for application to aluminum or other window frame materials to suit the environmental conditions.

Glazing Sealant

It shall be tape or ribbon of polymerized butyl or mixture of butyl 1 and polyisobutylene compounded with inert fillers and pigments, solvent based, 95 percent solids thread or fabric reinforced, paintable, non- staining.

Setting Blocks

It shall be chloroprene (Neoprene) 70 to 90 durometer hardness, compatible with sealant used, channel shaped and of the necessary height for proper perimeter clearance.

Channels, Gaskets, and spacer's

It shall be chloroprene (Neoprene), 40 to 50 durometer hardness compatible with sealant used.

11.06 **INSTALLATION OF GLAZING**

- a. Glass is to be handled with care, and placed into openings without distortion, set on such spacers, sprigs or other components as recommended.
- b. Glazing shall comply with the recommendations of glass and glazing materials manufacturers.
- c. Examine each piece of glass and discard and replace glass with edge damage or face imperfection. All glazing shall be wind tight and fully water tight on completion.

- d. All rebates, grooves, etc. for glazing shall be prepared by thoroughly cleaning of all dirt, dust, oil, grease and other foreign matter. Clean glazing channels and other framing members indicated to receive glass. Remove coatings, which are not firmly bonded to the substrate.
- e. Remove lacquer from metal surfaces wherever elastomeric sealants are to be used. Apply primer and sealer to joint surfaces wherever recommended by the sealant manufacturer and as shown on the drawings.
- f. All glass shall be cut to suit each opening, perfectly square, and with due allowance for glazing tolerances, thermal expansion as recommended by the manufacturer.
- g. Trim and clean excess glazing materials from surrounding surfaces immediately after installation and eliminate stains and discolorations.
- h. Cure glazing sealants and compounds in compliance with manufacturer's instructions to obtain high early bond strength internal cohesive strength and surface durability.
- i. All glazing secured by neoprene gaskets is to be held in place by full enclosure of gaskets, applied with approved tools, corners continuously gasketed not mitred
- j. While glazing operation is in progress care shall be taken to avoid breakage or damage to the glass and adjoining glazing. The Contractor shall make good at his own cost, all glass broken by his workmen while cleaning or carrying out other operations. On the completion of the glazing work, all glass that has been set by the Contractor shall, if it becomes loose, within the maintenance period, be refixed at Contractor's expense.
- k. No glazing shall be considered complete until and unless paint and other stains have been removed from the surface of the glass and checked by the Engineer for water tightness.
- l. All glazing, by whatever method employed, shall be completely watertight and sound, and generally be in accordance with B.S.C.P. 152 Section 4/404.
- m. All glass shall thoroughly be cleaned on completion

11.07 PROTECTION AND CLEANING OF GLAZING

Glass shall be protected against damage. Any damaged or broken glass shall be removed and replaced by the Contractor at his own cost to the approval of the Engineer.

11.08 ACCEPTANCE

Labels showing glass manufacturer's identity, type of glass, thickness and quality will be required on each piece of glass. Labels must remain on glass until it has been set and inspected.

11.09 CLEANING

Remove all smears, labels and excess glazing sealant, leave clean inside and outside free from scratches. The Contractor shall be responsible for the protection of installed glass. Before final acceptance, damaged or broken glass shall be removed and replaced with new glass at no additional expense to the Employer.

All glass surfaces shall be washed clean both inside and outside within two weeks prior to final acceptance by the Employer.

Any labels, smears, stains, marks, spots and dirt etc. shall be removed from the glass and the glass shall be washed clean on both sides taking care not to scratch or damage the glass.

Plaster, mortar, paint, excess sealant, putty etc. or any other material shall be removed immediately after contact with the glass and shall not be permitted to remain on the glass surface.

11.10 GUARANTEE

Contractor shall provide a guarantee that all glazing joints in exterior openings shall remain water tight for a period of at least ten years after the acceptance of the building. The Contractor shall also guarantee that during the above period, glazing gaskets & sealants shall not crack, dry out, crumble or

fall away from smash on glass.

11.11 SAMPLES

Samples of all kinds of materials to be used on the job shall be submitted to the Engineer for approval. Approved samples shall be retained by the Engineer to form standards against which all deliveries will be judged.

11.12 TESTING

All materials shall be subject to standard testing and specifications such as ASTM, British Standard or equivalent. If any item found below the specified standard, shall be rejected and removed from the Site immediately and replaced by the Contractor at his own cost.

11.13 MEASUREMENT AND PAYMENT

No separate payment shall be made for the supply, installation and fixing of glass/ glazing as per the requirements of this section of Specifications but is deemed to be included in the unit rates of the relevant items of aluminum doors, windows, ventilators, glazed screens/walls etc. entered in the Bill of Quantities.

Glass bricks/ blocks shall, however, be paid separately per square meter/feet for the supply, installation and fixing as per the requirement of this section of Specifications at the unit rates entered in the Bill of Quantities and as per the terms of the Conditions of this Contract.

***** END OF SECTION *****

SECTION - 12

ROOF WATER PROOFING

12.01 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.

12.02 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.

12.03 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".

12.04 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.

12.05 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.

12.06 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.

12.07 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 - 13

MARBLE AND GRANITE WORK

13.01 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.

13.02 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.

13.03 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.

13.04 MATERIALS

13.04.1 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.

13.04.2 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.

13.04.3 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

13.04.4 **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.

13.04.5 **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.

13.05 **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

13.06 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 - 14

FLOOR AND WALL FINISHES

14.01 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.

14.02 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.

14.03 GENERAL

14.03.1 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.

14.03.2 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.

14.04 CEMENT SAND SCREED

14.04.1 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.

14.04.2 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.

14.05 MARBLE FLOOR TILES

14.05.1 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.

14.05.2 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.

14.05.3 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

14.05.4 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.

14.05.5 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.

14.05.6 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.

14.05.7 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.

14.06 CERAMIC FLOOR TILES

14.06.1 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.

14.06.2 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.

14.06.3 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.

14.06.4 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.

14.06.5 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.

14.06.6 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.

14.07 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.

14.08 PORCELAIN FLOOR TILES

14.08.1 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.

14.08.2 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.

14.08.3 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.

14.08.4 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.

14.08.5 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.

14.08.6 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.

14.09 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 - 15

PAINTING

15.01 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.

15.02 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.

15.03 GENERAL

- 15.03.1 Except as otherwise specified, all painting shall be applied in conformity with BS CP 231 "Painting of Building" as applicable to the work.
- 15.03.2 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.
- 15.03.3 Except as otherwise specified, all concrete and plastered surfaces are to be painted.
- 15.03.4 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.
- 15.03.5 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.
- 15.03.6 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 board panels. Manufacturer's color chart shall be submitted for color specifications and selection.

15.04 MATERIALS AND EQUIPMENT'S

- 15.04.1 All materials shall be acceptable, proven, first grade products and shall meet or exceed the minimum standards of approved manufacturers.
- 15.04.2 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.

- 15.04.3 Approved quality Distemper paint shall be used for painting where specified on the drawings as directed by the Engineer.
- 15.04.4 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.
- 15.04.5 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.

15.05 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.

15.06 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.

15.07 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.

15.08 JOB CONDITIONS

- 15.08.1 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 degree C. No painting shall be done above 90% relative humidity.
- 15.08.2 Adequately protect all finished work.
- 15.08.3 Remove and replace all items of finish hardware, device plates, accessories, lighting fixtures or other removable items.
- 15.08.4 In no case shall any finish hardware or other finished item that is already fitted into place be painted, unless otherwise specified

15.09 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.

15.10 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.

15.11 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 - 16

MISCELLANEOUS METAL WORK

16.01 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.

16.02 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.

16.03 MATERIALS

16.03.1 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.

16.03.2 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.

16.04 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.

16.05 SAMPLES

Samples or materials specified shall be submitted for approval when required by the Engineer.

16.06 FABRICATION

16.06.1 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.

16.06.2 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.

16.06.3 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.

16.06.4 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.

16.06.5 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.

16.06.6 Riveting

Riveting where exposed shall be flush unless otherwise indicated on Drawings or directed by the Engineer.

16.06.7 Bolting

Bolting, where permitted, shall be done with proper size bolts. Nuts shall be drawn tight and thread nicked.

16.06.8 Steel

The use of Structural Steel in Buildings shall comply with BS 449 Part 2.

16.06.9 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 dip galvanized. No cold galvanizing paint permitted cold galvanizing zinc.
- d. No black bolts will be accepted. Only H.D. galvanized bolts shall be allowed.

16.06.10 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.

16.06.11 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.

16.06.12 **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.

16.06.13 **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.

16.07 **MISCELLANEOUS ITEMS**

16.07.1 **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.

16.07.2 **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.

16.07.3 **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.

16.08 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 - 17

WALL TILING

17.01 SCOPE OF WORK

The Work under this section of the Specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with providing and laying of wall tiles, complete in strict compliance with this section of Specifications, the applicable Drawings and in accordance with the terms and conditions of the Contract.

17.02 GENERAL

Best quality local or imported wall tiles from approved manufacturers in approved size, color and pattern at locations shown on the Drawings and in the Bill of Quantities shall be supplied and laid dully approved by the Engineer.

17.03 MATERIALS

Tile can be from of any of the types listed below:

Ceramic tiles, Porcelain tiles, Marble tiles, Granite tiles, Cement tiles, Vitrified tiles, Glass Tiles, Mosaic Tiles, Travertine tiles, Slate Tile, Quartzite Tiles etc.

- a. All the tiles shall be perfectly true to shape, flat, free from crazing, walks and other flaws and shall be consistent in color and pattern equal to samples presented to the Engineer for approval. The bedding faces of all tiles shall be keyed to an approved pattern.

Except as otherwise specified, the following British Standards and Code of Practice shall be applicable to materials and fixing methods for ceramic tiles:

- i. British Standard 1281: 1966 "Glazed Ceramic Tiles and Tile Fittings for internal wall".
- ii. British Standard CP 212: for fixing methods and workmanship.
- b. Adhesives for ceramic tiling shall be neat cement paste or as recommended by the tile manufacturer.
- c. Joint Filler shall be white cement grout in matching color 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 grout shall be water resistant and shall not wash out under water.
- d. Portland cement conforming to BS 12.
- e. White Cement conforming to relevant BS Specifications.
- f. Sand shall comply with ASTM C-33.
- g. Water shall be clean potable drinking water, free from oils, acids, alkalis, salts and organic or other injurious matter.
- h. Pigments to be used shall comply with BS 1014.

17.04 SAMPLES

All wall tiles materials such as ceramic tiles etc. to be used in the Works shall receive prior approval of the Engineer.

The Contractor shall submit adequate number of samples of tiles from the product ranges of different local manufacturers for the selection and approval of the Engineer. The approved samples shall be kept by the Engineer to form standards against which all deliveries will be judged.

The Contractor shall strictly follow the instructions of the manufacturers and the wall finishes shall be applied accordingly.

Wall tiling to internal and external walls and fascia shall be fixed true to the line level and plumb in approved manner satisfactory to the Engineer. All tiles shall be aligned properly with straight joints in even widths.

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 by the Engineer, and the Contractor shall be required to remove and replace such work without any claim at his own cost as per the instructions of the Engineer.

17.05 BEDDING AND JOINTING

- a. The tiles shall be fixed to the walls over a rendered backing as described below:

Rendered Backing

The tiles to be fixed to walls shall be fixed on a rendered backing. Walls to be tiled are to be prepared exactly as for rendering/plastering. A 10 mm thick cement sand render coat shall then be applied exactly as described for plastering in a ratio of 1:4. The surface to be scratch-keyed as approved and particular attention to be given to curing. The tiles shall be fixed to this rendered backing with a paste of cement.

- b. Surfaces to receive the ceramic tiling shall be clean and free of dirt, dust, oil, grease or other objectionable material.
- c. After having been immersed in clean water for a minimum of 7 hours, until saturated the tiles shall then be bedded in a bedding coat of cement paste, all to the approval and instructions of the Engineer.
- d. Tiles shall be set out carefully and bedded to a true vertical face, square and plumb, aligned in accurate continuous horizontal and vertical courses to an un-bonded pattern so as to give regular joint widths of approx. 2 mm if spacer nibs are not provided.
- e. Tiled areas shall be cured when set by continuous wetting for a minimum period of 3 days.
- f. When cured, tile joints shall be pointed with a liquid neat white Portland cement grout in matching color so as to fill each joint solidly and continuously. When set, joints shall be finger-smoothed off to an even concave profile.
- g. Tiles where required to be cut shall be marked off and cut with approved tools perfectly square and true, with no chipped or cracked edges. Cut tiles shall generally be positioned on the perimeters, and setting-out should be carefully carried out to ensure this. Tiles shall similarly be carefully and cleanly cut around pipes, fixings and other projecting components.

17.06 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.

17.07 MEASUREMENT AND PAYMENT

Wall tiling work covered under this section of Specifications, complete and approved, will be measured and paid for per square meter including preparations, rendered backing, tile adhesive, grouting and

pointing etc. at the respective individual item rates entered in the Bill of Quantities and generally in accordance with the applicable terms and Conditions of the Contract.

***** END OF SECTION *****

SECTION - 18

SUSPENDED CEILING

18.01 SCOPE OF WORK

The Work under this section of the Specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with the installation of suspended ceilings at locations shown on the Drawings, complete in strict accordance with this section of the Specifications and applicable Drawings and subject to the terms and conditions of the Contract.

18.02 GENERAL

- a. Suspended ceilings to be provided at the project shall be Gypsum Board Ceiling:
- b. All the suspended ceilings shall be installed in conformance with British Code of Practice: CP 290.
- c. In most cases, ceilings are intended to conceal or contain services. The Contractor shall liaise directly with the mechanical and electrical services specialists and following this shall prepare detailed reflected ceiling plans and shop drawings of each area of ceiling indicating the intended method of framing, tile layout, position of electrical light fittings & smoke detectors etc. for the approval of Engineer. Requirements for removable access panels shall be determined by the services specialists and indicated on the drawings accordingly. Suspended ceilings shall then be installed as per the approved shop drawings.
- d. Suspended ceilings shall be installed by specialist subcontractors as per the recommendations of the manufacturers in conformity with the approved shop drawings and to the approval of the Engineer.

18.03 SAMPLES

- a. The Contractor shall provide samples of gypsum board ceiling tiles, and proposed suspension and framing systems 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. All the materials shall be supplied from the approved manufacturers as per the samples approved by the Engineer.

18.04 MATERIALS AND INSTALLATION

Gypsum Board Ceiling

Gypsum board ceiling shall comprise of gypsum board tiles, 7.5 mm thick, fixed to the framing.

Framework to be fabricated from wooden runners or galvanized steel metal frame. Sizes of sections to be appropriate to spans and framing conditions so that a perfectly stable and rigid result is achieved.

Boards are to be fixed to the framework with rustproof self-tapping screws/nails with heads countersunk and filled. Gaps between boards are to be filled with a suitable inert filler and the whole surface sanded off so as to produce a perfectly plane smooth matching surface.

Removable access panels shall be provided where indicated on the approved reflected ceiling plans. The panels shall be secured by suitable rustproof proprietary fixing devices.

Propriety Acoustic Suspended Ceiling Systems

The suspended ceiling systems shall be from approved suppliers/ manufacturers all propriety ceilings shall be inclusive of all suspension system steel framing, trims angles exposed or concealed grid system subject to approval of the Engineer.

Approved Manufacturers

- U.S. Gypsum
- Armstrong

- Or other approved suppliers, manufacturers

Dampa Acoustic Metal Pan Ceiling Systems

The suspended aluminum ceiling systems shall be from approved suppliers/ manufacturers all propriety ceilings shall be inclusive of all concealed/ exposed system as recommended by the manufacturers and approved by the Engineer. Various whole sizes and perforation patters in conformation with colored acoustic felt bonded to the reverse side of the tiles shall be used to achieve optimal acoustics. All panels must achieve NRC rating of 0.75 ASTM minimum panel size shall be 600mm x 600mm.

Approved Manufacturers

- Dampa U.K
 - Thermec Engineering (PVT) LTD.
 - Or other approved suppliers, manufacturers
- **Other Ceiling Systems**
 - Mineral fiber Acoustical Ceiling Tiles.
 - Glass fiber Insulation board adhesive applied to chip board panels
 - False Ceiling comprising of Fur Wood Planks.
 - False Ceiling of Fur Wood planks with deodar wood facia

18.05 WORKMANSHIP

- a. The installation of suspended ceiling shall be carried out by approved specialist subcontractors with adequate experience in this field.
- b. The Work shall generally by executed in accordance with best practice; members shall be cut, drilled and framed, joints made, fixings positioned and made, and work assembled and fixed generally in accordance with approved shop drawings and manufacturers recommendations.
- c. The workmanship shall generally comply with the standards set out in CP 290.
- d. All suspended ceilings shall be set out and installed in accordance with the details shown on the approved reflected ceiling plans and shop drawings and no modification in form or detail may be made except with the specific approval of the Engineer.
- e. All fixtures shall be fixed as per approved plans.
- f. No suspended ceilings shall be fixed until all wet trades and services above have been completed.

18.06 PROTECTION

- a. All the suspended ceilings shall be protected throughout the Contract period.
- b. Any damage occurring to the suspended ceiling before the Contract completion from whatever cause shall be made good or replaced at Contractor's cost, all to the approval of the Engineer.

18.07 MEASUREMENT AND PAYMENT

Suspended ceilings shall be measured per square meter and paid at the unit rates entered in the Bill of Quantities inclusive of all framing, suspension system, accessories, painting, access panels, recesses for lights etc., complete in all respect.

*** END OF SECTION ***

SECTION - 19

WATER RETAINING STRUCTURES

19.01 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.

19.02 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.

19.03 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.

19.04 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.

19.05 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.

19.06 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.

19.07 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.

19.08 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.

19.09 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.

19.10 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.

19.11 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.

19.12 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 coefficient 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).

19.13 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 - 20

POLYVINYLCHLORIDE (P.V.C) WATER STOPPER AND SWELL BARS

20.01 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.

20.02 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.

20.03 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 vulcanising for jointing places of water stoppers at site shall be done with the prior Approval in accordance with the Manufacturer's recommendations and specifications.

20.04 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.

20.05 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 21

WATERPROOFING OF TANKS AND BELOW-GRADE STRUCTURES

21.01 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.

21.02 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.

21.03 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.

21.04 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.

21.05 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.

21.06 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.

21.07 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.

21.08 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.

21.09 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.

21.10 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.

21.11 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.

21.12 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.

21.13 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.

21.14 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 – 22

EXTERNAL PAVING, PARKING AREAS

22.01 SCOPE

The work covered under this section consist of providing and making items as per specifications laid down herein under, drawings and Bill of Quantities.

- CC Paving Stones as per finishes schedule and Bill of Quantities
- Kerb Stone as per finishes schedule and Bill of Quantities
- CC floor with grooves
- CC floor laid in panel

22.02 MATERIAL REQUIREMENTS

Cement, Sand, Aggregate: Shall conform to specifications given in the relevant Section of this specification.

Concrete Blocks: Shall conform to specifications given in the relevant Section of this specification.

Tiles and Special Dry Bond Mortar: Shall conform to specifications given in relevant Section of this specification.

Concrete Pavers / Tuff Tiles / Uni-block: As per manufacturer's specifications

Chips: For washed terrazzo shall conform to specifications given in relevant section of "Materials" & washed Terrazzo.

Strength: Min 28 days Cylinder Compressive strength for 50 mm thickness shall be 35 MPa (5000 psi) and for 60 / 80 mm thickness, it shall be 48 MPa (7000 psi).

Thickness of Sub Base and Pavers: Recommended thickness of sub base and pavers is shown in Table below:

Application	Thickness of sub-base mm (in.)		Thickness of paver (mm)
	Dry Area	Low Wet Area	
LIGHT DUTY Residential, drive way, walk ways, parking patios etc.	0 to 76 (0 to 3)	100 to 204 (4 to 8)	50
MEDIUM DUTY Residential, Streets, Public Parking, service road, maintenance area, canal lining, storage area, City petrol pumps etc.	100 to 152 (4 to 6)	254 (10)	60
HEAVY DUTY City Streets, Loading deck Industrial floors, Highway petrol pumps etc.	204 (8)	305 (12)	80

Shapes: Pavers are available in Uni-Block, I-Section, Rectangle, Half Rectangle, Wavy, Heagon and Delta Shapes

Quantity and thickness: Quantity and thickness required per Square meter of different shape and size of pavers is shown in Table below:

Specification for the Paving Stone

S.No	Type	Thickness (mm)	Area per Tile Sq cm (Sq In.)	Nos. of Tiles/Sqm (Tiles/Sq Ft)
1.	Uni-Block	50/60/80	249.74 (38.71)	39.81 (3.70)
2.	I-Section	50/60	270.83 (41.98)	36.90 (3.43)
3.	Rectangle	60/80	196.90 (30.52)	50.67 (4.71)
4.	Half Rectangle	60	128.12 (19.86)	78.01 (7.25)
5.	Wavy	60	275.99 (42.78)	35.83 (3.33)
6.	Hexagon	60	346.64 (53.73)	28.83 (2.68)
7.	Delta	50	245.74 (38.09)	40.67 (3.78)

22.03 CONSTRUCTION REQUIREMENTS

The entire area under external Paving shall be prepared by dressing earth, to a hard or graded surface where necessary, the prepared surface shall be made up to the required levels by filling and consolidating earth in accordance with the specifications for earth filling under floors.

CC Paving Stones

50mm thick cc paving stone in natural color shall be laid over 50mm thick sand over compacted earth for entrance foyer.

Kerb Stone

The kerb stone 350mm x 300mm x 150mm shall be joint in Cement Mortar 1:4 or as specified by Engineer.

CC Floor

CC Type "A," (1:2:4) with Power float Screed bed 50 mm thick in panel of 10'x10' where joint is filled with hot bitumen mixed with fine sand on bond breaking material as specified by Engineer.

22.04 MEASUREMENT AND PAYMENT

Measurement for all the items covered under this section shall be made in Sq. ft/m of the actual surfaces completed and approved.

The rate quote from the work items covered in this Section shall constitute full compensation for all materials, labor equipment, plant and all incidentals to complete the works.

*** END OF SECTION ***

SECTION 23

SOLING

23.01 SCOPE OF WORK

The work to be done under this section of specifications consists of furnishing all plant, labour, equipment, appliances, materials and performance of all operations required in connection with the construction of stone or gravel bottoming under foundations and/or floors in strict accordance with the specifications and Drawings and/or as directed by the Engineer. The scope of this section of specifications is covered with detailed specifications as laid down herein.

23.02 MATERIAL

Stone/ Gravel

Stone to be used shall comprise of strong, hard, durable stone of the specified/approved size, free from impurities, quarry sap, dust, dirt and solubility characteristics. The stone/ gravel shall be obtained from approved quarries and shall be sound, free from laminations and weak cleavages.

23.03 CONSTRUCTION

I. Preparation of Sub-grade

Sub-grade shall be formed of suitable materials free of clods, roots, stumps, bush or other objectionable material.

Sub-grade material shall be placed in successive layers not exceeding 6 inch. (150mm) in thickness loose measure, and each layer shall be thoroughly compacted to give the specified density.

The sub-grade will be compacted at optimum moisture content and loose pockets, if any, cut-out and refilled with selected materials in layers not more than 6 inch. (150mm) thick and formed to levels and grades shown on the Drawings.

Compaction shall be done by approved methods consistent with the soil/material to be compacted.

The maximum dry weight density of the sub-grade shall not be less than 95% of Modified AASHTO requirements.

Maximum density is defined as the maximum dry weight density as determined by ASTM Designation D-1557 (MOD-AASHTO).

II. Stone Soling

The stone shall be well graded having a maximum size or 2 inch (50mm). It should be graded down to 3/4 inch (20mm).

The soling material shall be laid and packed to even grades and well rolled to a consolidated thickness as shown on the Drawings.

The whole of the surface of the compacted stone bottoming will be blinded with or any other approved gritty material, after the interstices have been filled with smaller size stones, so as to effectively fill in the voids and crevices, watered, if necessary and again thoroughly rolled with the same roller to produce a smooth and even surface free from irregularities, true to line and level.

Care is to be taken to avoid any damage to existing structures, mains or pipes while rolling operation is in progress. In places inaccessible for a roller, compaction shall be done by hand tampers weighing not less than 9 kg or power rammers as directed by the Engineer.

23.04 MEASUREMENT AND PAYMENT

Soling shall be measured per cubic ft/ Meter; on areas and in thickness as shown on the Drawings and paid for at the unit rates entered in the Bill of Quantities, inclusive of compaction, grading, leveling, bracing, shoring etc.

***** 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)

First Floor Adl. Work

**Construction of Building for the Department of Mechanical Engineering at
Thar Institute of Engineering, Sciences & Technology-TIEST at Tharparkar**

JULY, 2025



Head Office (Karachi): Suite No. 314, 3rd Floor, Mashriq Center, Gulshan-e-Iqbal Block-14, Karachi

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BILL OF QUANTITIES
CONSTRUCTION OF BUILDING FOR THE DEPARTMENT OF MECHANICAL ENGINEERING AT
THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY (First Floor - Adl. Work)
AT
THARPARKAR
COST SUMMARY

S.No	DESCRIPTION	SCHEDULE ITEM	PREMIUM ON SCHEDULE ITEMS	AMOUNT OF PREMIUM	NON SCHEDULE ITEM	TOTAL AMOUNT
		a	b	c = a x b	d	e = a+c+d
1	CIVIL WORKS	99,930,039	____ %			
2	PLUMBING WORKS	336,497	____ %			
3	ELECTRICAL WORKS					
	TOTAL COST	100,266,536				
	GRAND TOTAL COST					

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CIVIL WORKS

Ref. No. / NSI	Item no	Description	Unit	TOTAL		
				Qty	Rate (Rs.)	Amount (Rs.)
<u>PART-C FIRST FLOOR</u>						
<u>SCHEDULE ITEM</u>						
SECTION -1 PLAIN CEMENT CONCRETE						
S.No. 6(a) P-17	C-1.1	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	27495.88	717.59	19,730,771.76
S.No. 8/ P-26	C-1.2	Fabrication of deformed steel reinforcement for cement concrete including cutting,bending, laying in position, making joints and fastenings including cost of binding wire (also includes removal of rust from bars.) a) Deformed bar i) Grade-60	P.Cwt	1472.99	18,934.02	27,889,694.31
S.No 16 (c) /P-42	C-1.3	Provide & lay topping of concrete 1:2:4, including surface finishing & dividing in panels : 2" thick (For Under Floor)	Sft	20301.05	108.75	2,207,739.19
S.No. 11/ P-26	C-1.4	Providing and fixing ornamental cement jalli 4" thick (1 : 2 : 4) without steel.	P.Sft	2309.50	452.24	1,044,448.28
TOTAL COST						50,872,653.53
SECTION -2 BRICK MASONRY WORK						
S.No 6 & 5 /P-30	C-2.1	Pacca brick work in first floor in (e) Cement sand mortar. 1:6	Cft.	26053.92	398.41	10,380,142.27
TOTAL COST						10,380,142.27
SECTION -3 SURFACE RENDERING						
S.No 13(b) /P-52	C-3.1	Cement plaster 1:6 upto 12' height (b) 1/2" thick (For Internal Side)				
	a	First Floor(Add 13% extra labour rate)	Sft	57828.97	40.69	2,353,060.79
S.No 11(a) /P-52	C-3.2	Cement plaster 1:4 upto 12' height (a) 3/8" thick (For Ceiling)				
	a	First Floor(Add 13% extra labour rate)	Sft	30983.80	41.56	1,287,686.73
SS.No 13(b) /P-52	C-3.3	Cement plaster 1:6 upto 12' height. (c) 3/4" thick. (For External)				
	a	First Floor(Add 13% extra labour rate)	Sft	40047.52	40.69	1,629,533.59
TOTAL COST						5,270,281.11
SECTION -4 PAINTING & VARNISHING						
S.I. No. 36(a) / P-54	C-4.1	Preparing the surface and painting with matt finish i/c rubbing the surface with bathy (Silicon carbide rubbing brick) filling the voids with zink/chalk/plaster of paris mixture, applying first coat premix making the surface smooth and then painting 3 coats with matt finish of approved make etc: complete (3 coats)	Sft	57828.97	100.83	5,830,895.05
S.I. No. 23/P-53	C-4.2	Primary coat of Chalk under distemper (for ceiling)	Sft	30983.8	3.59	111,231.84
S.I No. 24/P-53.	C-4.3	Distempering (c) three coats.(for ceiling)	Sft	30983.8	17.23	533,850.87

Sl. No. / NSI	Item no	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)
S.No 38(A) +(B x 2)/P-56	C-4.4	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 paris and then painting with weather of approved make (new surface) three coat	Sft	8009.504	86.58	693,462.86
S.No 7 /P-71	C-4.5	French polishing complete: On new work	Sft	3,144.00	65.18	204,925.92
S.No 5(d) /P-70	C-4.6	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.	Sft	1,674.00	9.76	16,338.24
		(b) Each subsequent coat of paint.	Sft	1,674.00	7.12	11,918.88
TOTAL COST						7,402,624
SECTION -5 FLOOR FINISHES						
S.No 28 IX /P-46	C-5.1	Providing & Laying Full Body Porcelain Tile in Flooring or Facing of Approved Design Set in Gry Cement Motor 1:2 or of 3/4" Thicknss I/C Washing & Joints With White Cement Slurry Using Colour Pigment for matching complete as per Spacification. 24"x24"x5/16"	Sft.	5242.09	439.57	2,304,265.50
S.No 25 /P-43	C-5.2	Laying floor of approved with glazed tile 1/4" thick in white cement 1:2 over 3/4" thick cement mortar 1:2 complete.including grouting with matching color and finishing	Sft.	1208.34	325.40	393,193.84
S.No 38 /P-45	C-5.3	Glazed tile dado 1/4" thick laid in pigment over 1:2 cement sand mortar 3/4" thick including finishing.including grouting with matching color and finishing	Sft.	3821.62	389.36	1,487,985.96
S.No 28(a) /P-46	C-5.3	Laying Afghan Ziarat white marble flooring fine dressed on the surface without winding set in lime mortar1:2 including rubbing and polishing of the joints. (a) 3/4" thick flooring.	P.Sft	14379.42	1058.78	15,224,642.31
S.No 61 /P-49	C-5.4	P/F 3/8" thick Marble Tiles of Approved Quality & Colour & Shade size 8"x4" or 6"x4" in dado Skirting & facing removal tucking of existung plaster surface etc.over 1/2" thick base of cement mortor 1:3 setting of tile in slurry of white cement over motor base I/c filling & joints &washing the tile with white cement slurry curent finishing cleaning & polishing etc, complete (New Work)	P.Sft	1157.33	247.28	286,184.56
TOTAL COST						19,696,272.17
10% BELOW AS PER NOTIFICATION DATED:24-10-2024						1,969,627.22
SUB TOTAL COST						17,726,644.95
SECTION -6 CARPENTRY AND JOINERY						
S.No 7 /P-58	C-6.1	Fist class deodar wood wrought, joinery in doors and windows etc, fixxed in position including chowkats hold fasts hinges, iron tower bolts, chocks cleats, handles and cords with hooks, etc. (3130.83-1233.27=1897.56)	Sft	1572.00	1897.56	2,982,964.32
S.No 29 /P-93	C-6.2	Providing and fixing G.I frames /Choukhats of size 7" x 2" or 4 1/2" x 3" for door using 20 gauge G.I sheet I/c welded hinges and fixing at site with necessary hold fasts, filling with cement sand slurry of ratio 1:6 and repairing the jambs. The cost also i/c all carriage , tools and plants used in making and fixing.	P.Rft.	1092.50	690.67	754,556.98
S.No 83 (B) /P-83	C-6.3	Supplying & fixing in position Aluminum channels framing for hinged doors or made with 5 mm thick tinted glass glazing (Belgium) and Alpha (Japan) locks I/c handles, stoppers etc.. (b) Deluxe model (Bronze).	Sft	0.00	1656.14	0.00

Sl. No. / NSI	Item no	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)
S.No 84 /P-108	C-6.4	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.b) Deluxe model (Bronze).	Sft	1392.00	2,386.73	3,322,328.16
S.No 89 /P-84	C-6.5	Providing & Fixing railing for curtains I/c fixed in wall with clips screwed in gitties etc. complete.	Rft	267.00	395.27	105,537.09
S.No 21 /P-60	C-6.6	Providing and fixing approved quality mortice lock.	Each	56.00	2,049.84	114,791.04
S.No 26 /P-93	C-6.7	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).	Sft	1116.00	1,124.10	1,254,495.60
TOTAL COST						8,534,673.19
10% BELOW ON ITEM 6.1, 6.3 and 6.4 AS PER NOTIFICATION DATED:24-10-2024						630,529.25
SUB TOTAL COST						7,904,143.94
SECTION -7 MISCELLANEOUS						
S.No 14 /P-26	C-7.1	Reinforced cement concrete spout including fixing in position 24" x 16" x 2.5"	No,s	20.00	2446.26	48,925.20
S.No 86 /P-110	C-7.2	Providing and fixing stainless steel nickle coated stair case railing of 3-1/2" consisting of horizontal 2-1/2"x21/2"at bottom and 1-1/2"x1-1/2" vertical tube 12" center to center and 3" steel tube with round ball as directed by engineer / incharge.	Sft	29.00	6598.80	191,365.20
S.No 88 /P-127	C-7.3	Providing and Fixing PVC Water stopper	Rft	50.00	2665.18	133,258.85
TOTAL COST						373,549.25
SUB TOTAL SCHEDHULE ITEM PART-C FIRST FLOOR						99,930,038.71
<u>NON SCHEDULE ITEM</u>						
SECTION -1 FACAD						
NSI	C-1.1	Providing & Fixing Machine made Guttea brick tiles facing 1-1/2" to 2" thick in cement marter 1:3 cement pointed in deep cut grooves and in any pattern as per direction of the Engineer including in any floor in any high.	Sft	32038.02		
SECTION -2 FLOOR FINISHES						
NSI	C-2.1	Providing and laying, 50 mm thick Granolithic floor in panels of 6'x6', such that concreting of ratio 1:2:4 will be done for 38mm and spreading 12mm mortar (1:2 1 cement 2 gravel) on top of green concrete including curing of floor etc complete. Grinding using machine will be done to make the surface smooth after curing etc complete.	Sq.ft.	1800.00		
NSI	C-2.2	Providing and laying, 13 mm thick Granolithic skirting such that concreting (ratio 1:2) will be done for 13mm thickness for skirting. including curing and making the surface smooth of skirting etc complete.	Sq.ft.	180.00		
NSI	C-2.3	Providing and laying approved Quality Marble slab polished Required Size Steps on laid over 3/4 inch (20 mm) thick cement mortar 1:2 setting the tiles with Bound over cement mortar, jointing to tiles with joint filler of approved quality as per direction of the Engineer incharge.	Sft	336.00		
NSI	C-2.4	Providing and laying approved Marble slab polished Required Size on Riser laid over 1/2 inch (12 mm) thick cement mortar 1:2 setting the tiles with Bound over cement mortar, jointing to tiles with joint filler of approved quality as per direction of the Engineer incharge.	Sft	192.00		

Sl. No. / NSI	Item no	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)
NSI	C-2.5	Providing and laying approved Marble slab Required Size on counter tops/Venety laid over 3/4 inch (20 mm) thick cement mortar 1:2 setting the tiles with Bound over cement mortar and nosing including curing, etc.complete (Imported origin China, Italy or equivalent) all as specified.& Instruction by engineer in charge	Sft	4861.31		
SECTION -3 FALSE CEILING						
NSI	C-3.1	Providing and fixing of Gypsum board false ceiling (Elephant brand or as approved equivalent) as per approved design , 1/2" thick, including hanging arrangement supported including matt enamel paint finish of ICI make and as directed by the Architect/Engineer incharge.	Sft	1126.13		
SECTION - 5 ROOFING & WATERPROOFING						
NSI	C-5.1	Water proofing treatment on roof slabs comprising hot bitumen coat ,2" (50mm) thick thermopore Sheet, Chicken Mesh Jali & 2" thick (1:2:4) PCC including surface finishing & dividing in panels complete in all respects as approved by the Engineer Incharge.	Sft	51583.59		
SECTION -6 MISCELLANEOUS						
NSI	C-6.1	Providing and fixing 2" thick thermopore sheet cavity wall.complete as per instruction of the Engineer-in-Charg.	Sft	6801.68		
NSI	C-6.2	Supplying & fixing inposition Aluminium channels framing for glass partition partially forested glass made with 5 mm thick tempered glass including all necessary accessories as specified & as per instruction of engineer in charge.	Sft	284.63		
SUB TOTAL NON SCHEDULE ITEM PART-C FIRST FLOOR						

BILL OF QUANTITIES
CONSTRUCTION OF BUILDING FOR THE DEPARTMENT OF MECHANICAL ENGINEERING AT THAR
INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY (First Floor - Adl. Work)
AT
THARPARKAR

PLUMBING WORK

Ref. No. / NSI	Item no	Description	Unit	TOTAL		
				Qty	Rate (Rs.)	Amount (Rs.)
PART-C FIRST FLOOR						
SCHEDULE ITEM						
SECTION -1 SANITARY FIXTURES AND FITTINGS						
S.I. No.23/P-189	C-1.1	Providing and fixing in position nylon connection complete with " dia brass stop cock with pair of brass nuts and lining jointed to nylon connection.	Each	54.00	637.65	34,433.10
S.I. No.19A/P-199	C-1.2	Providing & fixing C.P muslim shower with double bib cock & ring pipe .	Each	23.00	5475.6	125,938.80
S.I. No.19A/P-188	C-1.3	Providing and fixing steel sinks stainless local bt make complete with cast iron or wrought iron LINA ALVH brackets 6 inches built into wall, 1- 1/2" rubber plug and chrome plated brass chain 1- 1/2" C.P. brass waste wwith 1-1/2" P.V.C. waste pipe & making requisite number of holes in walls, plinth & floor for pipe connection & making good in cement concrete 1:2:4. Steel Sink stainless size 40"x20" local make (standard patteren)	Each	2.00	12,555.27	25,110.54
S.I. No.4A/P-190	C-1.4	Providing & fixing 15"x12" bavelled edge mirror of Belgium glass completed with 1/8" thick hard and C.P. screws fixed to wooden cleats (Standard quality).	Each	14.00	2,340.00	32,760.00
S.I. No.1b/P-190	C-1.5	Providing & fixing chrome plated brass towel rail complete with brackets fixing on wooden cleats with 1" long c.p brass screws. (I) Towel rail 36" long (b) 3/4" dia round or square (Superior quality).	Each	14.00	3285.07	45,990.98
S.I. No.14A/P-198	C-1.6	(a) Supplying & Fixing wash basin mixture of superior quality with C.P head 1/2" dia	Each	14.00	3135.6	43,898.40
S.I. No.23/P-199	C-1.7	Supplying & Fixing bath room accessories set (7 Piece) i/c towel rod , brush holder , soaptray,shelf of approved design i/c cost of screw nuts etc complete .(Master Brand)	Each	1.00	14,320.80	14,320.80
S.I. No.16A/P-199	C-1.8	(a) Supplying & Fixing swan type pillar cock of Superior quality single c.p. head 1/2" dia.	Each	5.00	1029.6	5,148.00
SECTION -2 VALVES						
S.I. No.6/P-198	C-2.1	Providing and Fixing ball valves with Plastic Ball & Seat				
	a	1" dia	Each	13.00	1322.1	17,187.30
	b	1-1/2" dia	Each	9.00	1439.1	12,951.90
	c	2" dia.	Each	10.00	1614.6	16,146.00
SUB TOTAL SCHEDHULE ITEM PART-C FIRST FLOOR						373,885.82
10% BELOW PREMIUM AS PER NOTIFICATION DATED:24-10-2024						37,388.58
TOTAL COST OF SCHEDULE ITEMS						336,497.24

NSI	Item no	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)
NON SCHEDULE ITEM						
SECTION -1 SANITARY FIXTURES AND FITTINGS						
NSI	C-1.1	Supply and fix, Wash Basin with pedestal, glazed ware, Imported (like Porta, Marchi or equivalent) in white / Ivory colour, one hole, complete with waste pipe coupling, CP chain and plug and pedestal etc (except mixer) best quality, fixed to concrete, brick, stone or wood work.	Each	2.00		
NSI	C-1.2	Supply and fix Pedestal less wash basin 75cm x 45cm of (like Porta, Marchi or equivalent) including all fitting accessories but excluding the cost of mixing tap etc complete.	Each	12.00		
NSI	C-1.3	Supply and fix, WC apparatus, European Pattern, complete (coupled set), comprising closet 13 lit flushing cistern glazed, in white colour, seat cover, complete set (like Porta, Marchi or equivalent) fixed to concrete, brick, stone or wood work, best quality, as per instruction of engineer in charge	Each	10.00		
NSI	C-1.4	Supply and fix, WC Asiatic pattern white colour including foot rest, full (like Porta, Marchi or equivalent) 13 lit flushing cistern, low down (plastic), flush pipe etc fixed to concrete, brick, stone, or wood work, best quality, as per instruction of engineer in charge	Each	16.00		
NSI	C-1.5	Providing & fixing S.S floor trap (Stainless Steel or approved by engineer in charge) with 110mm dia inlet and 110mm dia outlet of the approved self cleaning design with a Grating with or without a vent arm including cost of making requisite number of holes in walls plinth and floor for pipe connections and making good cement concrete 1:2:4.	Each	40.00		
NSI	C-1.6	Providing and fixing CP Soap tray of approved shape pattern and size, complete with plugs, screws etc complete and as per instructions of engineer in charge.	Each	14.00		
NSI	C-1.7	Providing and fixing C.P brass toilet paper holder of standard size with chrome plated brass brackets complete similar to two ford design superior quality.	Each	23.00		
SECTION -2 WATER SUPPLY PIPES AND FITTINGS						
NSI	C-2.1	Providing, laying, fixing, testing and disinfecting, polypropylene pipelines for cold and hot water supply as per DIN 8077/8078 PN-20 for pipe and DIN 16962 PN-25 for fittings or equivalent BS specification Dadex, Firat (Turkey make) or formul (Turkey make) make as approved by the Engineer Incharge complete in all respects to their entire satisfaction, including specials such as tee, cross, reducer, bend, union, elbow, plug, socket etc., supported on walls or suspended from slab or run in chases including supports, cutting and making good the same as necessary to the structure, excavation and backfilling in layers complete in all respects..				
		(a) 20mm (3/4") dia	Rft	50.00		
		(b) 25 mm (1")	Rft	228.67		
		c) 38mm (1-1/2") dia	Rft	108.00		
		d) 50mm (2") dia	Rft	1467.88		

NSI NO. / NSI	Item no	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)
SECTION -3 SOIL, WASTE AND VENT PIPES						
NSI	C-3.1	Providing and fixing upvc Soil and Waste Pipe with specials and clamps including fixing, cutting and fitting including the cost of breaking through walls and roofs etc complete and as per instructions of engineer in charge. 3 inches (75mm) dia (Dadex or equivalent)	Rft	222.58		
NSI	C-3.1	Providing and fixing upvc Soil and Waste Pipe with specials and clamps including fixing, cutting and fitting including the cost of breaking through walls and roofs etc complete and as per instructions of engineer in charge. 4 inches (110mm) dia (Dadex or equivalent)	Rft	294.67		
TOTAL NON SCHEDULE ITEM PART-C FIRST FLOOR						

PRICING PREAMBLES

- a) This Contract Document, consisting of Tender Specifications, Bill of Quantities and Tender Drawings are the property of A.A. Techno Engineers and shall be returned on the date of Tender submission even if the Contractor chooses not to participate in the Tender. Any reproduction or transmission of this Contract document without prior explicit approval of A.A. Techno Engineers is illegal and may be subject to legal action.
- b) All pages of the BoQ and specifications shall be signed and stamped by the authorized representative of the Contractor. Only the signed and stamped copy of the BoQ shall be entertained and considered part of the Contract. A soft copy of the BoQ shall be provided to facilitate the process of costing. Any change in the BoQ text from the original shall be deemed as breach of contract and liable for penalty.
- c) All items shall to be executed as per specifications, drawings, and as directed by the Consultant/Engineer, and shall confirm to the latest edition of the IEEE wiring regulations. Contractor shall test relevant installation to be witnessed by Electrical Consultant and or Client representative and provide all relevant test reports.
- d) Samples of all items including but not limited to shop drawings for DB's, raceways, back boxes, outlets for switch sockets and voice/data, cables etc., shall to be got approved by the Consultant / Engineer prior to installation.
- e) Any item not mentioned herein but necessary for the completion of works to the satisfaction of the owner/client shall be deemed to be part of the appropriate electrical works. Details of such works shall be submitted for Consultant/Engineer's approval before start of work.
- f) All works related to active IT equipment, including but not limited to provision of PRI, ISDN, POTS lines, installation and configuration of routers/switches etc., inter office /WAN connectivity, internet / remote / radio link etc. are not covered under the scope of this contract, unless specifically stated in the BoQ.
- g) NoC for all electrical works shall be obtained from relevant authorities before project handing over. Costs for obtaining approvals shall be quoted separately.
- h) Quotations shall be based on the approved equipment list / supplier. Deviations, if any, shall have to be got approved prior to installation works. Any discrepancy found shall be rectified / replaced at the cost of the contractor.
- i) Any conflict between the wiring standards and instructions as per drawings, specifications or Consultant instructions shall be immediately brought to the notice of the Consultant for appropriate consideration.
- j) Vendor's recommendation, if different from that specified in BoQ/Specifications shall be submitted for review and approval prior to equipment purchase.
- k) Contractor cost shall be inclusive of all applicable Govt. taxes.
- l) This BoQ is indicative of the item requirements and approximate quantities. Final cost of contract shall be determined upon verification of items and respective quantities installed on site. No price escalation or quantity variations shall be entertained. Contractor shall carefully review all drawings and develop his own quantity sheet and indicate any missing items in the designated section of the BoQ with all relevant details.
- m) All items quoted for against this Contract shall be new and of latest make /model. Any outdated, obsolete or end-of-life products shall be replaced with alternate models from the same manufacturer and gotten approved from the Client or his representative (Architect, Consultant) during the bidding process. The Client or his representative shall have the right to ask for replacement of any item, with similar or better specification, which is found faulty or substandard or is a subject of discrepancy not clarified during the bidding process. **All items shall be provided with min. 2 years warranty**
- n) In case of discrepancy between any BoQ item, Drawings or Specifications, it is the responsibility of the Contractor to bring it to the notice of the Engineer who shall be the sole authority to clarify the discrepancy, issue any resolution.
- o) BoQ shall be read in conjunction with all applicable / relevant specifications and drawings. In case of any ambiguity between the BoQ, specifications and drawings, the same is to be brought in the notice of the client / client's engineer who shall be the sole authority for conflict resolution
- p) All supply and installation items shall include delivery of equipment on site which may comprise of delivery on floor other than ground floor.
- q) **Quantities mentioned in the BoQ are approximate and may vary by +/- 15%. This variation will not affect the rates quoted by the prospective bidder**
- r) **Items with N/A mentioned against supply rates is to be considered as Owner Provided. Items for which rates are being solicited only have been labelled as N/A in the composite amount column**
- s) Contractor shall be responsible for engaging and reimbursing (3% of project electrical cost or as quoted by approved engineering company) for the services of a qualified and technically competent electrical engineer to top supervise the site and prepare and submit all necessary technical documentation as well as liaise with the project Consultant. Service charges for the engineer's engagement, site visits, inspection visits (including outstation visits minimum 4 with airfare, boarding and lodging), unless otherwise specified, shall be part of the items quoted in the BoQ

Summary of Cost

S.No.	Description	Amount (Rs.) Total
A	BASIC ELECTRICAL REQUIREMENTS	
B	BASIC ELECTRICAL MATERIAL & METHODS	
C	WIRING AND RACEWAY	
D	WIRING ACCESSORIES	
E	LIGHT FIXTURES	
F	SWITCHGEAR	
G	EARTHING SYSTEM	
H	STRUCTURED CABLING SYSTEM	
I	MISCELLANEOUS ITEMS	
J	UPS / STABILIZED POWER SYSTEM (Installation Only, Equipment Owner Provided)	
K	CONVENTIONAL FIRE ALARM SYSTEM	
L	PUBLIC ADDRESS SYSTEM (Not In Contract - Auditorium Sound System by Vendor)	
M	CCTV SYSTEM (IP)	
N	CATV SYSTEM	
O	STANDBY POWER GENERATOR SYSTEM (WIRING / INSTALLATION ONLY)	
	SUB-TOTAL (ELECTRICAL WORKS)	
	GST / Sindh Sales Tax (@ _____ %) [Contractor to fill in taxes as appropriate]	
	TOTAL COST OF ELECTRICAL WORKS	
	In Words: Rupees:	
		Contractor

Item No.	Description	Qty	Unit	Rate (Rs.)	Amount(Rs.)
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Notes:

a) See pricing preambles / General Instructions.

b) Contractor shall be responsible for managing all statutory regulations such as submission of WCR, Electrical Inspector Approval etc. (Refer BoQ Section A)

c) All items shall be provided with minimum 2 year warranty. 2nd year extended warranty (other than the default 1 year) shall be specified in a separate line item in the relevant section of BoQ

A BASIC ELECTRICAL REQUIREMENTSParticular Notes:

a) Contractor shall submit and get approved the (shop and interiam /final as-built) drawings on hard copy format prior to submission of final copies in soft and hard copy formats

- 1 Development and submission of Shop Drawings in AutoCAD format on non-erasible media(CD-R /DVD-R) and two hard copies (tracing+white paper) on appropriate paper size.

Note: This item does not relieve the contractor from submission of shop drawings for Distribution Boards, Low Current Systems etc.)

1

Job

- 2 Development and submission of As-built Drawings in AutoCAD format on non-erasible media(CD-R /DVD-R) and two hard copies (tracing+white paper) on appropriate paper size.

Note: This item does not relieve the contractor from submission of shop drawings for Distribution Boards, Low Current Systems etc.)

1

Job

- 3 Securing utility supply connection (approx. 120kW) from appropriate utility supply company (official charges / fee will be paid by the client on production of demand note etc on behalf of the client). Bidder to quote rates for services rendered, on behalf of the client, in obtaining contract load

1

Job

Rate Only

- 4 **Madatory:** Obtaining NoC / Approval from Electric Inspector for the facility excluding Standby Power Generation System (official inspection charges/fee will be paid by the client on production of demand note etc on behalf of the client)

1

Job

- 5 Providing and connecting up of temporary electricity lighting and power cabling (2 to 3 distribution points), including temporary main and sub distribution boards, site vide LED lighting and power cabling between main and sub distribution boards, complete in all respects. Contractor shall also be responsible for removal of all such equipment when no longer required on site

1

Job

Total Cost of Basic Electrical Requirements:**B BASIC ELECTRICAL MATERIAL & METHODS**Particular Notes:

a) See pricing preambles / General Instructions.

b) Separate back boxes shall be used for Emergency / UPS circuits for normal light / power wiring

c) Wiring shall be done with appropriate color codes as per latest edition of IEEE wiring regulations

c) **Wiring Accessories shall be based on Orange electric or Clipsal (C-Vivace equivalent), white**

Item No.	Description	Qty	Unit	Rate (Rs.)	Amount(Rs.)
1	Providing and fixing of following point wiring with single core PVC insulated 450/750 volt grade copper conductors, including green/yellow CPC (cream color for clean / isolated earth) in appropriate size class B PVC conduit rigid / flexible, clipped to the surface, or concealed in structure or in already-laid trunking, including cutting, chasing, making good and all accessories, 10A gang switch, fan dimmer, 2 way switch, bell push, ceiling rose, sheet steel back-box with earth terminal, fan hook, connectors etc., 1.0mmsq 3-core flexible PVC/PVC cord upto fixture etc. for:				
a)	DB / UPS-DB / LCP to switch / relay / dimmer / DLP (including wiring between switching units on same circuit) with 2x2.5mmsq conductors and 2.5mmsq CPC	48	Nos.		
b)	DB to light point with 2x4.0mmsq conductors and 4.0mmsq CPC (signage etc., (inclusive of wiring between DB -timer-signage)	1	No.		
c)	Light / exhaust / fan point to switch with 2x1.5mmsq conductors and 1.5mmsq CPC	88	Nos.		
d)	Same as item 1c above, but light point, from point to point	593	Nos.		
e)	Fixture to fixture with 3C x 1.0mmsq flexible conductors	45	Nos.		
f)	Non switched emergency light point wiring from DB to 1st light point with 3 core 1.5sqmm PH 60 fire retardant cable in appropriate size PVC conduit	24	Nos.		
g)	Same as item 1(e) above, but light point, from point to point.	272	Nos.		
2	Providing and fixing of switch socket-outlet point wiring with single core PVC insulated 450/750 volt grade copper conductors, including green/yellow CPC (cream color for clean / isolated earth) in appropriate size class B PVC conduit rigid / flexible, clipped to the surface, or concealed in structure or in already-laid trunking, including cutting, chasing, making good, sheet steel back-box with earth terminal, connectors etc., and all accessories, as follows:				
a)	From DB to 5A Round / 13A Universal switch socket outlet point with 2x2.5mmsq conductors and 2.5mmsq CPC	30	Nos.		
b)	Same as (a) above but, point to point with 2x2.5mmsq conductors and 2.5mmsq CPC	116	Nos.		
c)	From DB to 13A flat pin (simplex / duplex) / switch socket outlet point with 2x4 mmsq conductors + 4 mmsq isolated earth.	4	Nos.		
d)	Same as item (c) but, point to point with 2x2.5mmsq conductors and 2.5mmsq CPC	38	Nos.		
e)	5 / 13 adjacent outlet with 2x2.5mmsq conductors + 2.5mmsq CPC (isolated earth with 13A sockets)	138	Nos.		
f)	DB to 15 / 20A spur outlet point with 2x4.0mmsq conductors and 4.0mmsq CPC (hand drier, water heater, insect killer)	1	No.		
3	Providing and fixing of 20 amp isolator wiring for AC / ventilation fans/ Water Heater, including wiring between isolator and indoor unit with single core PVC insulated 450/750 volt grade copper conductors, including green/yellow CPC, in appropriate size class B PVC conduit rigid / flexible, clipped to the surface, or concealed in structure or in already-laid trunking, including cutting, chasing, making good, sheet steel back-box with earth terminal for isolator and all mounting accessories as follows:				
a)	From DB to 20A SPN isoator point with 3x4.0mmsq conductors	5	Nos.		
b)	From DB to 20A TPN isoator point with 5x4.0mmsq conductors	3	Nos.		

Item No.	Description	Qty	Unit	Rate (Rs.)	Amount(Rs.)
4	Providing and fixing of wiring for UPS / Data Center Rack power, with PVC insulated 450/750 volt grade copper conductors, including green/yellow CPC, in appropriate size class B PVC conduit rigid / flexible, clipped to the surface, or concealed in structure or in already-laid trunking, including cutting, chasing, making good, sheet steel back-box with earth terminal for isolator and all mounting accessories, as follows:-				
a)	From DB / CDB to UPS in/out isolator / industrial socket outlet point with 3x4.0mmsq conductors (rack power)		Nos.		
b)	From DB / CDB to UPS in/out isolator / industrial socket outlet point with 5x6.0mmsq conductors (UPS IN/OUT)	2	Nos.		Refer Wiring Section
Total Cost of Electrical Material and Methods:					

C WIRING & RACEWAYParticular Notes:

a) See pricing preambles / General Instructions.

Note: Cost of ceiling suspended conduits, pipes, cable tray etc. even if not explicitly stated shall be inclusive of threaded rods, nuts washer, steel base plate etc

WIRING (LV)

- 1 Supply, laying, connecting up and testing of non armoured / armoured cable 600/1000 V grade, in already laid raceway, including all fixing, jointing & termination accessories, designation labels at both ends etc., in the following sizes (Actual length of cable shall be measured at site by the contractor before placing the order with the manufacturer, however approximate length of cable are shown herewith)

a)	4C x 95mmsq Cu/PVC/PVC, [Incoming Cable r -MDB] - Termination Only		Job		
b)	4C x 95mmsq Cu/PVC/PVC, [Genset -MDB]		Rft.		
2	Supply, laying, connecting up and testing of PVC insulated 450/750V grade cable, in already laid raceway including all fixing, jointing & termination accessories, designation labels at both ends etc., in the following sizes: (Actual length of cable shall be measured at site by the contractor before placing the order with the manufacturer, however approximate length of cable are shown herewith)				
a)	4C x 4mmsq Cu/PVC/PVC, [MDB - DBLP-01]	1,230	Rft.		
b)	4C x 6mmsq Cu/PVC/PVC, [MDB - DBLP-05]	650	Rft.		
c)	4C x 10mmsq Cu/PVC/PVC, [MDB - DBLP-1F-05]	550	Rft.		
d)	1C x 10mmsq Cu/PVC/PVC (earthing cables)	550	Rft.		
e)	1C x 4mmsq Cu/PVC (earthing cables)	1,230	Rft.		
f)	1C x 6mmsq Cu/PVC (earthing cables)	650	Rft.		

RACEWAY

- 3 Supply, laying and installation of following PVC / GI / MS pipe to be recessed in walls / floors or clipped to surface, as required at site and as shown on the drawing including accessories steel pull wires, complete in all respects;

a)	60mmx60mm PVC channel (Adamjee Dura Duct or equivalent)	50	Rft.		
b)	50mm dia (class B)	55	Rft.		
c)	38~32mm dia (class B)	1,130	Rft.		

Item No.	Description	Qty	Unit	Rate (Rs.)	Amount(Rs.)
d)	25mm dia (class B)	25	Rft.		
4	Providing and laying of RCC / PVC raceway, buried 600mm below grade at road crossing, in already excavated soil, including spacers between pipes, sand (sieved) bedding (above and below pipes), back-filling, nylon pull rope, caution tape bends, boxes and all accessories etc. in the following sizes (internal dia):				
a)	100mm dia (class E) PVC		Rft.		
b)	50mm dia (class D) PVC		Rft.		
5	Excavation, soft sand bedding, back-filling, compacting, cable marking tape, accessories, etc. and all accessories in the following sizes;				
a)	300(w) x 600(d) mm		Rft.		
CABLE TRAY / TRUNKING / LADDER					
6	Supply, laying and installation of following 16 SWG, GI / enamel painted / HDGAF, non - perforated, sheet steel cable trunking complete with all installation accessories including GI slotted C-Channel base support of size 1-1/2"x1-1/2"x1/8", GI threaded rod of 1/2" dia, nuts, bolts etc., complete in all respects in the following sizes;				
a)	150mmx75mm, (Enamel painted GI) with solid cover	0	Rft.		
b)	200mmx75mm, (Enamel painted GI) with solid cover	70	Rft.		
Total Cost of Wiring and Raceways:					
D WIRING ACCESSORIES					
<u>Particular Notes:</u>					
a) See pricing preambles / General Instructions.					
c) Cost of industrial sockets shall be of complete set (male + female)					
c) Wiring Accessories shall be based on Orange electric or Clipsal (C-Vivace equivalent). white					
1	Providing and fixing following rating 250/500 volt switch socket outlet and all mounting accessories				
a)	3 pin, 13 Amp, 250 volt universal switch socket outlet	198	Nos.		
b)	3 pin, 13 Amp, flat pin, 250 volt switch socket outlet	190	Nos.		
c)	3 pin, 13 Amp, flat pin, 250 volt duplex switch socket outlet	0	No.		
d)	3 pin, 15 Amp, 250 volt switch socket outlet	12	Nos.		
e)	32A, SPN+E industrial socket outlet (Surface, flanged type) male - female set	1	No.		
f)	20 Amp, 250 volt, double pole isolator switch with neon indication (AC indoor, air curtain etc.)	0	No.		
g)	20 Amp, 250 volt, spur outlet for hand drier / insect killer / water heater	2	Nos.		
h)	Weatherproof cover for outdoor switches / sockets etc.	0	No.		
2	Providing and fixing following rating SP&N 250 / TP&N 500 volts weather proof load break switches / isolator, including weather proof sheet steel enclosure and all mounting accessories				
a)	20A, 250V, SP&N	3	Nos.		
b)	20A, 500V, TP&N	2	Nos.		

Item No.	Description	Qty	Unit	Rate (Rs.)	Amount(Rs.)
3	Providing and fixing following type 250 volts ceiling suspended, false ceiling mounted fan / exhaust fan, including all mounting accessories				
a)	56" dia ceiling suspended fan with 12" long rod	136	Nos.		
b)	18" dia Wall bracket fan		No.		
c)	8" dia exhaust fan (plastic)	2	Nos.		
4	Providing and fixing following type pull boxes in 16swg sheet steel with cover and knockouts for cable entry, including all mounting accessories etc. complete in all respects				
a)	12"x12" under floor sheet steel (Epoxy powder painted GI) pull box	10	Nos.		
b)	12"x12" ceiling mount PVC pull box	10	Nos.		
5	Providing and fixing floor boxes (Davis / Clopal / MK type) with hinged cover and provision for outlets (A, B, C types etc.)/ floor boxes, without socket outlets but including all mounting accessories etc. complete in all respects.				
a)	4 outlet floor box	91	Nos.		
6	Providing and fixing 16SWG (epoxy powder painted) sheet steel furniture boxes (technology box) with cover and provision for outlets (A, B, C types etc.)/ floor boxes, without socket outlets but including all mounting accessories etc. complete in all respects.				
a)	4 outlet furniture box	95	Nos.		
Total Cost of Wiring Accessories					

E LIGHT FIXTURESParticular Notes:

a) See pricing preambles / General Instructions.

b) Recessed type fixtures should be compatible with and fit exactly into the false ceiling. All suspended type fixtures shall be suspended with

c) Ballast shall be of electronic type as indicated

d) All light fixtures including emergency and exit lights shall be LED type

e) All lamps shall be warm white (4000K) unless otherwise stated or instructed by Architect / Consultant**f) All light fixtures shall be rated at minimum 35000 operating hours**

- 1 Providing and Fixing of following light fixtures as per fixture schedule or equivalent light fixture as approved by consultant installed on surface or on false ceiling or pendant mounted, with all accessories such as lamps, lamp holders, ballast, starters, capacitors, LED drivers as applicable, etc. and all relevant installation material as approved by the Engineer, complete in all respects

a)	Fixture type "A": Linear LED Ceiling suspended 43W fixture including suspension rod	238	Nos.		
b)	Fixture type "B": Surface / Recessed type COB LED spotlight fixture including 10W LED lamp (warm white)	194	Nos.		
c)	Fixture type "C" LED batten fitting fixture 15 Watt	86	Nos.		
d)	Fixture type "D" LED weather proof wall light 40 watt	28	Nos.		

Total Cost of Light Fixtures:

Item No.	Description	Qty	Unit	Rate (Rs.)	Amount(Rs.)
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F SWITCHGEARParticular Notes:

a) See pricing preambles / General Instructions.

b) Short-circuit ratings to IEC 947-2, Icu/Ics at 400V

c) All components (ELCBs, Contactors etc.) are to be provided with backup protection

d) DBs of incoming size 100A or less may be provided with cascading

e) Contractor shall be responsible for factory testing of all DB's in the presence of Consultant. All costs for factory testing shall be included in the cost of DB's

- 1 Supply, installing, testing & commissioning of following distribution boards (made of 16 SWG sheet steel) with hinged doors and locks, including bus bars of tin plated copper conductor for phases, neutral and ground, of short circuit rating as mentioned below and all TP MCCBs shall also have minimum ultimate interrupting capacities (Icu) as mentioned in the drawings.

Note: The contractor shall take the dimensions of the site, prepare the shop drawing of DB / Panel and approval from the Consultant before manufacturing. Maximum current density of each Phase, Neutral and Earth bus bar shall not be more than 1.5 Amp per sq. mm

a) DBLP-1F-01 (surface mounted, indoor type)	1	No.		
b) DBLP-1F-02 (surface mounted, indoor type)	1	No.		
c) DBLP-1F-03 (surface mounted, indoor type)	1	No.		
d) DBLP-1F-04 (surface mounted, indoor type)	1	No.		
e) DBLP-1F-05 (surface mounted, indoor type)	1	No.		
f) EDB-1F-01 (surface mounted, indoor type)	1	No.		
g) EDB-1F-02 (surface mounted, indoor type)	1	No.		
h) EDB-1F-03 (surface mounted, indoor type)	1	No.		
i) EDB-1F-04 (surface mounted, indoor type)	1	No.		
j) EDB-1F-05 (surface mounted, indoor type)	1	No.		

Total Cost of Switchgear:**G EARTHING SYSTEM**Particular Notes:

a) See pricing preambles / General Instructions.

b) All earth pits shall be individually tested for value ≤ 1 Ohm.

- 1 Providing, fixing and commissioning of following earth pits with earth leads in 50mm GI pipe up to and including 4"x1"x1/4" earth test point, CC inspection chamber, charcoal lime mixture / green earth chemical, all accessories, medium duty C.I. Cover etc.

Note: Multiple earthing or machine boring for adequate depth shall be considered to ensure earth resistance value does not exceed 1 ohm.

a) Rod type earthing with 19/20mm dia copper clad steel electrode, 3 m long, connected with 2x25mmsq bare copper conductors from earth rod to earth test point in pit		No.		
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Item No.	Description	Qty	Unit	Rate (Rs.)	Amount(Rs.)
B)	Plate type earthing with 600 x 600 mm copper plate connected with 2x25mmsq bare copper conductors from earth plate to earth test point in pit		No.		
2	Providing, fixing and commissioning of earth test point at various locations, including isolators, nuts bolts washers and all mounting accessories with green colored heat shrink sleeves, as follows;				
a)	Providing and fixing of tinned copper earth bar 12" long, 1" wide and ½" thick in Electric closet for system / genset earthing etc.	2	Nos.		
b)	Providing and fixing of tinned copper earth bar 8" long, 1" wide and ½" thick in Server and UPS Rooms for rack earthing.		No.		
3	Equipotential bonding of all DB's racks, UPS, etc with 1C x 4 sqmm Cu/PVC cable connected to nearest earth test point including lugs, washers bolts etc. complete in all respects. Cable already covered in other section. Only services to be considered	1	Job.		
4	Testing and commissioning of the entire earthing system and making necessary rectifications to achieve the necessary results (<=1 ohm).		Job.		
Total Cost of Earthing System					

H STRUCTURED CABLING SYSTEMParticular Notes:

a) See pricing preambles / General Instructions.

b) All components, materials and equipment shall meet or exceed the relevant Category requirements of EIA/TIA Standard 568A/B)

c) Contractor shall coordinate and follow recommendations of Voice / Data equipment supplier

d) Wiring Accessories shall be based on Orange electric or Clipsal (C-Vivace equivalent). whiteDATA NETWORK

1	Providing and fixing of following type of wiring with 4 pair cable in appropriate size class B PVC conduit rigid / flexible, clipped to the surface, or concealed in structure or in already-laid trunking, including cutting, chasing, making good, including termination at both ends, sheet steel back-box etc. complete in all respects as follows;				
a)	Cat6 LSOH UTP cable (plenum rated) from Data Patch Panel to Cat6 RJ45 outlet (23 AWG)	150	Nos.		
2	Providing and fixing of following Imported (velocity / Concord / Vivanco) wall mounted / floor standing IT Rack (50% of the cabinet space shall be kept empty to install active networking hardware). including cage nuts and all mounting accessories.				
a)	MDF-DC, 42-U floor mounted Data Rack (600mmx800mm) with mesh front door including 1 Fan tray, 2 fixed tray		No.		
b)	IDF-GF, 19U wall mounted network Rack (600mmx600mm) with glass front door including 1 Fan tray, 1 fixed tray		No.		
c)	IDF-1F 19-U wall mounted Data Rack (600mmx600mm) with glass front door including 1 Fan tray, 1 fixed tray	1	No.		
3	Providing, fixing and connecting up of following type multiport (RJ45) jack modular patch panels including sleeve type labelling and all mounting accessories etc. complete in all respects				

Item No.	Description	Qty	Unit	Rate (Rs.)	Amount(Rs.)
a)	Cat6, 24 Port (all loaded ports) Patch Panel, including rear cable mangement	14	Nos.		
b)	Front Cable Management	1	No.		
c)	Blanking panels 1U	1	No.		
4	Providing and fixing of following type shuttered communication outlet including face plate matching with adjecnt switch socket outlet with sleeve type labelling, identification tags and all accessories etc. complete in all respects.				
a)	Single Port, Cat6 UTP RJ45 outlet	110	Nos.		
b)	Dual Port, Cat6 UTP RJ45 outlet	100	Nos.		
5	Providing and connecting up of factory made Cat6 patch cords (non-plenum) with RJ45/RJ45 plugs as follows;				
a)	0.6 m long	30	Nos.		
b)	1.0 m long	40	Nos.		
6	Providing and connecting up of factory made Cat6 drop cords (non-plenum) with RJ45/RJ45 plugs as follows;				
a)	3.0 m long	45	Nos.		
7	Supply, installation and connecting up of folowing Rack mount PDU strip				
a)	Non metered 4/5 way PDU strip	2	Nos.		
8	Testing and Commissioning, including labelling of Data / Voice network and providing owner/consultant witnessed fluke test report (two copies, bounded) etc. complete in all respects.	1	Job.		
<u>VOICE NETWORK</u>					
9	Providing and fixing of following type of wiring in already laid raceway including termination at both ends, sheet steel back-box, and all accessories etc. complete in all respects as follows;				
a)	5 pair Cat5e cable from Mall PTCL Cabinet to DeMarc block / TJB [Length mentioned is approximate only. Exact length to be confirmed as per site]		Rft.		
b)	5 pair Cat5e cable from PABX - TJB	100	Rft.		
10	Providing and fixing of following type of TJB / Main Cross Connect / MDF / IDF including wheather resistant sheet steel / PVC back-box, and all accessories etc. complete in all respects as follows;				
b)	TJB 30 pair (110 type IDC wiring blocks) wall mounted (PVC enclosure)	1	No.		
c)	05 pair building entrance protector (gas tube based) installed in TJB-Guard (Mandatory requirement)		No.		
11	Providing and connecting up of factory made patch cords (non-plenum) as follows;				
a)	2 pair Cat5e 110-110 type plugs, 0.6m	40	No.		
b)	4 pair Cat5e 110-RJ45 type	40	No.		

Item No.	Description	Qty	Unit	Rate (Rs.)	Amount(Rs.)
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- 12 Supply, Installation, fixing and commissioning of following PABX and accessories, including cable termination at PABX and Main Cross Connect / MDF / IDF and all mounting accessories etc. complete in all respects as follows

a) VOIP PABX (Owner Provided)	1	No.		Rate Only
b) Executives VOIP phone set with POE injectors (Owner Provided)	1	No.		
c) Users VOIP phone set with POE injectors (Owner Provided)	10	Nos.		

- 13 Testing commissioning and labelling of the entire voice system including coordinating with PABX vendor for schematic drawings, and submission of owner/consultant witnessed test report (two copies, bounded) etc. complete in all respects

Job.

Total Cost of Structured Cabling System:**I MISCELLANEOUS ITEMS**Particular Notes:

a) See pricing preambles / General Instructions.

- 1 Providing, fixing and connecting up of wall/ceiling mounted insect killer fixture (INSECT-O-CUTOR-CG22) or approved equivalent attraction circumference 360° complete with all accessories etc.

1

No.

- 2 Supply, installation and connecting up of Hand Drier (Siemens, World Dryer or approved equivalent)

1

No.

- 3 Providing, fixing, configuring and testing of following sizes television with RJ-45, HDMI, RG-6 (RF), USB and RCA input, including mounting brackets etc. complete in all respects

- a) 43" LED TV (4K, smart TV) [Samsung Series 7 or equivalent]

1

No.

- b) 55" LED (4K, smart TV) [Samsung Series 7 or equivalent]

1

No.

- 5 Providing, laying and fixing following cables laid in appropriate size conduit in raceway including all mounting accessories etc. complete in all respects,

- a) HDMI cables with appropriate plugs/connectors from wall mount screen/TV to floor box (+/- 25 rft)

2

Nos.

- 6 Providing, fixing and connecting up of 25 mtr HDMI over Cat6 range extender (Tx + Rx set with adaptors) including connecting HDMI cables and mounting accessories, from IT Rack to TV outlets

2

Nos

- 7 Providing, fixing and connecting up of HDMI Splitter (1 in 4 out), including power supply, weather resistant PVC housing and all mounting accessories complete in all respects

2

Nos

Total Cost of Miscellaneous items**J UPS / STABILIZED POWER SYSTEM**Particular Notes:

a) See pricing preambles / General Instructions.

- 1 Supply, Installation, fixing and commissioning of following rating Uninterruptible Power Supply (UPS) system, with minimum backup time of 15 minutes on 100% load with maintenance free lead acid batteries, including all mounting accessories etc. complete in all

- a) 40 kVA 3~in/3~out floor mount UPS (floor UPS)

No.

- b) 10 kVA 1~in/1~out floor mount UPS (floor UPS)

No.

Total Cost of UPS / Stabilized Power System:

Item No.	Description	Qty	Unit	Rate (Rs.)	Amount(Rs.)
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K CONVENTIONAL FIRE ALARM SYSTEMParticular Notes:

a) See pricing preambles / General Instructions.

b) FACP shall have capability to be connected to the building BMS and /or provide appropriate signal to turn off central airconditioning and / or dedicated air-conditioning system

c) 2 complete sets of Manufacturers recommended Operations and Maintenance manuals shall be submitted prior to commissioning of the system

d) Important: Contractor to review FA System Schematic Diagram before quoting.

- 1 Providing and fixing of following wiring for fire alarm system components with 2Cx1.5mmsq shielded PH 30 (30min) fire resistant cable, installed in appropriate size conduit (concealed PVC or surface mounted anti corrosive painted 16 S.W.G. MS), complete with all accessories, as follows:

a) Wiring from / to FACP to manual break glass/smoke/heat detector/electronic sounder

1

No

b) Same as item 1a but from initiating / indicating device to device

25

Nos

- 2 Providing, fixing and connecting up of following Fire Alarm Control Panel (FACP) / Repeater Panel (RP), including termination, complete with all features and accessories etc., complete in all respects

a) Fire Alarm repeater Panel

1

No

- 3 Providing, fixing & connecting up of following detectors, with base (with built-in loop isolator), including EOL resistors / Line Isolators, termination and all accessories complete in all respects.

a) Conventional Photoelectric smoke detector

15

Nos

b) Conventional Heat detector (rate of rise + fixed temp type)

2

Nos

c) Conventional multi detector (smoke + heat)

0

No

d) Conventional Manual 'break glass station (resettable type)

2

Nos

e) Electronic Sounder (>100dB) with strobe

2

Nos

f) I/O Module for connectivity with main FACP or other ELV systems etc

1

No

- 4 Providing, fixing and commissioning of any additional component required to integrate facility FACP with Access Control System, Intruder Alarm Controller, complete in all respects

1

Job

Rate Only

- 5 Testing and commissioning of the entire fire alarm system including system certification from Principle and training of owner representative, complete in all respects

1

Job

Total Cost of Fire Alarm System:**L PUBLIC ADDRESS SYSTEM (NOT IN CONTRACT) [By Specialist Vendor]**Particular Notes:

a) See pricing preambles / General Instructions.

b) PA system shall be compatible with any existing sound system components and Building BMS or I/O Module .**c) Quotation shall be inclusive of all interconnecting wiring between any existing and new equipment.**

d) PA shall have capability to be connected to the building FACP / BMS and /or provide appropriate sound / alert sound for the entire building (if required)

Item No.	Description	Qty	Unit	Rate (Rs.)	Amount(Rs.)
	e) The sound system shall be gotten checked and verified from the architect/Consultant before installing.				
	f) 2 complete sets of Manufacturers recommended Operations and Maintenance manuals shall be submitted prior to comissioning of the system				
1	Wiring of background / PA / music system with 3x2.5sq.mm FR (PH-120 rated) cable in appropriate size PVC conduit rigid / flexible, clipped to the surface, or concealed in structure or in already-laid trunking, including cutting, chasing, making good, connectors etc., and all accessories, including termination and labelling at both ends, etc., complete in all respects.(Belden speaker cable FR rated or equivalent)				
	a) Zone wiring from amplifier to speaker / volume controler / attenuator and attenuator to attenuator		No		
	b) Same as item 1a but from VC - VC		No		
	c) VC / Speaker to Speaker with 2x1.5 sqmm cable		No		
	d) Amplifier / VC to EN-54 Speaker / Speaker with 2x1.5 sqmm		No		
	e) Wiring for microphone outlet / jack to amplifer with flexible screened cable (2.5sqmm equivalent)		Rft		
2	Supply, installation and connecting up of following mixer amplifier / PA System Components including all mounting accessories etc. complete in all respects				
	a) 70W 2 Zone Mixer Amplifier with built in MP3 player and VC override capability with priority input from MALL PA System		No.		
	B) 30W Volume control		No.		
	c) Table type Microphone including cable cord, batteries, etc, complete in all respects.		No.		
	d) 6W ceiling mounted speakers with tapping type transformer.		No.		
3	Programming, Comissioning and Testing of the entire audio system, including coordinating with vendor for PA system for shop drawings, installation supervision.		Job.		
Total Cost of Public Address System:					

M C.C.T.V. SYSTEM (IP)Particular Notes:

a) See pricing preambles / General Instructions.

b) Video retention to be min 45 day at 25fps, HDD capacity to be configured accordingly

- 1 Wiring for CCTV System from camera to recording equipment in Server / Security room with following / manufacturers recommended cable in appropriate size PVC conduit including all accessories etc. complete in all respects.

a) From IP camera to appropriate floor patch panel in IT Rack (MDF / IDF) with Cat 6 UTP LSZH cable (23 AWG)

140

Nos

Cabling already covered in "Structured Cabling" section

- 2 Providing, fixing and connecting up of following CCTV Cameras Including mounting and all accessories, complete in all respects.

a) 4 MP (smoked dome type) IP Camera [cameras to be project series and not commercial series)

6

Nos

Item No.	Description	Qty	Unit	Rate (Rs.)	Amount(Rs.)
b) 4 MP (bullet type) outdoor IP Camera with bracket and all mounting accessories [cameras to be project series and not commercial series]		1	No		
3	Providing, fixing and connecting up of NVR (raid capable) 16CH with recording of atleast 30 days for the above mentioned cameras also having frame rate and other specifications as mentioned on the drawing or instructed by the consultant, including system configuration and licenses for 3 concurrent sessions. (2x8TB HDD or higher as per recording requirement)	1	No		
4	Providing and fixing of 24 port POE switch, including system configuration etc. complete in all respects	1	No		
5	Providing, fixing and connecting up of 21" LCD Monitor at reception and / or security desk complete in all respects.		No		
6	Testing and Commissioning of CCTV system including training of owner's personnel in the operation and maintenance of the equipment (All operation and maintenance manuals shall be submitted in triplicate).	1	Job		
Total Cost of IP C.C.T.V. System:					

O C.A.T.V. SYSTEMParticular Notes:

a) See pricing preambles / General Instructions.

- 1 Wiring of following television antenna tv system with RG-6 copper cable in appropriate size class B PVC conduit rigid / flexible, clipped to the surface, or concealed in structure or in already-laid trunking, including cutting, chasing, making good, sheet steel back-box for isolator and all mounting accessories as follows

a) From Dish / incoming service provider tap-off to splitter	100	Rft.		
b) TV point from splitter to television outlet	2	Nos		
2 Providing, fixing and connecting up of following CATV components, including mounting and all accessories, complete in all respects.				
a) 4 Way active splitter / amplifier (active splitter)	1	No		
b) TV Antenna outlet	0	No		
c) 12" x 12" x 5" recessed type locable sheet steel enclosure M-TVJB for mounting active splitter (refer item a above)	0	No		

Total Cost of C.A.T.V. System:**P STANDBY GENERATOR WORKS**Particular Notes:

a) See pricing preambles / General Instructions.

b) Shop drawings for genset foundation as required to be made, control panel, day tank and piping etc., shall be submitted and got approved by the Consultant / Engineer upon confirmation of contract and prior to installation.

c) Tenderer shall inform of any other implied work not mentioned below but necessary to make the standby power system completely operation. Details of all such works to be submitted prior to installation.

d) Tenderer shall submit list of spare parts as mentioned in relevant items below along with the tender document

Item No.	Description	Qty	Unit	Rate (Rs.)	Amount(Rs.)
	e) Any required civil works requested below may be got done by civil works contractor. Electrical Contractor shall however coordinate all related activities.				
1	Providing, installing and commissioning of 3 phase, 4 wire, 50Hz, 1500 RPM, 300 kVA continous rating LV D.G. Set (G1) , including weather proof acoustic canopy 85dB(A) @1 mtr, residential silencer, 100A (Adj), TP MCCB, control panel and all control wiring between D.G. Set and Main LV Panel, and all accessories, etc., complete in all respects. Note: Generator shall be placed on ground floor as per site conditions	1	No.		
2	Providing, laying, terminalton, testing and commissioning of control cabling with vendor recommended cable, from generators G1 (roof) up to Main LV panel (ground floor) in appropriate size class D PVC conduit, including labelling tags, and all installation and mounting accessories, complete in all respects	1	Job		
3	Testing & Commissioning of Generator including POL for 4 hour on-site testing of each generator. Note: This item does not relieve the contractor / generator supplier from getting factory inspection / load testing of generator done within the quoted cost of generator	1	Job		
4	Supply, installation, testing and commissioning of schedule 40 seamless piping up to generator G1 for auto refuelling of genset day tank) including fuel pump, liquid level controller, valves, control wiring in GI pipe, etc. complete in all respects	1	Job		
5	Providing and fixing of generator foundation pads for genset as per manufacturer recommendations, including sand/gravel around foundation pad and all allied material, complete in all respects.	1	Job		Rate Only
6	Providing, installing and commissioning of 3 phase, 4 wire, energy meter in appropriate size weather proof, sheet sheet lockable enclosure with CT's, including wiring between main LT Panel and Genset meter DB, including all mounting accessories etc. complete in all respects. Genset meter DB shall be mounted near main LT panel	1	No.		Rate Only
7	Approval from Electric Inspector / Explosives inspector for entire Standby Power Generation System (official inspection charges/fee will be paid separately upon production of receipt, in addition to price quoted above).	1	Job		Rate Only
8	Any other item not mentioned above, but required for the satisfactory installation and comissioning of the genset (Tenderer to submit details of such items along with the tender)	1	Job		
Total Cost of Standby Generator Works					

LIST OF APPROVED MANUFACTURERS / SUPPLIERS OF ELECTRICAL EQUIPMENT

*** All Equipment shall be procured from Principal Authorized agents / distributors / resellers**

The Bidder shall fill name of only one manufacturer for each equipment/material on which the tender is based. He shall be bound to supply the equipment from the same manufacturer. In case, the Bidder gives names of more than one manufacturer against any equipment, the Engineer / Owner can ask the Bidder supply the equipment from any one of them.

At the evaluation stage if it is noted that any material offered by the bidder does not meet the specification requirements, the Engineer / Owner reserves the right to ask the bidder to replace his choice of equipment supplier meeting the required quality and specification requirement.

During the execution stage if the material from any supplier is found defective / substandard the Engineer / Owner reserves the right to ask the successful bidder to replace his choice of manufacturer / supplier for that particular equipment.

Any change in manufacturer / supplier shall only be entertained if there is sufficient reason that adhering to the original choice of manufacturer / supplier shall be detrimental to either the project quality or project timeline. Proper approval shall have to be sought for change in the chosen manufacturer / supplier at least 1 month before the equipment is to be procured.

Samples of all equipments shall have to be got approved prior to their procurement. The bidder has to sign and stamp all pages of this list. Any deviation from the BoQ / Specification shall be listed in a separate sheet to be labeled as Annexure-1 containing the details of the deviation including the deviating BoQ item number. The contractor shall also provide the letter of authenticity.

S.No	Item	Manufacturer / Supplier	Country of Origin	Contact Information
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(Chosen Vendor to be highlighted by the Bidder)

L.V. Products

-	Low Voltage Switchboards and Distribution Boards	: Zman Engineering	Pakistan	Hussain	03360874574
		Taj Engineering	Pakistan	Abdullah	03312496291
		Smart Engineering	Pakistan	Ali Asghar	03075553945
		Almadina Engineering	Pakistan	Pervez	03313563715
-	Circuit Breakers (ACB, MCCB, ELCB, MCB)	: ABB	Germany		
		Siemens	Germany		
		Schneider Electric	France		
		or approved equivalent			
-	Contactors	: Schneider Electric	France		
		Fuji	Japan		
		Siemens, ABB	Germany		
		or approved equivalent			
-	Load Break / Changeover / Switches (Selector Switches)	: Socomec	France		
		Kraus & Naimer	Newzeland		
		Breter	Italy		
		Schneider Electric	France		

LIST OF APPROVED MANUFACTURERS / SUPPLIERS OF ELECTRICAL EQUIPMENT

*** All Equipment shall be procured from Principal Authorized agents / distributors / resellers**

- Push Buttons / Switches Etc.	: Schneider Electric Maruyasa or approved equivalent	France Japan		
- LV Cables & Wires	: Pakistan Cables Newage Cables Fast Cables	Pakistan Pakistan Pakistan	Faysal Adnan Sameen	03333156065 03008230970 03217420061
- Analog & Digital Meters (Voltmeter, Ammeter,	: Autonics ABB Schneider Electric Lovato or approved equivalent	Korea Germany France Italy		
- C.T. / P.T.	: Fico Circutor or approved equivalent	Pakistan Spain		
- Relays	: Finder Samwha Emirel Schneider Electric or approved equivalent	Italy Korea Italy France		
- Timers (with base)	: Nias Samwha Fotek or approved equivalent	Japan Korea		
- Cable Glands, Lugs, accessories, etc	: Cembre Hubbell / Hawke or approved equivalent	USA USA	Britlite	03201214321
- PVC / uPVC Conduits &	: Galco Civic Jeddah Polymer	Pakistan Pakistan Pakistan		
- G.I. / Steel Conduits &	: IIL Steelex Hilal Industrial or approved equivalent	Pakistan Pakistan Pakistan		
- Back Box, Pull Box, Junction Floor box	: Ezzi Engineering MK Hussain & Co. Electroline Davis / Clipsal or approved equivalent	Pakistan Pakistan Pakistan Pakistan Australia		03080919053
- Switch & Socket Outlets	: Clipsal	Australia		

LIST OF APPROVED MANUFACTURERS / SUPPLIERS OF ELECTRICAL EQUIPMENT

*** All Equipment shall be procured from Principal Authorized agents / distributors / resellers**

	MK	UK
	Legrand	UK
	ABB	Germany
	or approved equivalent	
- Fan & Accessories (ceiling, pedestal, exhaust)	: Pak Fan	Pakistan
	Millat Fan	Pakistan
	Royal Fan	Pakistan
	GFC Fan	Pakistan
	or approved equivalent	
- Lighting Fixtures (Min. 35000 hrs)	: Future Technologies	Pakistan
	Britlite	Pakistan
	or approved equivalent	Pakistan
	[Osaka (as per HBL req.)]	
- Emergency / Exit Lights	: Bardic (Honeywell)	USA
	Zman Engineering	Can
	Menvier (Cooper)	UK
	or approved equivalent	
- Ballast, Starters, Lamps	: Philips	Holland
	Osram	Germany
	Schwabe	Germany
	or approved equivalent	
- Cable Tray / Trunking	: Ezzi Engineering	Pakistan
	Electroline	Pakistan
	Ashraf Industries	Pakistan
	Zman Engineering	Pakistan
	or approved equivalent	
- Hand Driers	: Siemens	Germany
	World Dryer	USA
	Mitsubishi	Japan
	or approved equivalent	
- Insect Killers	: Insect-o-cutor	UK
	Moel	Italy
	or approved equivalent	
- Power Conditioning (UPS)	: Schneider Electric (APC, MG)	France
	General Electric	USA
	Eaton	USA
	Emerson / Liebert	UK
- Power Conditioning (Stabilizers, Isolation)	: Stavol	Japan
	Ortea	Italy
	Stabimatic	Japan

LIST OF APPROVED MANUFACTURERS / SUPPLIERS OF ELECTRICAL EQUIPMENT

*** All Equipment shall be procured from Principal Authorized agents / distributors / resellers**

- | | | |
|-------------------------------|--------------------------|-----------|
| | Watford | UK |
| | or approved equivalent | |
| - Lightning Protection System | : Furse | UK |
| | Erico | USA |
| | LPI | Australia |
| | Application Technologies | USA |
| | or approved equivalent | |
| - Bus Rising Mains / Bus Bar | : Power Bar | Malaysia |
| | Schneider Electric | France / |
| | or approved equivalent | |

Low Current Products

- | | | |
|---|------------------------------|-----------|
| - Data / Voice [23AWG]
(Communication Cabling) | : Schneider Electric | France |
| | Corning | USA |
| - Data Racks | : Concord | Taiwan |
| | Velocity | Taiwan |
| | or approved equivalent | |
| - Multicore Telephone Cables | : Schneider Electric | Taiwan |
| | Corning | USA |
| | Pony | Japan |
| - EPABX (Conventional / VOIP) | : Cisco | USA |
| | Avaya | USA |
| | Samsung | Korea |
| | Panasonic | Japan |
| | Or approved equivalent | |
| - Telephone Sets | : As per EPABX Vendor | |
| - Fire Alarm System | : Zeta | UK |
| | Essex by Honeywell | UK |
| | Morley (by Honeywell) | UK |
| - CCTV System | : HIK VISION | China |
| | Dahua Technologies | China |
| | Or approved equivalent | |
| - Public Address System | : Bose | USA |
| | Bosch | Singapore |
| | ToA | Japan |
| | or approved Equivalent | |
| - Lighting Control System | : C-Bus (Schneider Electric) | France |
| | S-Bus | USA |
| | ABB | Germany |
| | or approved Equivalent | |



NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

**ESTABLISHMENT OF THAR INSTITUTE OF ENGINEERING, SCIENCES AND
TECHNOLOGY-TIEST, ISLAMKOT**

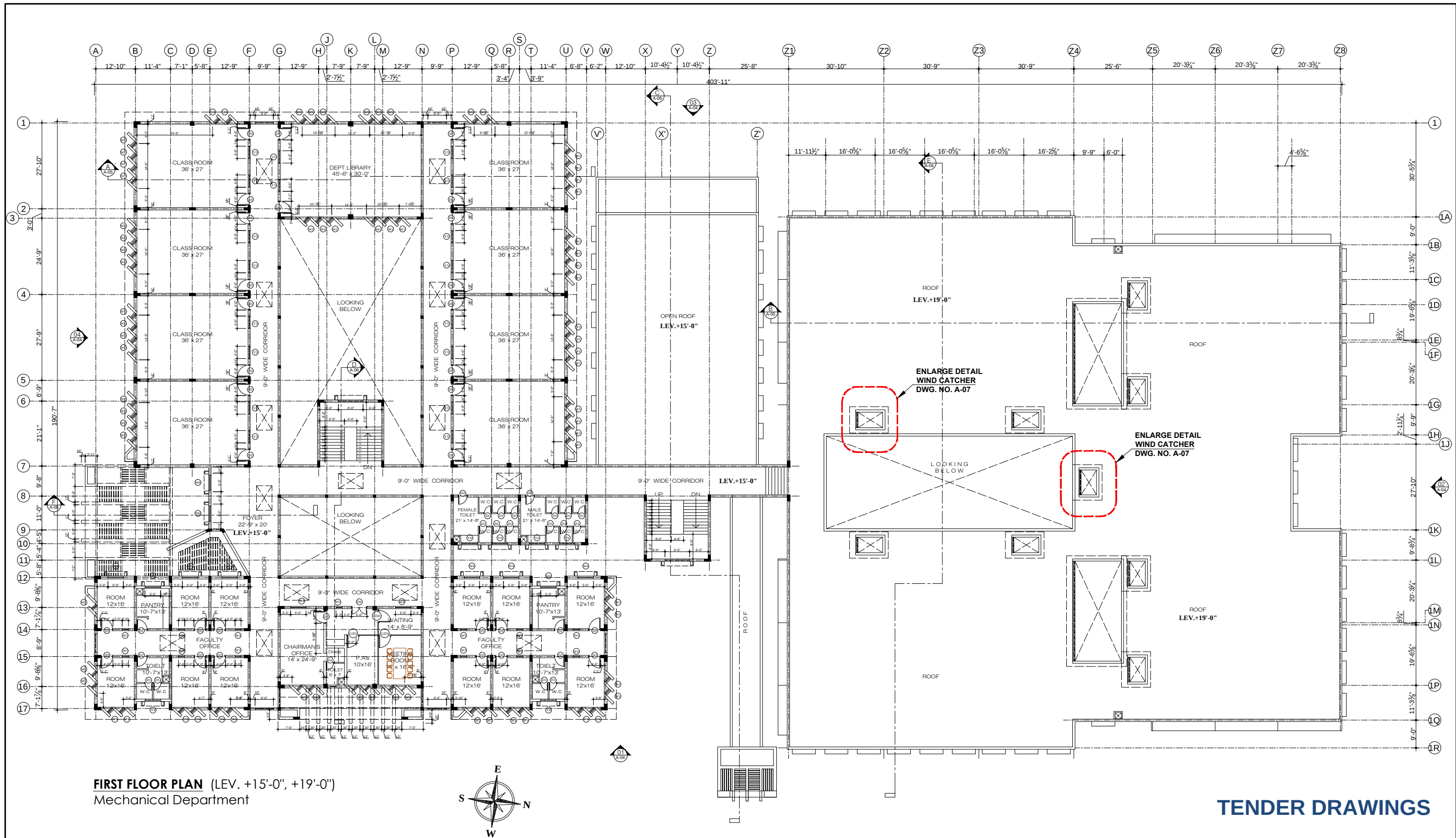
(CONSTITUENT COLLEGE OF NED UNIVERSITY)

VOLUME-IV

**CONSTRUCTION OF BUILDING FOR THE DEPARTMENT OF MECHANICAL
ENGINEERING AT THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY**

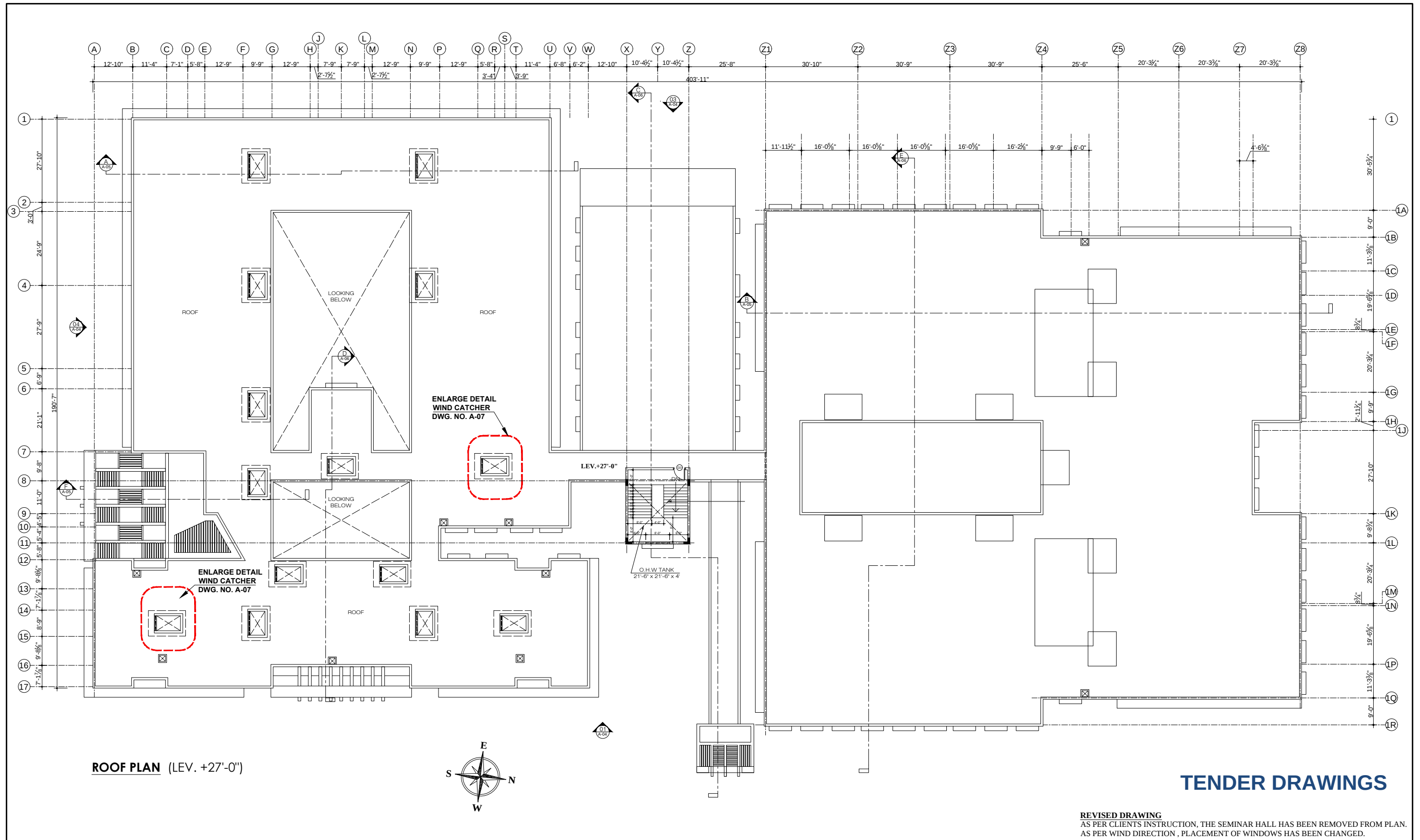
First Floor - Adl. work

TENDER DRAWINGS

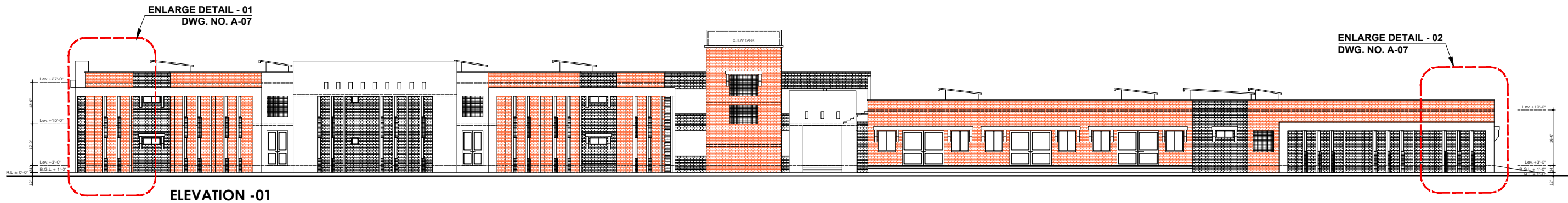


REVISED DRAWING
AS PER CLIENTS INSTRUCTION, THE SEMINAR HALL HAS BEEN REMOVED FROM PLAN.
AS PER WIND DIRECTION, PLACEMENT OF WINDOWS HAS BEEN CHANGED.

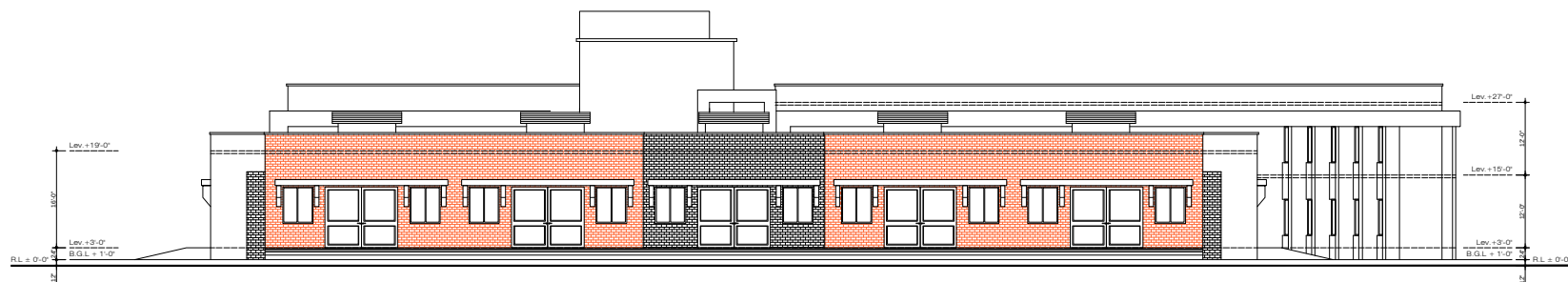
Client	Project	Job	Consultant	TITLE	DATE		COM. LOCATION.	SHEET REF.		
					18-07-2022					
					ISSUE	DESCRIPTION			DATE	
					REVISED				06-05-2024	
									03-03-2025	
NED UNIVERSITY OF ENGINEERING & TECHNOLOGY	THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR	MECHANICAL DEPARTMENT	 ESS -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	FIRST FLOOR PLAN	DRAWN	SCALE	N.T.S	CHKD. BY	JOB NO.	A-02



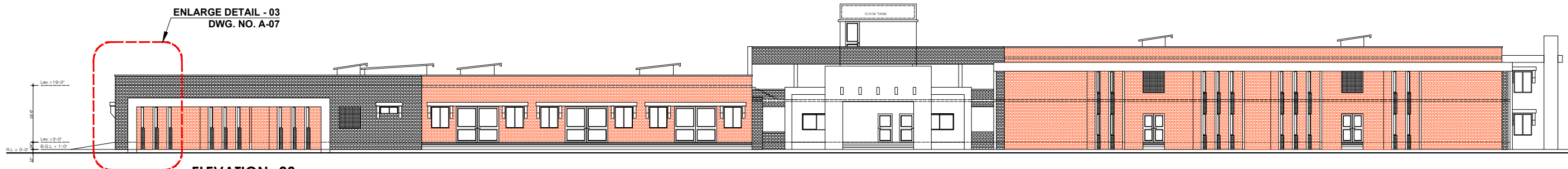
Client	Project	Job	Consultant	TITLE	DATE	COM. LOCATION.		SHEET REF.	
NED UNIVERSITY OF ENGINEERING & TECHNOLOGY	THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR	MECHANICAL DEPARTMENT	 ESS -I- AAR PLANNING , ENGINEERING & SERVICES CONSULTANTS SUITE NO. 314, 3- RD. FLOOR MASHRIQ CENTER SIR SHAH SULAIMAN ROAD , GULSHAN - E - IQBAL BLOCK NO. 14, KARACHI , P. O. BOX NO. 7608	ROOF PLAN	18-07-2022			ARCHI.	
				ISSUE	DESCRIPTION	DATE	CHKD. BY	JOB NO.	A-03
					REVISED	06-05-2024			
				DRAWN	SCALE				
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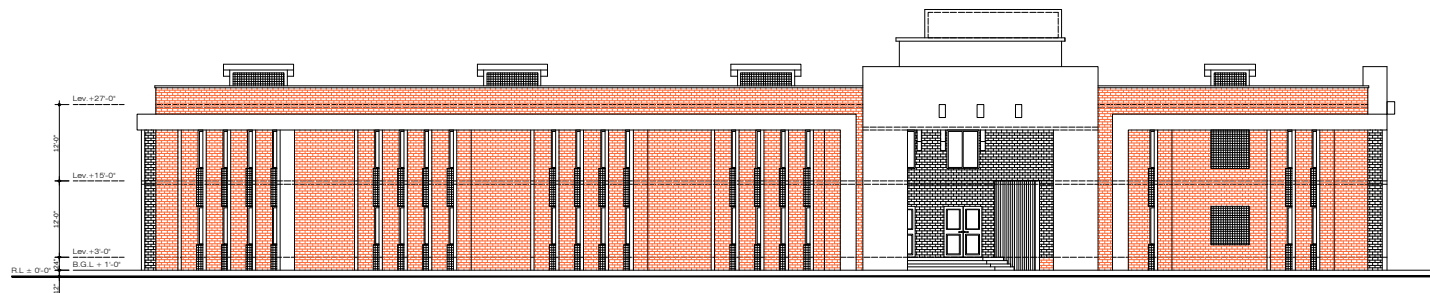
ELEVATION -01



ELEVATION -02



ELEVATION -03

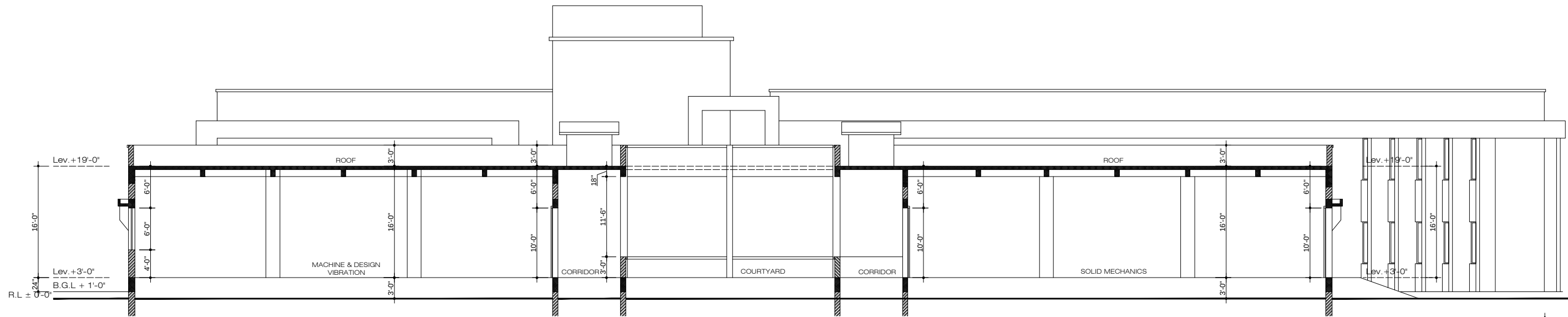


ELEVATION -04

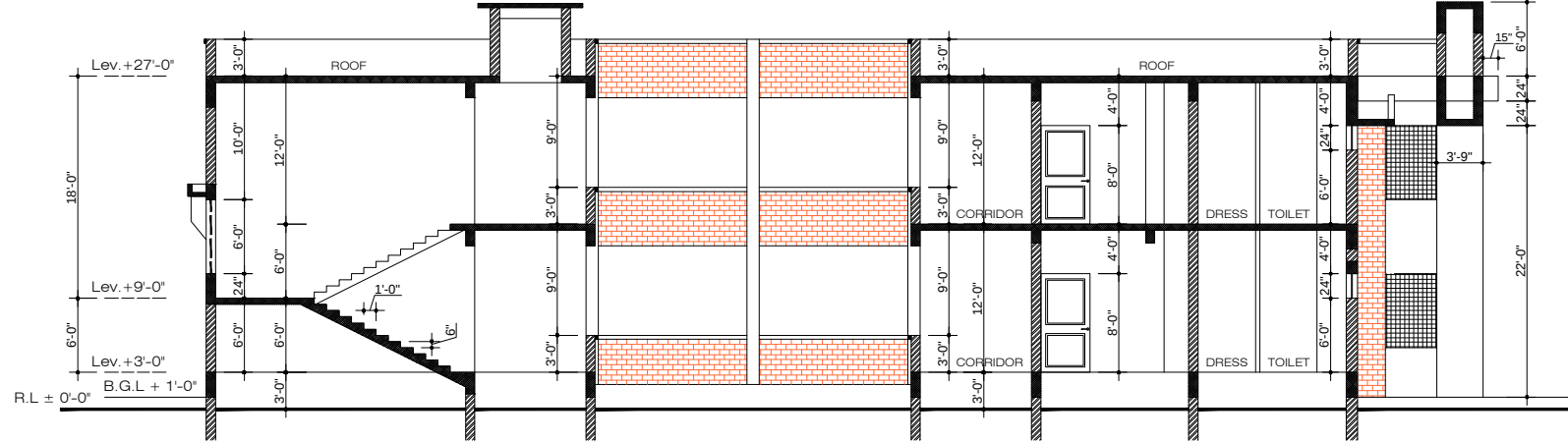
TENDER DRAWINGS

REVISED DRAWING
AS PER CLIENTS INSTRUCTION, THE SEMINAR HALL HAS BEEN REMOVED FROM PLAN.
AS PER WIND DIRECTION , PLACEMENT OF WINDOWS HAS BEEN CHANGED.

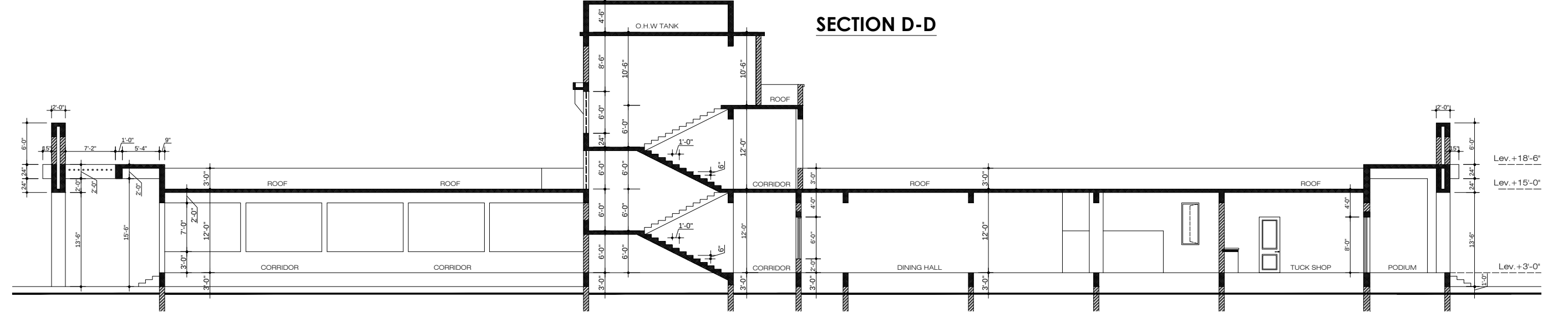
Client NED UNIVERSITY OF ENGINEERING & TECHNOLOGY	Project THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR	Job MECHANICAL DEPARTMENT	Consultant  ESS -I- AAR PLANNING , ENGINEERING & SERVICES CONSULTANTS SUITE NO. 314, 3-RD. FLOOR MASHRIQ CENTER SIR SHAH SULAIMAN ROAD , GULSHAN - E - IQBAL BLOCK NO. 14, KARACHI , P. O. BOX NO. 7608	TITLE ELEVATIONS 01,02,03 & 04		DATE 18-07-2022		COM. LOCATION.		SHEET REF. ARCHI.	
				DRAWN	SCALE N.T.S	ISSUE	DESCRIPTION	DATE	CHKD. BY	JOB NO.	A-04
						REVISED		06-05-2024			



SECTION E-E



SECTION D-D

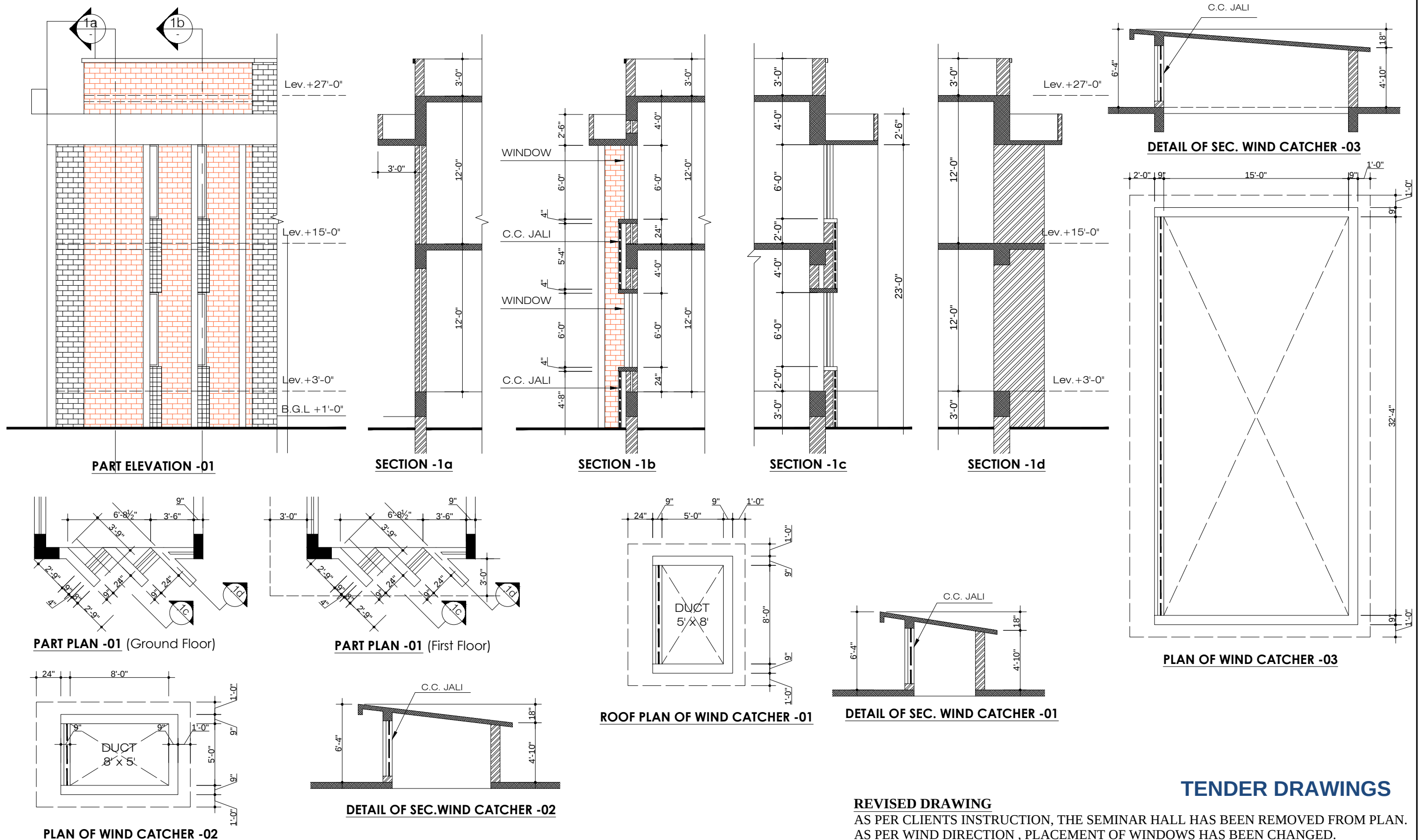


SECTION C-C

TENDER DRAWINGS

REVISED DRAWING
 AS PER CLIENTS INSTRUCTION, THE SEMINAR HALL HAS BEEN REMOVED FROM PLAN.
 AS PER WIND DIRECTION , PLACEMENT OF WINDOWS HAS BEEN CHANGED.

Client	Project	Job	Consultant	TITLE	DATE	COM. LOCATION.		SHEET REF.
NED UNIVERSITY OF ENGINEERING & TECHNOLOGY	THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR	MECHANICAL DEPARTMENT	 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	SECTIONS C-C , D-D & E-E	18-07-2022			ARCHI.
				ISSUE	DESCRIPTION	DATE		
					REVISED	06-05-2024		
				DRAWN	SCALE		CHKD. BY	JOB NO.
					N.T.S			
								A-06

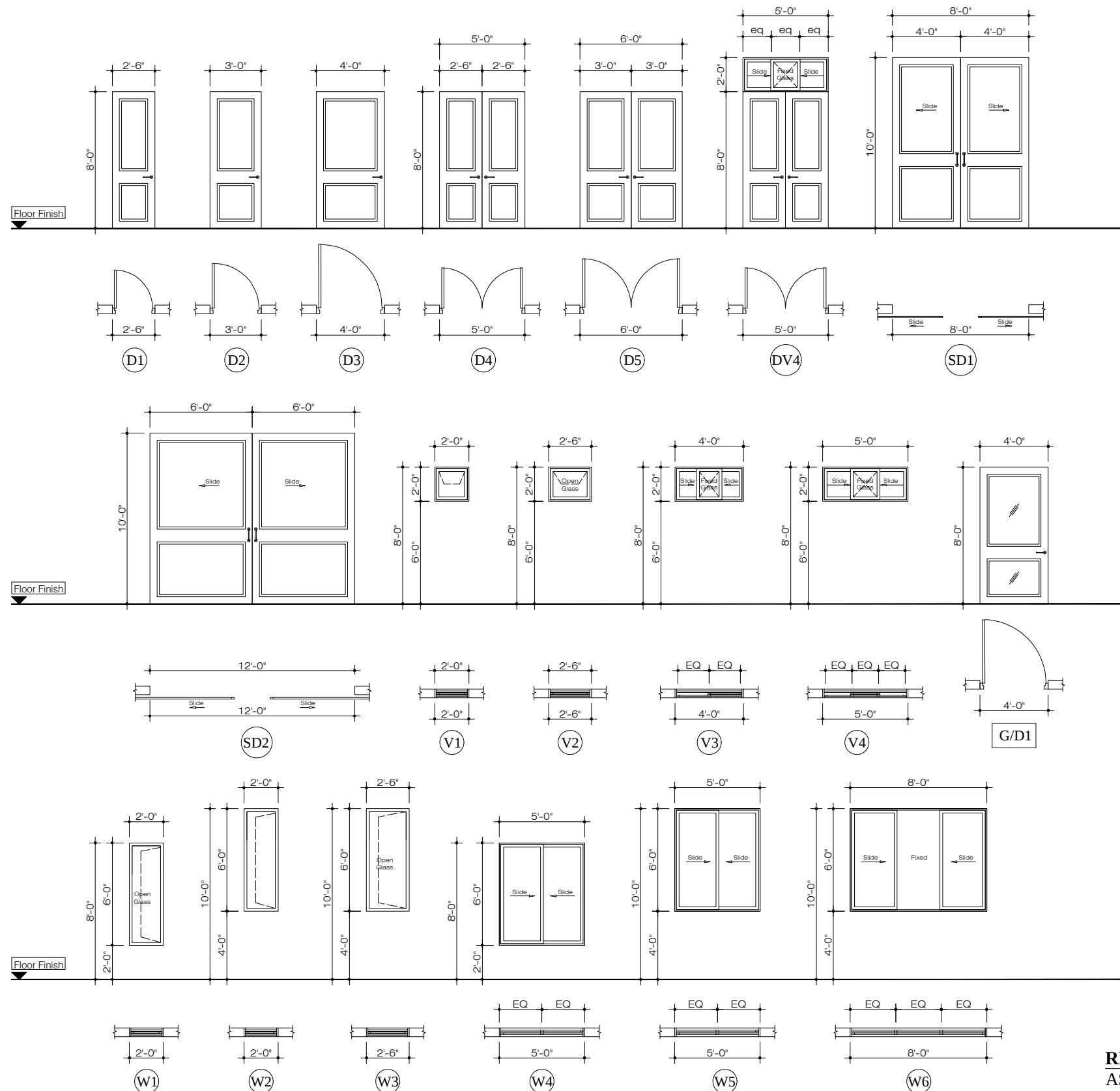


TENDER DRAWINGS

REVISED DRAWING

AS PER CLIENTS INSTRUCTION, THE SEMINAR HALL HAS BEEN REMOVED FROM PLAN.
AS PER WIND DIRECTION , PLACEMENT OF WINDOWS HAS BEEN CHANGED.

Client NED UNIVERSITY OF ENGINEERING & TECHNOLOGY	Project THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR	Job MECHANICAL DEPARTMENT	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 ENLARGE DETAILS		DATE 18-07-2022		COM. LOCATION.		SHEET REF.	
				DRAWN	SCALE N.T.S	ISSUE	DESCRIPTION	DATE	CHKD. BY	JOB NO.	ARCHI. A-07
							REVISED	06-05-2024			



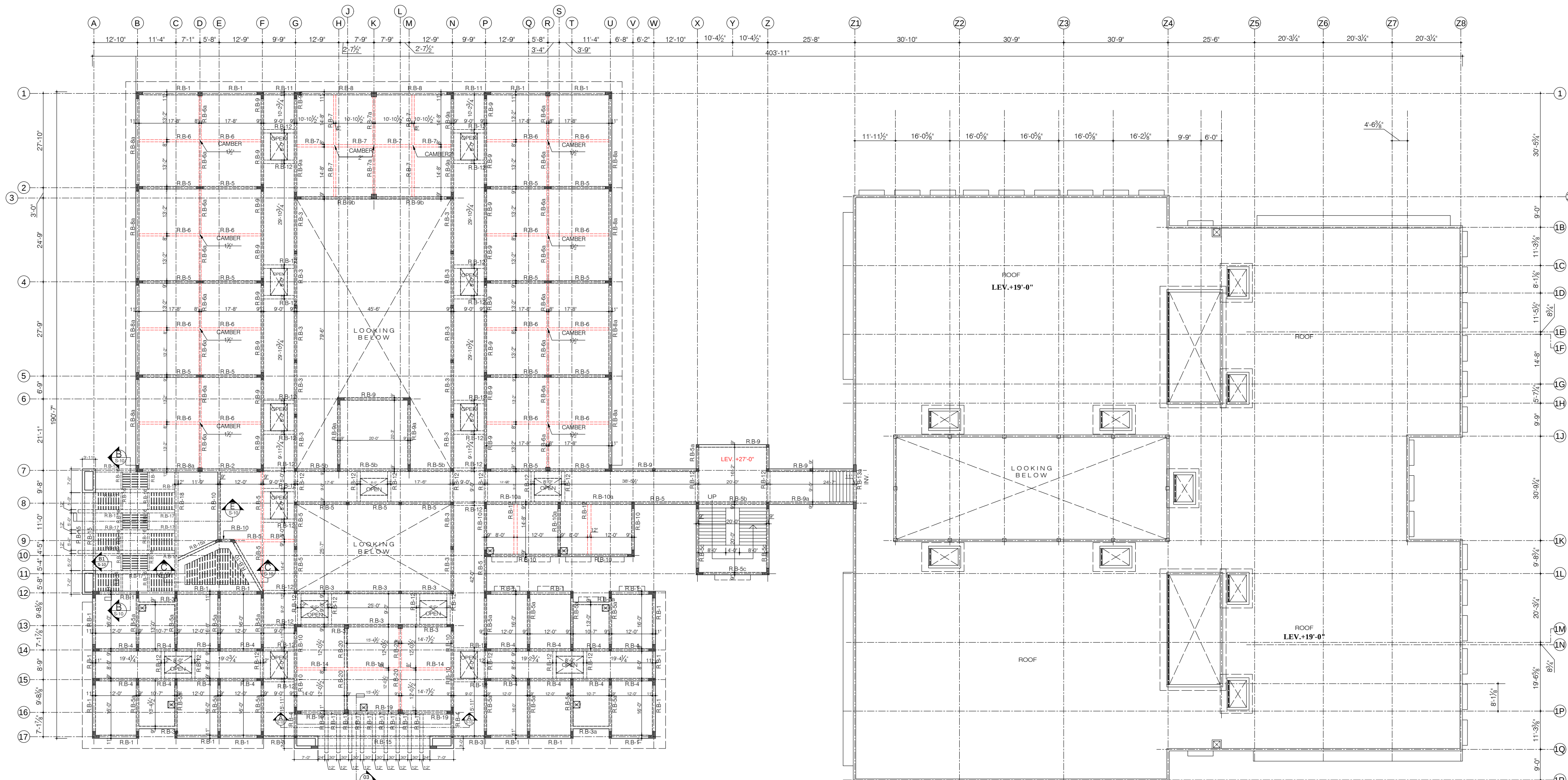
SCHEDULE OF DOORS, WINDOWS & VENTILATORS.						
MARK	SIZE	MATERIAL	NO.S OF GROUND FLOOR	NO.S OF FIRST FLOOR	NO.S OF ROOF PLAN	
D1	2'-6"x8'-0"		28	17		
D2	3'-0"x8'-0"		10	09		
D3	4'-0"x8'-0"		35	31	01	
D4	5'-0"x8'-0"		01	01		
DV4	5'-0"x10'-0"		00	-		
D5	6'-0"x8'-0"		08	-		
SD1	8'-0"x10'-0"		11	-		
SD2	12'-0"x10'-0"		11	-		
G/D1	4'-0"x8'-0"		03	-		
W1	2'-0"x6'-0"		86	86		
W2	2'-0"x6'-0"		31	-		
W3	2'-6"x6'-0"		11	-		
W4	5'-0"x6'-0"		12	10		
W5	5'-0"x6'-0"		46	-		
W6	8'-0"x6'-0"		02	-		
			-	-		
V1	2'-0"x2'-0"		04	-		
V2	2'-6"x2'-0"		-	-		
V3	4'-0"x2'-0"		18	18		
V4	5'-0"x2'-0"		09	06		

TENDER DRAWINGS

REVISED DRAWING

AS PER CLIENTS INSTRUCTION, THE SEMINAR HALL HAS BEEN REMOVED FROM PLAN.
AS PER WIND DIRECTION , PLACEMENT OF WINDOWS HAS BEEN CHANGED.

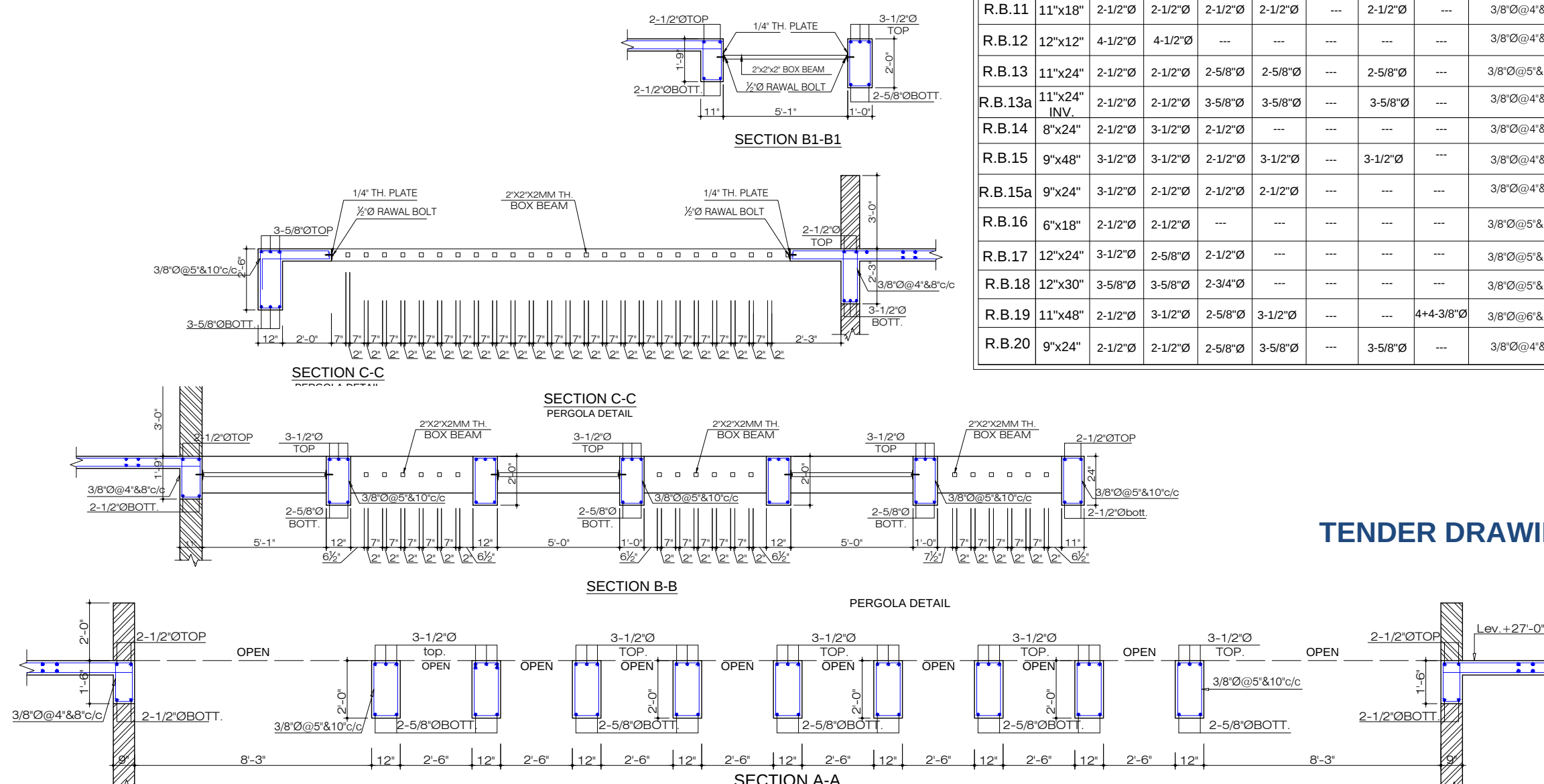
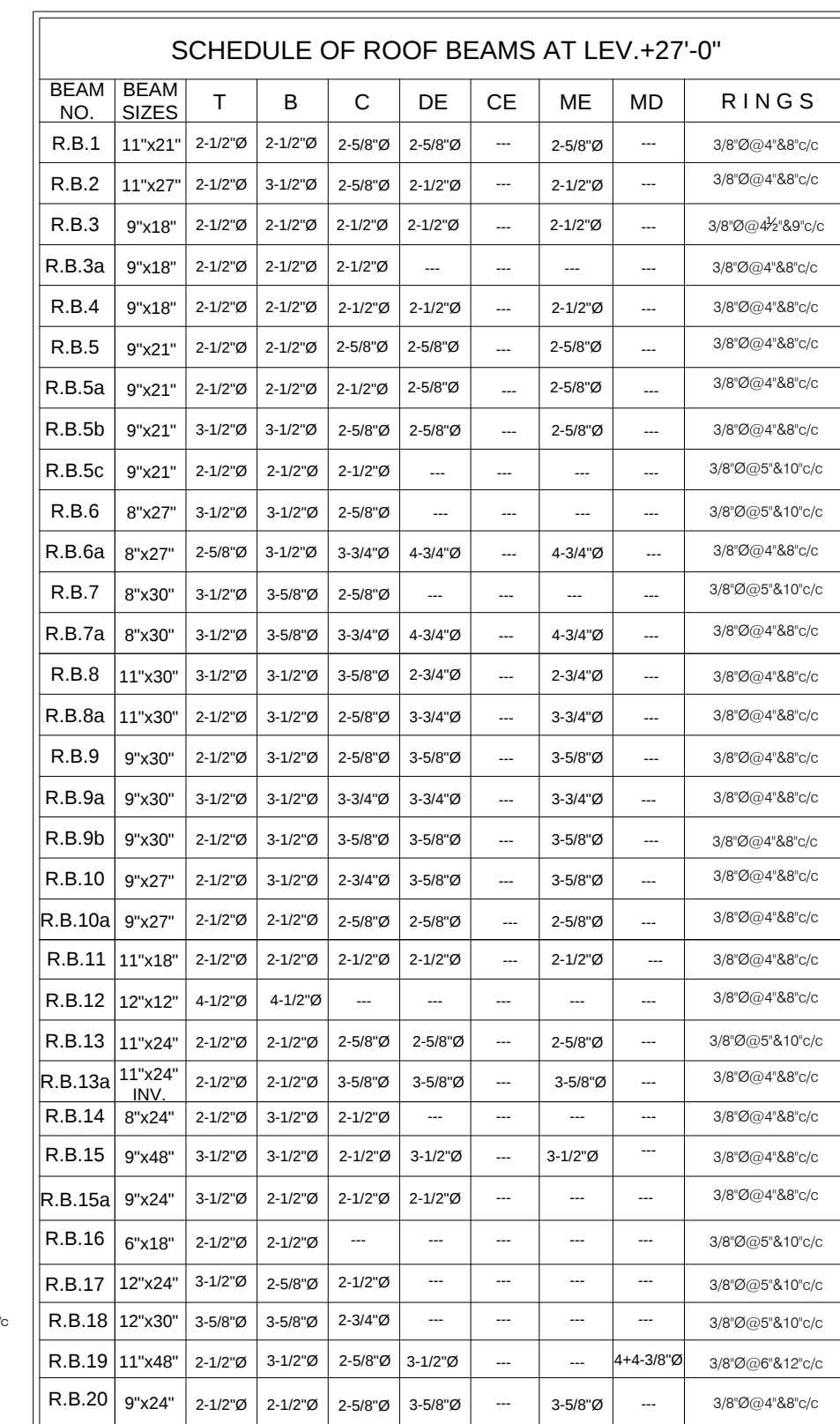
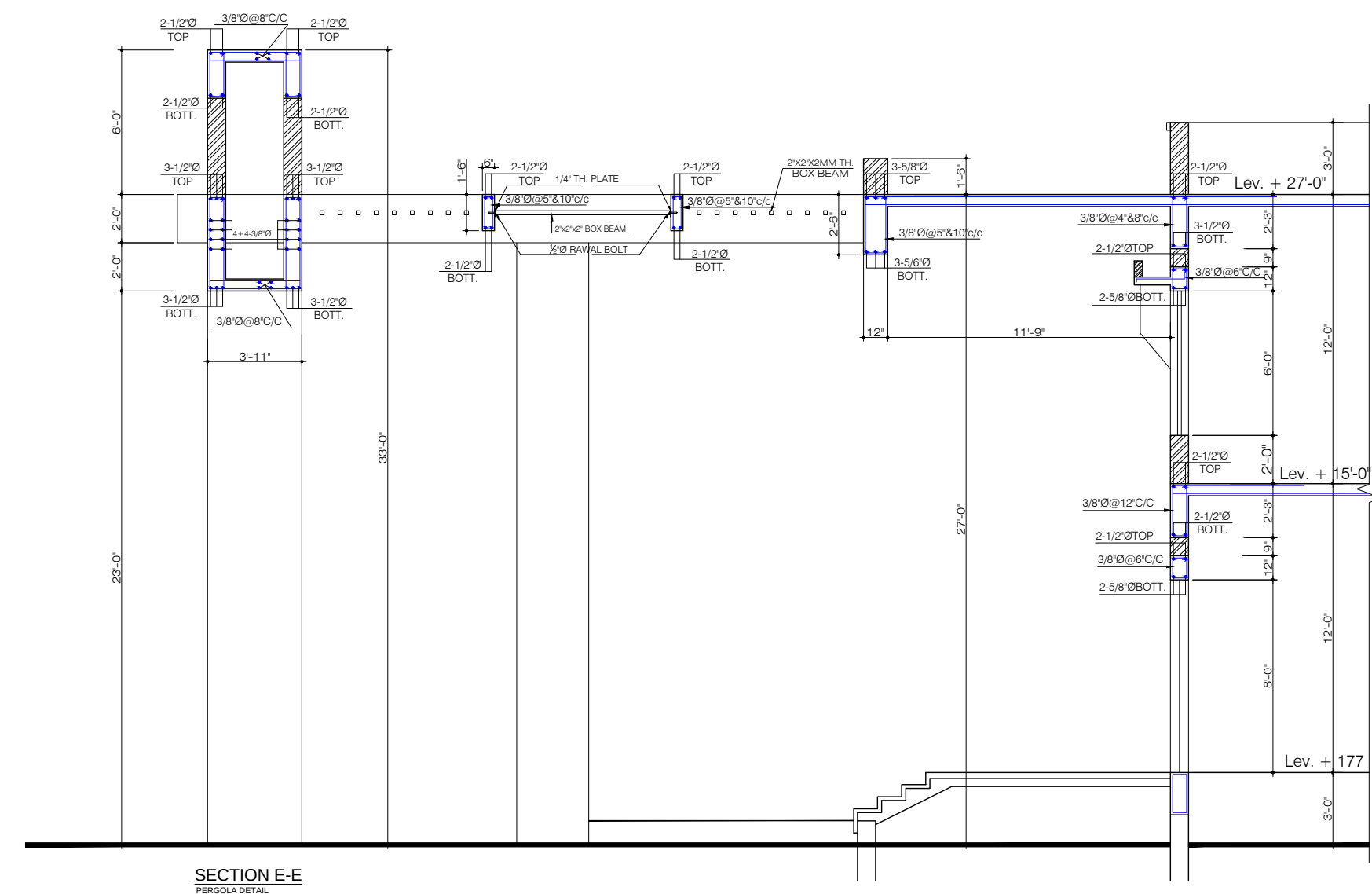
Client NED UNIVERSITY OF ENGINEERING & TECHNOLOGY	Project THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR	Job MECHANICAL DEPARTMENT	Consultant ESS -I- AAR PLANNING , ENGINEERING & SERVICES CONSULTANTS SUITE NO. 314, 3-RD. FLOOR MASHRIQ CENTER SIR SHAH SULAIMAN ROAD , GULSHAN - E - IQBAL BLOCK NO. 14, KARACHI , P. O. BOX NO. 7608	TITLE SCHEDULE OF DOORS, WINDOWS & VENTILATOR			DATE 18-07-2022		COM. LOCATION.		SHEET REF. ARCHI. A-09
				DRAWN	SCALE N.T.S		ISSUE	DESCRIPTION REVISED	DATE 06-05-2024	CHKD. BY	JOB NO.



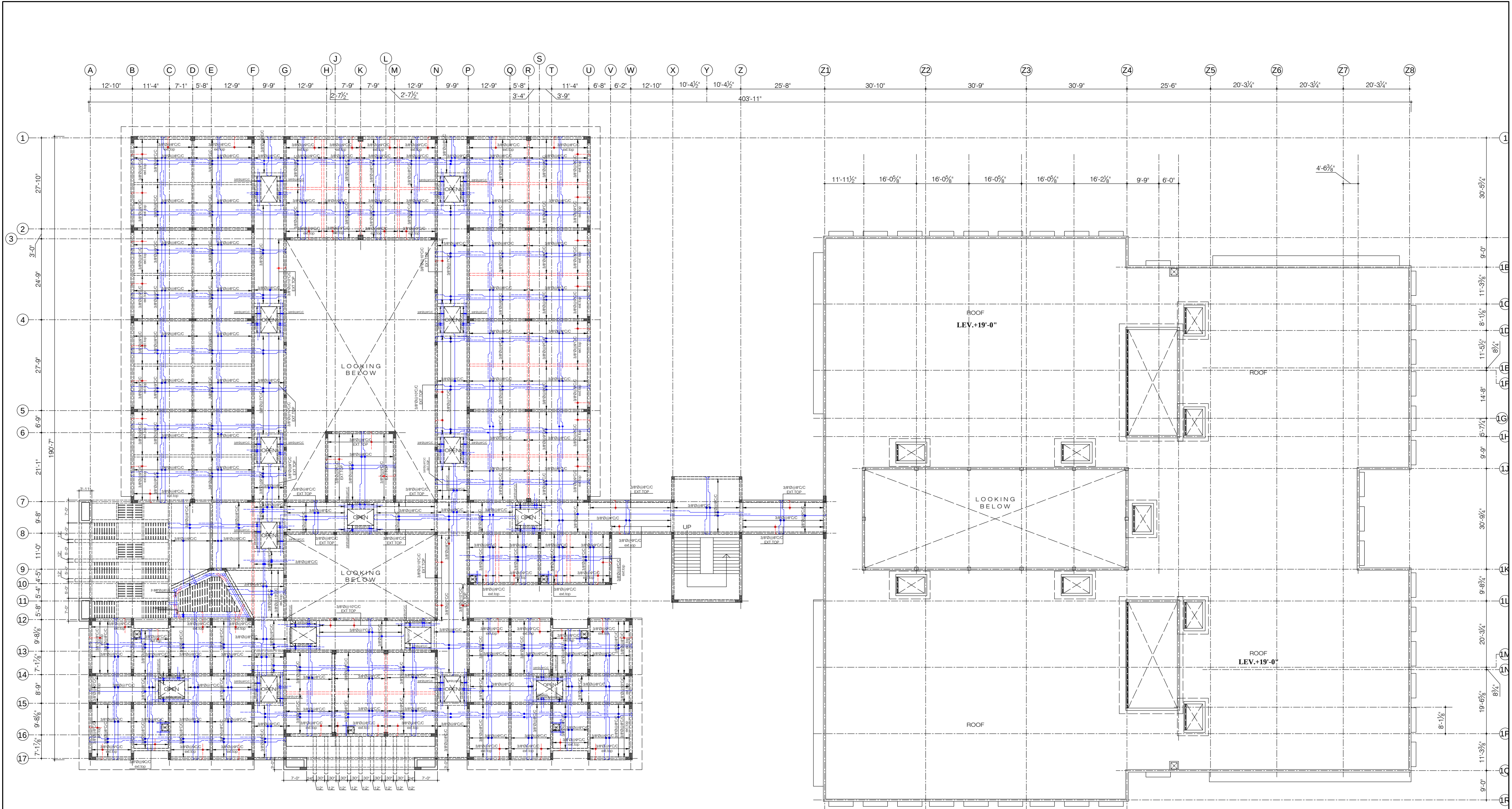
ROOF BEAM FRAMING PLAN

TENDER DRAWINGS

Client	Project	Job	Consultant	TITLE	DATE		COM. LOCATION.		SHEET REF.			
					26-08-2023							
					DRAWN	SCALE	ISSUE	DESCRIPTION	DATE	CHKD. BY	JOB NO.	S-09
							REVISED		10-05-2024			
NED UNIVERSITY OF ENGINEERING & TECHNOLOGY		THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR		MECHANICAL DEPARTMENT		 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		ROOF BEAM FRAMING PLAN				



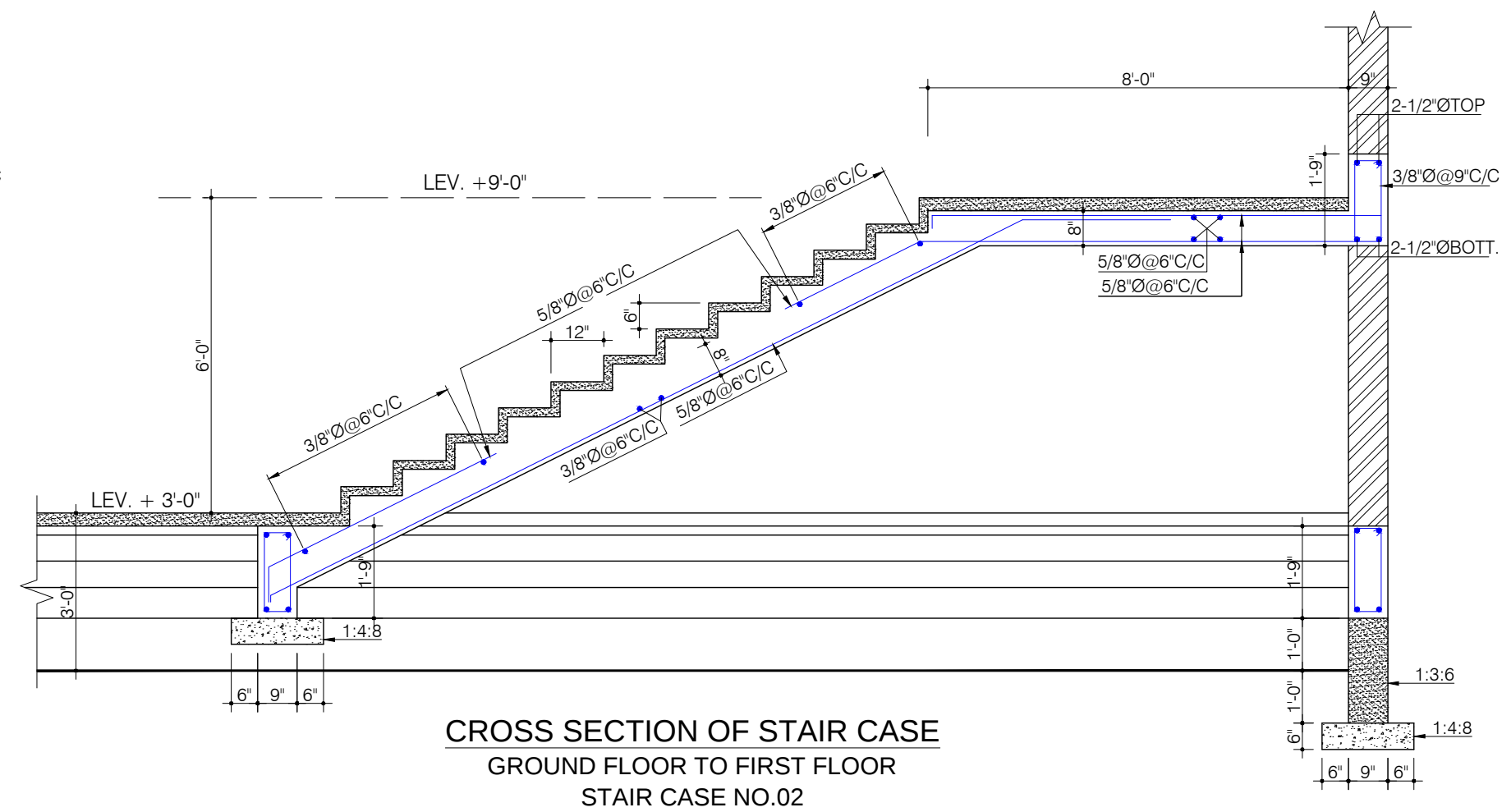
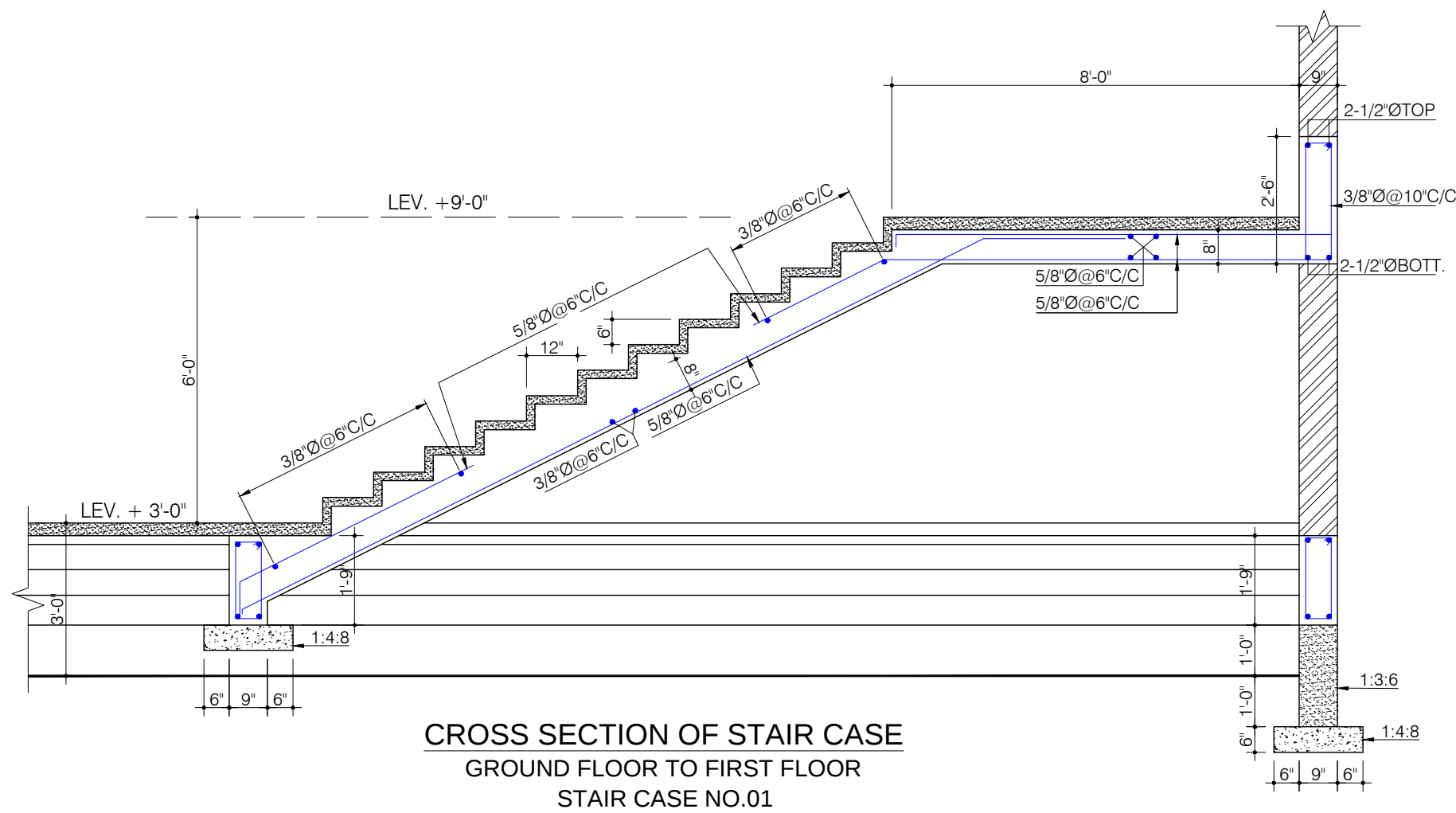
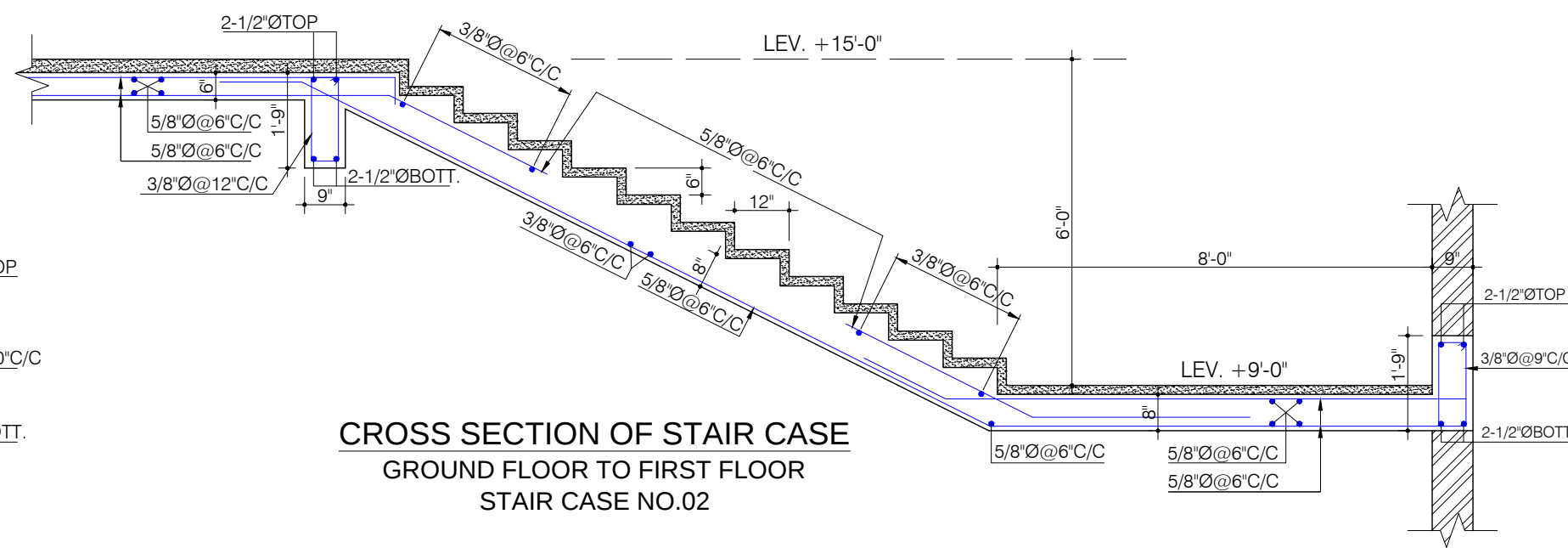
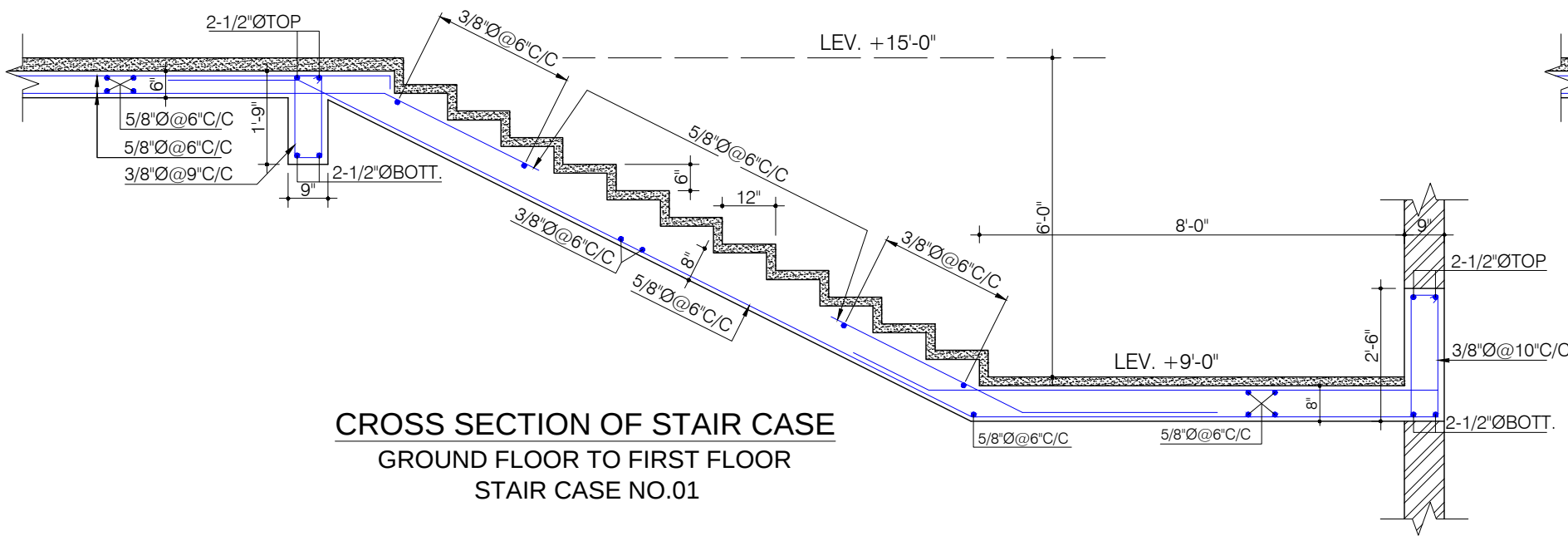
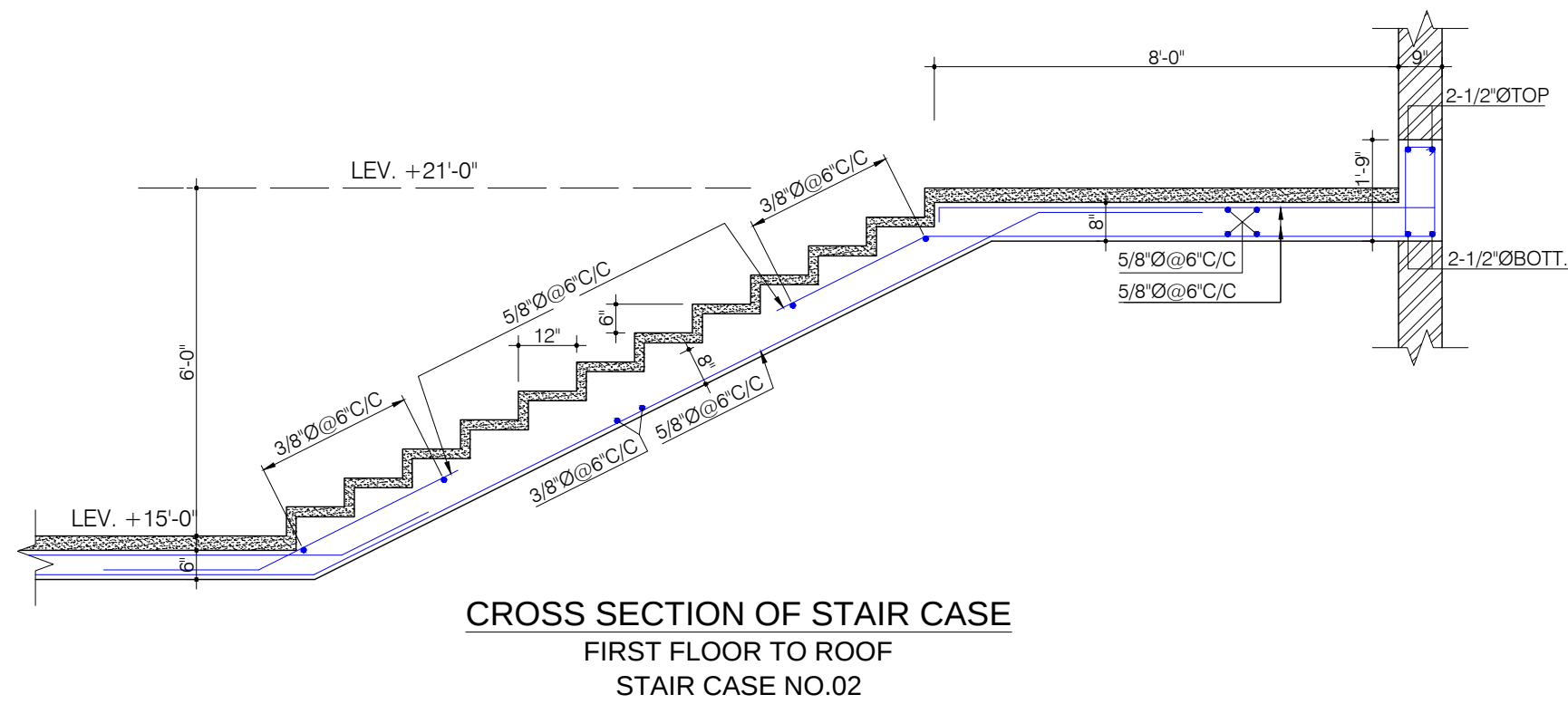
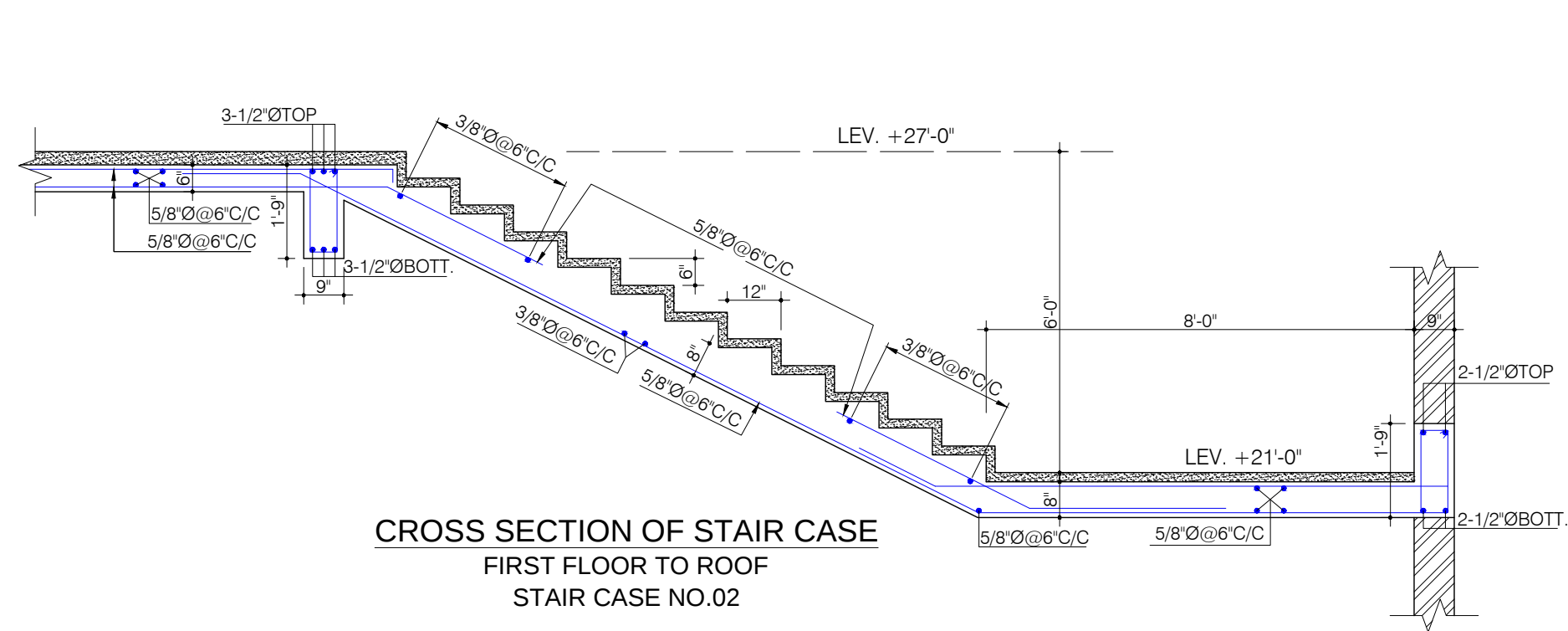
TENDER DRAWINGS



6"TH. ROOF SLAB REINFORCEMENT PLAN

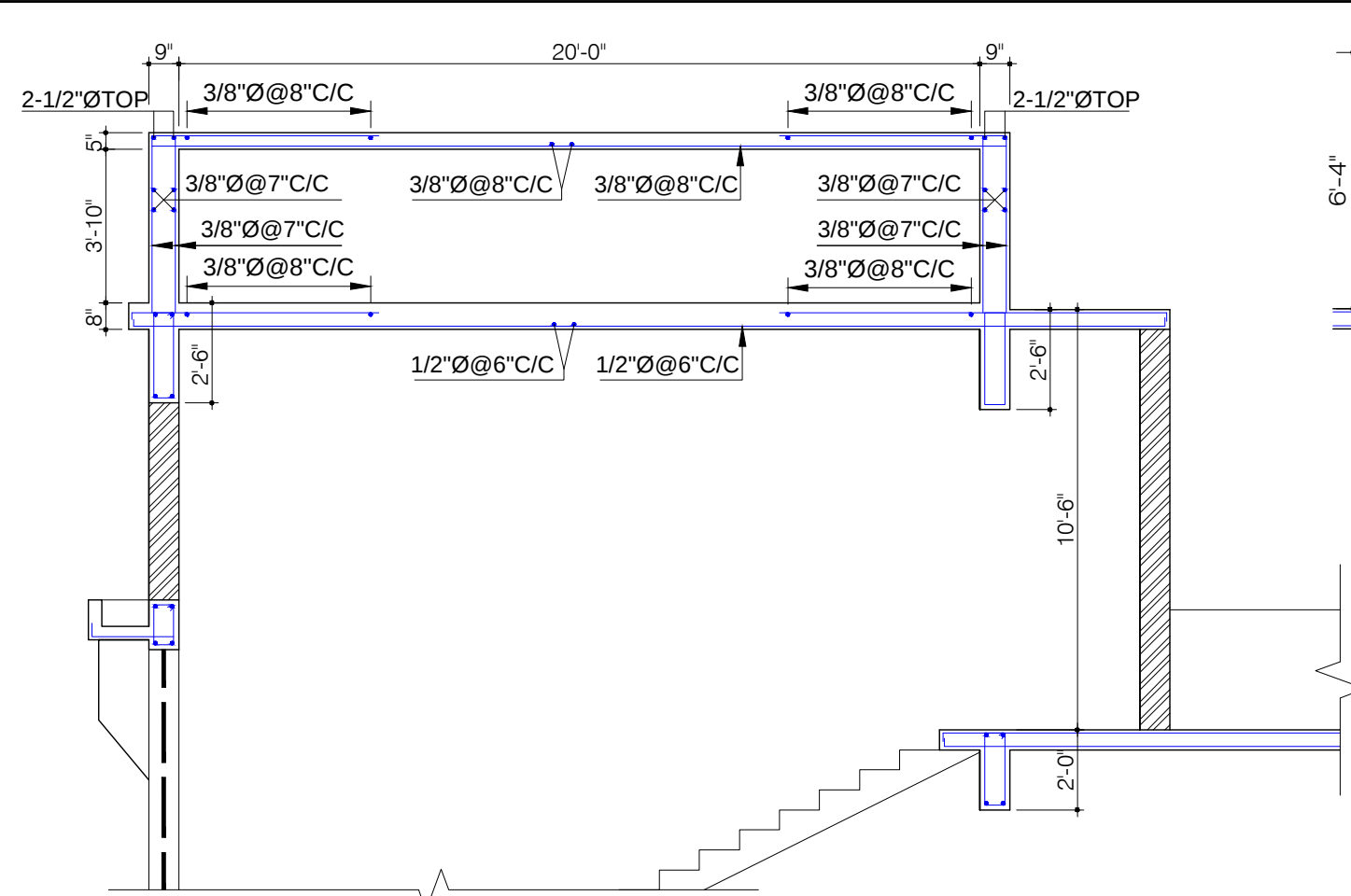
TENDER DRAWINGS

Client	Project	Job	Consultant	TITLE	DATE	COM. LOCATION.		SHEET REF.			
NED UNIVERSITY OF ENGINEERING & TECHNOLOGY	THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR	MECHANICAL DEPARTMENT	 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	6"TH.ROOF SLAB REINF. PLAN	26-08-2023			STR.			
				ISSUE	DESCRIPTION	DATE					
				DRAWN	SCALE	REVISED		10-05-2024	CHKD. BY	JOB NO.	S-11
				M.SHAHMEER	N.T.S						

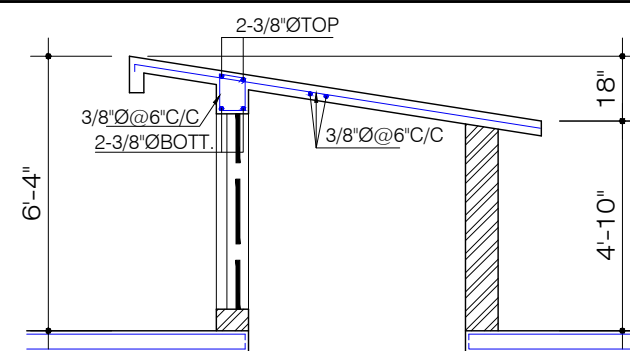


TENDER DRAWINGS

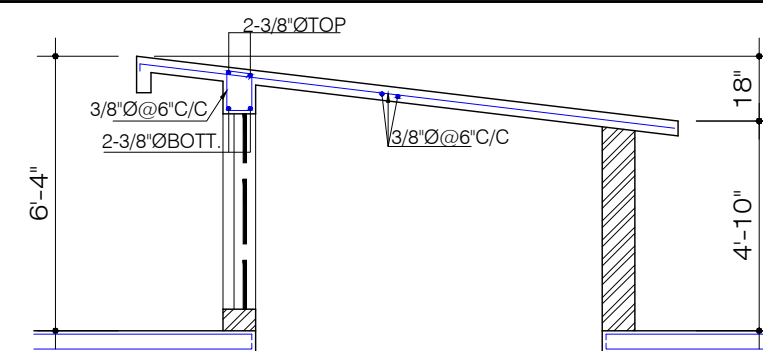
Client	Project	Job	Consultant	TITLE	DATE		COM. LOCATION.	SHEET REF.
					ISSUE	DESCRIPTION		
NED UNIVERSITY OF ENGINEERING & TECHNOLOGY	THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR	MECHANICAL DEPARTMENT	 ESS -I- AAR PLANNING , ENGINEERING & SERVICES CONSULTANTS SUITE NO. 314, 3- RD. FLOOR MASHRIQ CENTER SIR SHAH SULAIMAN ROAD , GULSHAN - E - IQBAL BLOCK NO. 14, KARACHI , P. O. BOX NO. 7608	DETAIL OF STAIR CASE SECTION	26-08-2023		CHKD. BY	JOB NO.
				DRAWN	SCALE	REVISED		
				M.SHAHMEER	N.T.S			S-12



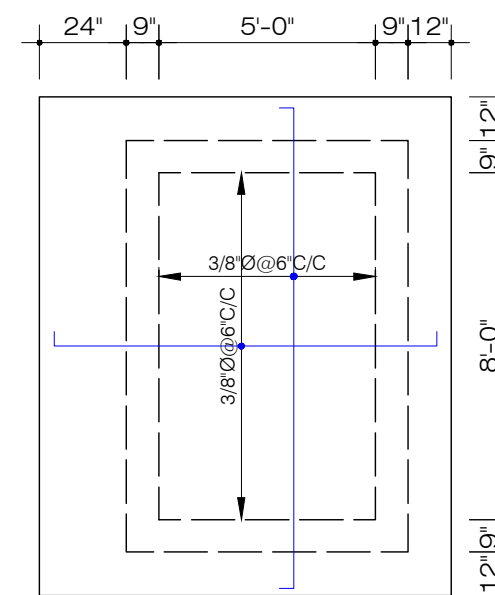
SECTION A-A



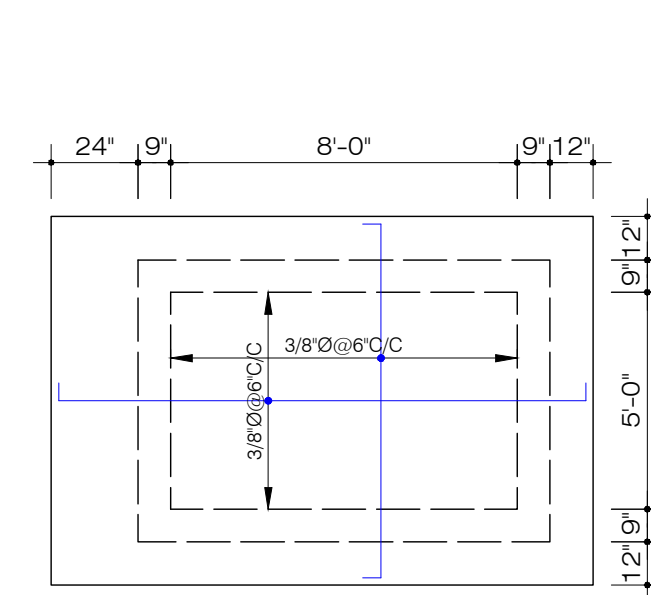
DETAIL OF
WIND CATCHER -01



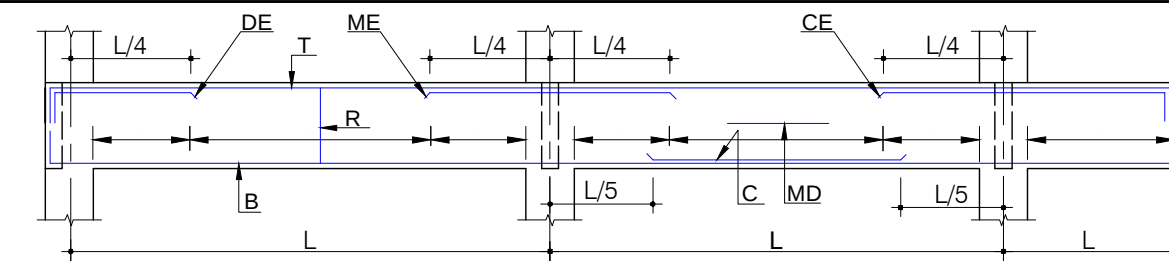
DETAIL OF
WIND CATCHER -02



PLAN OF
WIND CATCHER -01 (ROOF)



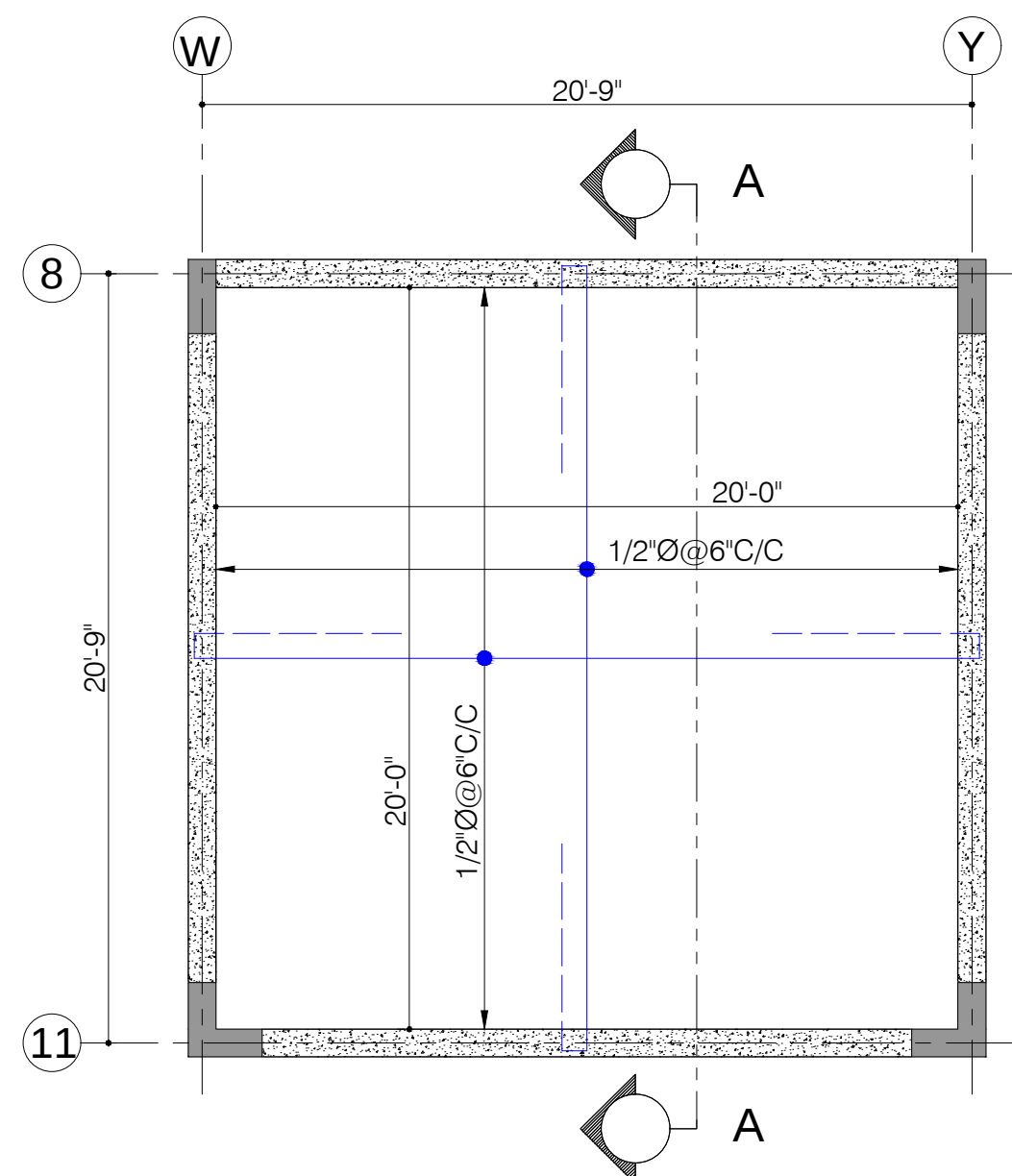
PLAN OF
WIND CATCHER -02 (ROOF)



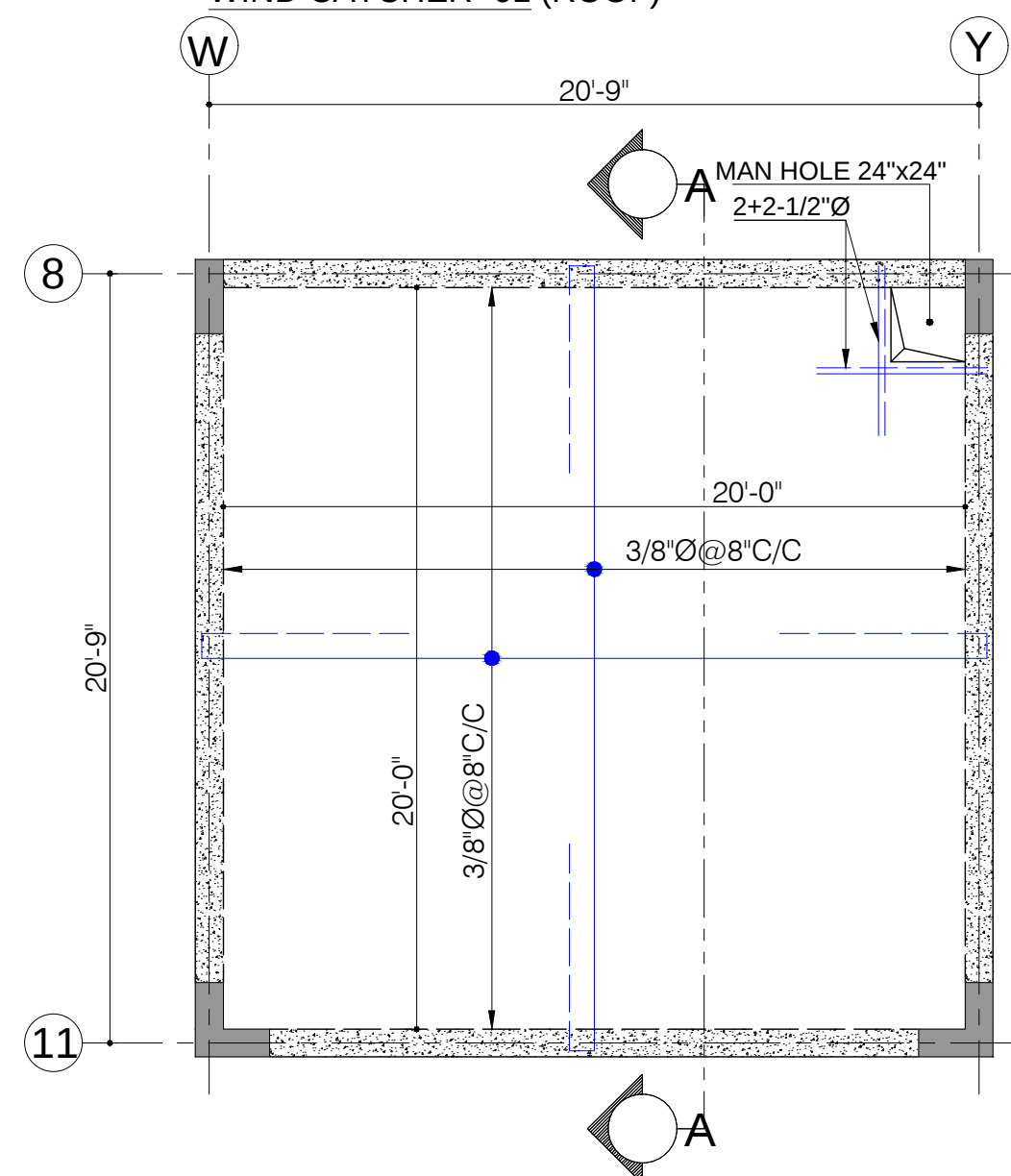
TYPICAL BEAM ELEVATION

SCHEDULE OF STAIR CASE TOWER BEAMS AT LEV.+37'-6"

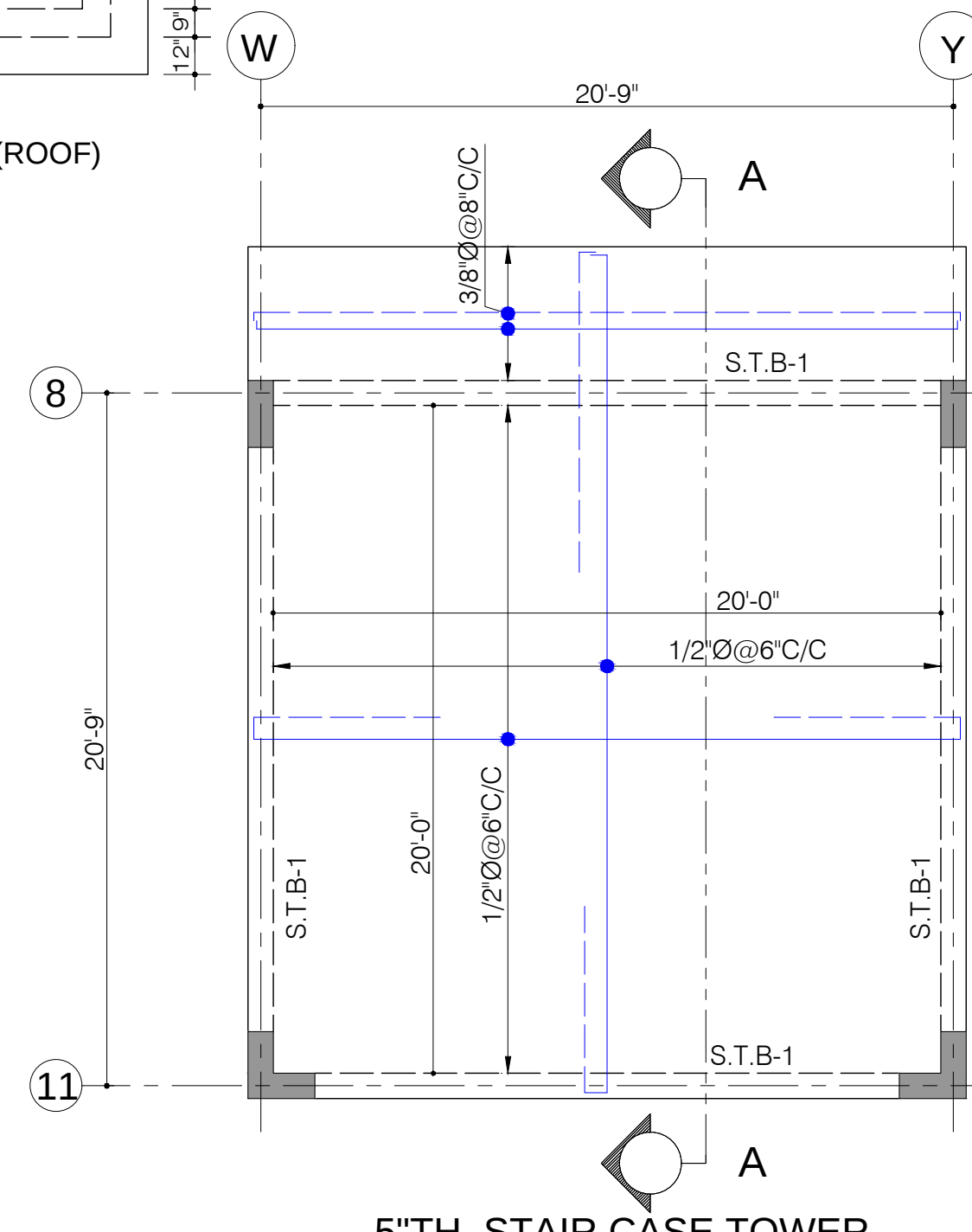
BEAM NO.	BEAM SIZES	T	B	C	DE	CE	ME	MD	R I N G S
S.T.B-1	9"x30"	2-1/2"Ø	2-1/2"Ø	3-5/8"Ø	3-5/8"Ø	---	3-5/8"Ø	---	3/8"Ø@12"C/C



8"TH. O.H.W. TANK BOTTOM
SLAB REINF. PLAN



5"TH. O.H.W. TANK TOP
SLAB REINF. PLAN



5"TH. STAIR CASE TOWER
SLAB REINF. PLAN
LEV. 37'-6"

TENDER DRAWINGS

Client	Project	Job	Consultant	TITLE	DATE	COM. LOCATION.	SHEET REF.
NED UNIVERSITY OF ENGINEERING & TECHNOLOGY	THAR INSTITUTE OF ENGINEERING SCIENCES & TECHNOLOGY THARPARKAR	MECHANICAL DEPARTMENT	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	DETAIL OF O.H.W.TANK & STAIR TOWER & DUCT	26-08-2023		STR.
				DRAWN	SCALE	CHKD. BY	JOB NO.
				M.SHAHMEER	N.T.S		
							S-13

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

No. DR (Estab)/(1003)/615

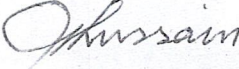
Dated: 28/01/ 2025

NOTIFICATION

In supersession of this University Officer Order No. DR(Estab)/(1003)/1990 dated: 12.02.2016, it is for information of all concerned that following the retirement of Engr. Khurshid Akhtar, former Director of Works and Services, effective from 24.01.2025, the University Administration has reconstituted the Procurement Committee for procurement of "Works" comprising of the Officers as follows:

- | | | |
|----|--|--------------------|
| 1. | Prof. Dr. Abdul Jabbar Sangi
Professor and Chairman
Department of Civil Engineering | Convener |
| 2. | Engr. Sadia Jabeen Asim
Senior Civil Engineer (HEJ)
University of Karachi | Member |
| 3. | Engr. Azhar Iqbal
Deputy Director Works & Services and
Ag. Director Works & Services | Member / Secretary |

The Terms of Reference (TORs), functions, and responsibilities of the aforementioned Committee shall be in accordance with the Rule 8 of the Sindh Public Procurement Rules 2010 (as amended). Additionally, the Committee will address all procurement matters initiated prior to the retirement of Engr. Khurshid Akhtar that are currently under evaluation.


REGISTRAR

To:

The Convener and all Members

Copy for information to:

1. Dean (ECE)
2. Director Finance
3. Director, Planning & Development
4. Director Procurement
5. Ag. Resident Auditor

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

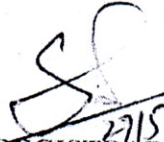
No. DR (Estab)/(1003)/5730

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 |


Ag. REGISTRAR 27/5/2016

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

**NED UNIVERSITY**
OF ENGINEERING & TECHNOLOGY



Director
Procurement

PROCUREMENT CELL
University Road, Karachi-75270

Tel: 99261281-68, (Ext. 2471 & 2220) Fax # 99261255.
Email: dp@neduet.edu.pk Website: <http://www.neduet.edu.pk>

Ref: No. DP/RGT-188278/8506/412 Date: 30.09.2025

SAY NO TO CORRUPTION

NOTICE INVITING TENDER
[EPADS]

NEDUET invites sealed bids on Single Stage One Envelope procedure from interested Bidders having adequate experience in carrying out projects of similar nature for following work:

**Construction of Building for the
Department of Mechanical Engineering
at Thar Institute of Engineering,
Sciences & Technology-TIEST at
Tharparkar. (1st Floor)**

Tender No. PC/NED/RGT/ Construction/8506/2025

Issuance of Documents from	Last Date of Issuance of Tender Documents	Tenders Submission Deadline	Tenders Opening Date / Time
03.10.2025	20.10.2025	21.10.2025 10:00 AM	21.10.2025 10:30 AM

Estimated Cost (Rs in Million)

161.216

Time of Completion

12 Months

ELIGIBILITY CRITERIA:

(i) Registration with Pakistan Engineering Council in Category C-4 or above and at least in specialization codes CE-09, CE-10, CE-11, ME-02, EE-02 and EE-11. The contractor should enclose valid PEC Registration Certificate.

(ii) Valid Registered License from Electrical Inspector for Electrical Works issued from Government of Sindh.

(iii) 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.

(iv) Affidavit on (non-judicial stamp paper) of no litigation history, non-blacklisting, never indulge in any corrupt, fraudulent and collusive practices, also undertaking that the information and documents provided with are correct. The date of issuance of said stamp paper and bidder signature on it should be later than the date of publication of this NIT.

(v) Having an experience for execution and completion of projects of similar nature in remote areas particularly in desert area or far-flung destinations.

(vi) Bids must be submitted exclusively through EPADS; manual bids will not be accepted. However, the bidder must ensure that the original and physical bid security reaches the office of the Deputy Director Procurement on or before the tender opening. any clause in this tender document asking for manual submission must be replaced and read as "through EPADS"

Bid Security @ 2% of bid cost in shape of Payorder should be in favor of Director Finance, NED University. Bidding documents can be obtained and shall be submitted through EPADS as per above schedule. 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 <https://www.portal.sindh.eprocure.gov.pk>. NEDUET reserve the right to accept or reject any or all bids in pursuance to provisions under of SPPRA Rules.

Director Procurement

بدھ 7 ربیع الثانی 1447ھ یکم اکتوبر 2025ء

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پاکستان کے سب سے بڑے روزنامہ سہ ماہیہ
باقاعدہ تصدیق شدہ اشاعت ABC CERTIFIED

THE DAILY JANG KARACHI

روزنامہ جنگ

جنگ سرگرمی

بانی میر ظلیل الرحمن

جسٹس

35 روپے

نمبر 268

بدھ 7 ربیع الثانی 1447ھ یکم اکتوبر 2025ء

جسٹس 89

WEDNESDAY OCTOBER 01, 2025

NED UNIVERSITY
OF ENGINEERING & TECHNOLOGY
Director
Procurement
PROCUREMENT CELL
University Road, Karachi-75270

Tel: 99261261-68, (Ext. 2471 & 2220) Fax # 99261255,
Email: dp@neduet.edu.pk Website: http://www.neduet.edu.pk
Ref: No. DP/RGT-188278/8506/412 Date: 30.09.2025

SAY NO TO CORRUPTION

نوٹس برائے طلبی ٹینڈر (EPADS)

NEDUET سرحد پولیس سٹیشن ایک فاسٹ کے طریقہ کار کے تحت آن لائن دیکھی رکھتے
والے ہونی دیکھ گاہ سے طلب کرتے ہیں۔ درج ذیل کام کے لیے طلبہ نوٹس کے
مضمون کو اہم دیکھنے کا مقررہ قواعد پر عمل کرنا ہوگا۔

Construction of Building for the Department of Mechanical Engineering at Thar Institute of Engineering, Sciences & Technology-TIEST at Tharparkar. (1st Floor)			
Tender No. PC/NED/RGT/ Construction/8506/2025			
دستور نامہ کے آپریٹنگ تاریخ	آپریٹنگ تاریخ کے آخری تاریخ	نیز رزنگ کرانے کی تاریخ	نیز رزنگ کرانے کی تاریخ
03.10.2025	20.10.2025	21.10.2025 10.00 AM	21.10.2025 10.30 AM
تفصیلی (مستند روپے)		161.216	
تفصیلی کارڈ		12	

اہلیت کے معیار:

- (i) پاکستان ٹینڈرنگ کونسل کے مقررہ قواعد کے تحت C پاس سے مراد کم از کم پاسنگ نمرات
گزار: EE-02, ME-02, CE-11, CE-10, CE-09, EE-11, CE-08
رہنمائی، گھبراہٹ اور کوئی ای سی کورسٹ رہنمائی سرٹیفکیٹ منسلک کرنا ہے۔
 - (ii) حکومت سندھ سے جاری کردہ انٹرنیشنل ورکس کے لیے انٹرنیشنل ایجنٹر کا
دستور نامہ پاس کرنا ہے۔
 - (iii) برقی دہندہ کو اہم اور بیکرنگس دونوں کے لیے ایف بی آر اور سندھ ریلوے بورڈ -
ایس آر بی میں رجسٹرڈ ہونا چاہیے، پہلی کا نام تبدیل نہیں دیکھ گاہ کی فہرست
(ایس بی ایس) میں شامل ہونا چاہیے۔ گھبراہٹ اور کوئی ای سی کورسٹ رہنمائی سرٹیفکیٹ منسلک کرنا ہے۔
سرٹیفکیٹ کی کاپی اور ATL سے پرنٹ بھی منسلک کرنا ہے۔
 - (iv) (تین ہزار اسی لاکھ روپے) پر مبنی نرس میں کوئی فائونڈیشن یا پورٹل کی تاریخ
ہو، ایک سٹریٹ ہو، کسی بھی قسم کی فائونڈیشن یا پورٹل کی تاریخ
موت نہ ہو، یہ بھی واضح کرنا ہے کہ فراہم کردہ مضامین اور دستاویزات
درست ہیں۔ نہ گورنمنٹ ہونے کی تاریخ اور اس پر ہونی دیکھ گاہ کے
دستور نامہ NIT کی شامت کی تاریخ کے بعد کے ہونے چاہئیں۔
 - (v) دور دراز علاقوں میں خاص طور پر صحرائی علاقوں یا دور دراز مقامات پر ای سی نوٹس
کے مضمون کی تکمیل کا تجربہ ہونا۔
 - (vi) ہائیں مخصوص طور پر EPADS کے ذریعے منسلک کرنا چاہیے۔ وہی ہائیں قبول
نہیں کی جائیں گی۔ تاہم، برقی دہندہ کو بھی منسلک کرنا ہے کہ اصل اور فرائیڈ
سکائی وئی ٹینڈر منسلک کرنا ہے یا اس سے پہلے اپنی ڈاکیمنٹ پر دیکھ گاہ کے دفتر تک
آئی جائے۔ اس ٹینڈر دستاویز میں جو بھی منسلک منسلک کرنا ہے کہ اس کا مطالبہ کرتی
ہے اسے جہاں کہا جاتا ہے اسے "EPADS" کے ذریعے "منسلک کرنا ہے۔
- یہ آرڈر کی اصل میں ہونی کی اگست کے 20% یا بڑھ کر ڈاکیمنٹ منسلک، ایس ای ای ای
یو ایس کے منسلک ہونی چاہیے۔ ہونی کے دستاویزات حاصل کیے جاسکتے ہیں اور نہ گورنمنٹ
کے مطابق EPADS کے ذریعے منسلک کرنا ہے۔ ہونی دیکھ گاہ سے درخواست کی جاتی
ہے کہ وہ اپنی بیکریں اور منسلک دیکھ گاہ کی "کوئی گھبراہٹ" کی ہائیں منسلک ہے۔ منسلک
ڈاکیمنٹ منسلک ہونی کے دستاویزات ویب سائٹس <https://www.neduet.edu.pk>
اور <https://www.portalsindh.eprocure.gov.pk> پر دستیاب ہیں۔
- NEDUET منسلک ہونی کی آرڈر دیکھ گاہ کے تحت کی منسلک ڈاکیمنٹ منسلک کرنا ہے۔
کرنا کا منسلک دیکھ گاہ ہے۔

ڈائریکٹر پروفیکورمنٹ

