



**STATE BANK OF PAKISTAN
SBP BANKING SERVICES CORPORATION
ENGINEERING DEPARTMENT
HEAD OFFICE KARACHI**

VOLUME-I

VOLUME I: TECHNICAL PROPOSAL

Bidding documents

For

**CONSTRUCTION OF ADDITIONAL SLAB FOR HVAC COOLING TOWERS
AND STRUCTURAL STRENGTHENING OF EXISTING HVAC PLANT
ROOM AND STORE BUILDING, SBP HEAD OFFICE KARACHI**

BIDDING AND CONTRACT DOCUMENT

INVITATION TO BID
INSTRUCTIONS TO BIDDERS
BIDDING DATA
FORM OF BID
QUALIFICATION CRITERIA
CONDITIONS OF CONTRACT
STANDARD FORMS
DRAWINGS
SPECIFICATIONS

Feb-26



SBP BANKING SERVICES CORPORATION
Engineering Department
Head Office Karachi

ITB No. ED/PROC-HOK/1083186/2026/308

INVITATION TO e-BID

1. SBP Banking Services Corporation, invites electronic bids from the suppliers/ contractors'/ service providers, who are registered with PPRA for E-Procurement on "e-Pak Acquisition and Disposal system (EPADS)", having Income & Sales Tax registration and are on Active Taxpayers List (ATL) of FBR.

Sr. No.	Tender No	Title of Procurement	Date & Time of		Bid Security (Rs.)
			Bid Submission	Bid Opening	
1.	308	Construction of additional slab for HVAC Cooling Towers and structural strengthening of existing HVAC Plant Room and Store Building, SBP Head Office Karachi	12-Mar-26 till 12:00 PM	12-Mar-26 at 12:30 PM	500,000/-

2. E-bidding documents as per regulations, containing detailed terms and conditions, specifications and requirements etc. are available for the registered bidders on EPADS at (www.eprocure.gov.pk).
3. The bidding shall be conducted in line with the Single Stage - Two Envelope Procedure - Rule 36 (b), prescribed under Public Procurement Rules 2004, e-Pak Procurement Regulations 2023 and any Regulations, Regulatory Guides, Procurement Guidelines or Instructions issued by the Authority (from time to time), and is open to all potential bidders registered in the EPADS.
4. All Bids must be accompanied by a Bid Security in the shape Payment Order/Bank Draft or an unconditional Bank Guarantee enforceable in Pakistan as mentioned in the table. The scanned copy of the Bid Security shall be uploaded in the EPADS while submitting bid, whereas the original Bid Security shall be submitted to the procuring agency at the Address mentioned before the bid submission deadline. The bidder who failed to submit the original bid security before the deadline shall be disqualified straightaway.
5. The e-bids, prepared in accordance with the instructions in the e-Bidding documents, must be submitted through EPADS on or before date/time specified in the table. E-bids will be opened on the same day at schedule mentioned in the table. Manual submission of Bids shall not be entertained. In case the bid opening date falls on a public holiday, the bids will be opened on the next working day at the same time.
6. In terms of Rules 48 of Public Procurement Rules, 2004 Grievance Redressal Committee (GRC) is notified for the subject procurement and notification copy is available on the procuring agency's website (www.sbp.org.pk) and on Authority's website at (www.ppra.org.pk).

Sd/-

Director Engineering
SBP Banking Services Corporation
Proc. Unit, Engg. Dept., 1st Floor Bolton Market
Building, MA Jinnah Road, Karachi
Phone: (92-21)-32454105, 32464122, Facsimile: 92-21-99221176
Website: www.sbp.org.pk

Table of Contents

VOLUME I: TECHNICAL PROPOSAL	1
SECTION II: INSTRUCTIONS TO BIDDERS	5
A. Introduction	5
B. Bidding Documents	7
C. Preparation of Bids	8
D. Submission of Bids.....	12
E. Opening and Evaluation of Bids	13
F. Award of Contract.....	19
G. Grievance Redressal & Complaint Review Mechanism	21
H. Mechanism of Blacklisting.....	22
SECTION III: BID DATA SHEET.....	24
SECTION IV: ELIGIBLE COUNTRIES, AND QUALIFICATION CRITERIA.....	26
SECTION V: WORKS REQUIREMENT, SCHEDULE	28
SECTION VI: STANDARD BIDDING FORMS.....	30
SECTION VII: GENERAL CONDITIONS (GC)	35
SECTION VIII: SPECIAL CONDITIONS OF THE CONTRACT.....	36
PART A – CONTRACT DATA	36
PART B – SPECIAL PROVISIONS.....	39
SECTION IX: CONTRACT FORMS	50
SECTION X - TECHNICAL SPECIFICATIONS & DRAWINGS	55
DRAWINGS.....	56
VOLUME-II: FINANCIAL PROPOSAL.....	1
Preamble.....	2
Bill of Quantities (BOQ).....	3

SECTION II: INSTRUCTIONS TO BIDDERS

A. Introduction		
1. Scope of Bid	1.1	The Procuring agency/Employer (PA), as indicated in the Bid Data Sheet (BDS) invites Bids for the execution of Works as specified in the BDS and Section V- Works Requirements . The name, identification, and number of lots (contracts) of this National/ International Competitive Bidding process are specified in BDS.
2. Source of Funds	2.1	Source of funds as referred in Bid Data Sheet.
3. Eligible Bidders	3.1	A bidder may be natural person, company or firm or public or semi-public agency of Pakistan or any foreign country, or any combination of them with a formal existing agreement (on Judicial Papers) in the form of a joint venture or consortium. In the case of a joint venture or consortium, all members shall be jointly and severally liable for the execution of the Contract in accordance with the terms and conditions of the Contract. The joint venture or consortium shall nominate a Lead Member as nominated in the BDS, who shall have the authority to conduct all business for and on behalf of any and all the members of the joint venture or consortium during the Bidding process, and in case of award of contract, during the execution of contract. <i>(The limit on the number of members of JV or Consortium may be prescribed in BDS, in accordance with the guidelines issued by the PPRA).</i>
	3.2	The appointment of Lead Member in the joint venture or consortium shall be confirmed by submission of a valid Power of Attorney to the Procuring agency/Employer
	3.3	Verifiable copy of the agreement that forms a joint venture or consortium shall be required to be submitted as part of the Bid.
	3.4	Any bid submitted by the joint venture or consortium shall indicate the part of proposed contract to be performed by each party and each party shall be evaluated (or post qualified if required) with respect to its contribution only, and the responsibilities of each party shall not be substantially altered without prior written approval of the Procuring agency/Employer and in line with any instructions issued by the Authority.
	3.5	The invitation for bids is open to all prospective bidder's subject to any provisions of incorporation or licensing by the respective national/ international incorporating agency or statutory body established for that particular trade or business.
	3.6	Foreign Bidders must be locally registered with the appropriate national incorporating body or the statutory body, before participating in the national/international competitive bidding with the exception of such procurements made by the foreign missions of Pakistan. For such purpose the bidder must have to initiate the registration process before the bid submission and the necessary evidence shall be submitted to the Procuring agency/Employer along with their bid, however, the final award will be subject to the complete registration process.
	3.7	A Bidder shall not have a conflict of interest. All Bidders found to have a conflict of interest shall be disqualified. A Bidders may be considered to have a conflict of interest with one or more parties in this Bidding process, if they: a) are associated or have been associated in the past, directly or indirectly with a firm or any of its affiliates which have been engaged by the Procuring agency/Employer to provide consulting services for the preparation of design or technical specifications of the works that are the subject of the bid; or b) any of its affiliates has been hired (or is proposed to be hired) by the Procuring agency/Employer as Engineer for the Contract implementation; or c) The works to be executed are resulting from or directly related to consulting services for the preparation or implementation of the project that the bidder provided or were provided by any affiliate that directly or indirectly controls, is controlled by, or is under common control with that firm; d) have controlling shareholders in common; or e) receive or have received any direct or indirect subsidy from any of them; or f) have the same legal representative for purposes of this Bid; or g) have a relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the bid of another

		bidder, or influence the decisions of the Procuring agency/Employer regarding this Bidding process; or h) Submit more than one bid in this bidding process.
	3.8	A Bidder may be ineligible if – (a) he is declared bankrupt or, in the case of company or firm, insolvent; (b) payments in favor of the bidder is suspended in accordance with the judgment of a court of law other than a judgment declaring bankruptcy and resulting (in accordance with the national laws) in the total or partial loss of the right to administer and dispose of its property; (c) legal proceedings are instituted against such bidder involving an order suspending payments and which may result, in accordance with the national laws, in a declaration of bankruptcy or in any other situation entailing the total or partial loss of the right to administer and dispose of the property; (d) the bidder is convicted, by a final judgment of a Court of Law or relevant Professional Statuary Body, of any offence involving professional conduct; (e) The bidder is debarred/ blacklisted by a national level Procuring agency/Employer and hence debarred due to involvement in corrupt and fraudulent practices, or performance failure or due to breach of bid securing declaration. (f) The bidder is blacklisted or debarred by a foreign country, international organization, or other foreign institutions for the period defined by them.
	3.9	Bidders shall provide to the Procuring agency/Employer evidence of their eligibility, proof of compliance with the necessary legal requirements to carry out the contract effectively.
	3.10	Bidders shall provide such evidence of their continued eligibility to the satisfaction of the Procuring agency/Employer, as the Procuring agency/Employer shall reasonably request.
	3.11	Bidders shall submit proposal relating to the nature, conditions and modalities of sub-contracting wherever the sub-contracting of any elements of the contract is envisaged.
4. Eligible Material and Equipment	4.1	All the material and equipment to be mobilized under the contract shall have their origin in eligible source countries, and all expenditures made under the contract will be limited to such materials and equipment. For this purpose, ineligible countries are stated in the section-IV titled as “Eligible Countries”.
	4.2	For purposes of this Clause, “origin” means the place where the material, equipment is produced, manufactured, or processed, or through manufacture, procession, or assembly, another commercially recognized article results that differs substantially in its basic characteristics from its imported components or the place from where the services are/to be supplied.
	4.3	The nationality of the bidder shall not determine the origin of the material and equipment.
	4.4	To establish the eligibility of the material and equipment, Bidders shall fill the country-of-origin declarations included in the Form of Bid.
5. One Bid per Bidder	5.1	A bidder shall submit only one bid, in the same bidding process, either individually as a bidder or as a member in a joint venture or any similar arrangement.
	5.2	No bidder can be a sub-contractor while submitting a bid individually or as a member of a joint venture in the same bidding process.
6. Cost of Bidding	6.1	The Bidder shall bear all costs associated with the preparation and submission of its bid, and the Procuring agency/Employer shall in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

B. Bidding Documents		
7. Contents of Bidding Documents	7.1	The scope of Works, bidding procedures, and terms and conditions of the contract are prescribed in the bidding documents. In addition to the Invitation for Bids, the bidding documents which should be read in conjunction with any addenda issued in accordance with ITB 9.2 include: Section I -Invitation for Bids Section II Instructions to Bidders (ITBs) Section III Bid Data Sheet (BDS) Section IV Eligible Countries Section V Works Requirements Technical Specifications & Schedule of Requirements Section VI Standard Bidding Forms Section VII General Conditions of Contract (GCC) Section VIII Special Conditions of Contract (SCC) Section IX Contract Forms
	7.2	The number of copies to be completed and submitted with the Bid is specified in the BDS .
	7.3	The Procuring agency/Employer is not responsible for the completeness of the bidding documents and their addenda, if they were not obtained directly from the Procuring agency/Employer or the signed pdf version downloaded from the website of the Procuring agency/Employer or the Authority's website or e-Procurement System as the case may be. However, procuring agency/Employer shall place both the pdf and editable version of the same on its website and Authority's website or e-Procurement System to facilitate the bidder for filling the standard bidding forms.
	7.4	The bidder is expected to examine all instructions, forms, specifications, terms and conditions prescribed in the bidding documents. Failure to furnish all the information required in the bidding documents will be at the bidder's risk and may result in the rejection of his bid.
8. Clarification of Bidding Document, Pre-bid Meeting	8.1	A prospective bidder requiring any clarification of the bidding document may notify the Procuring agency/Employer in writing or in electronic form that provides record of the contents of communication at the Procuring agency/Employer's address indicated in the BDS .
	8.2	The Procuring agency/Employer will within three (3) working days after receiving the request for clarification, respond in writing or in electronic form to any request for clarification provided that such request is received not later than three (03) days prior to the deadline for the submission of Bids as prescribed in ITB 24.1 . However, this clause shall not apply in case of alternate methods of procurement.
	8.3	Copies of the Procuring agency/Employer's response will be forwarded to all identified prospective bidders through an identified source of communication, including a description of the inquiry, but without specifying its source. In case of downloading of the bidding documents from the website of Procuring agency/Employer or e-Procurement System, the response of all such queries will also be available on the same platform available at the website.
	8.4	Should the Procuring agency/Employer deem it necessary to amend the bidding documents as a result of a clarification, it shall do so following the procedure as prescribed under ITB 09 .
	8.5	If indicated in the BDS , the bidder's designated representative is invited at the bidder's cost to attend a pre-bid meeting at the place, date and time mentioned in the BDS . During this pre-bid meeting, prospective bidders may request clarification of the schedule of requirement, the evaluation criteria or any other aspects of the bidding documents.
	8.6	Minutes of the pre-bid meeting, if applicable, including the text of the questions asked by bidders, including those during the meeting (without identifying the source) and the responses given, together with any responses prepared after the meeting will be transmitted promptly to all prospective bidders who have obtained the bidding documents. Any modification to the bidding documents that may become necessary as a result of the pre-bid meeting shall be made by the Procuring agency/Employer exclusively through the use of an

		Addendum pursuant to ITB 9 . Non-attendance at the pre-bid meeting will not be a cause for disqualification of a bidder.
	8.7	The bidder is advised to visit and examine the Site of Works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the bidder's own expense.
	8.8	The bidder and any of its authorized personnel will be granted permission by the Procuring agency/Employer to enter upon its premises and lands for the purpose of such visit, but only upon the express condition that the bidder and its personnel will release and indemnify the Procuring agency/Employer 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 the inspection.
9. Amendment of Bidding Documents	9.1	Before the deadline for submission of bids, the Procuring agency/Employer for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder or pre-bid meeting may modify the bidding documents by issuing addenda.
	9.2	Any addendum issued including the notice of any extension of the deadline shall be part of the bidding documents pursuant to ITB 7.1 and shall be communicated in a timely manner and on equal opportunity basis. Where notification of such change, addition, modification or deletion becomes essential, such notification shall be made in a manner similar to the original advertisement. <i>Provided that the bidder who had either already submitted their bid or handed over the bid to the courier prior to the issuance of any such addendum shall have the right to withdraw his already filed bid and submit the revised bid prior to the original or extended bid submission deadline.</i>
	9.3	To give prospective bidders reasonable time in which to take an addendum/corrigendum into account in preparing their bids, the Procuring agency/Employer may, at its discretion, extend the deadline for the submission of bids: <i>Provided that the Procuring agency/Employer shall extend the deadline for submission of bid, if such an addendum is issued within last three (03) days of the bid submission deadline.</i>
C. Preparation of Bids		
10. Language of Bid	10.1	The bid prepared by the bidder, as well as all correspondence and documents relating to the bid exchanged by the bidder and the Procuring agency/Employer shall be written in the English language unless specified in the BDS . Supporting documents and printed literature furnished by the bidder may be in another language provided they are accompanied by an accurate translation of the relevant pages in the English language unless specified in the BDS , in which case, for purposes of interpretation of the bidder, the translation shall govern.
11. Documents Establishing Eligibility of Material, Equipment and Works, their Conformity to Bidding Documents	11.1	The bid prepared by the bidder shall constitute the following components: - a) Documentary evidence established in accordance with ITB 11 that the material, equipment and services to be provided by the Bidder are eligible material, equipment and services, and conform to the Bidding Documents; b) Documentary evidence established in accordance with ITB 12 that the bidder has been authorized to carry out the Construction works; c) Documentary evidence established in accordance with ITB 12 that the bidder is eligible and/or qualified for the subject bidding process; d) Form of Bid and Bid Prices completed in accordance with ITB 14 and 15 ; e) Completed schedules as required, including priced Bill of Quantities in accordance with ITB 13 & 15 . f) Technical Proposal completed in all aspects in accordance with ITB-17 . g) Bid security or Bid Securing Declaration furnished in accordance with ITB 19 ; h) Alternative bids, if permissible, in accordance with ITB 20 ; i) Duly Notarized Power of Attorney authorizing the signatory of the Bidder to submit the bid; and j) Any other document required in the BDS .
	11.2	In addition to the requirements, bids submitted by a JV shall include a copy of the Joint Venture Agreement entered into by all members. Alternatively, a letter of intent to execute

		a Joint Venture Agreement in the event of a successful bid shall be signed by all members and submitted with the bid, together with a copy of the proposed Agreement.
	11.3	The bidder shall furnish, as part of its bid, all those documents establishing the eligibility in conformity to the terms and conditions specified in the bidding documents for all material, equipment and works which the bidder proposes to execute.
	11.4	The documentary evidence of conformity of the material, equipment and works to the Bidding Documents may be in the form of literature, drawings, and data, and shall consist of: a) a detailed description of the work methodology, approach, schedule and resources to be mobilized at site; b) an item-by-item commentary on the Procuring agency/Employer's Technical Specifications demonstrating substantial responsiveness of the material, equipment and works to those specifications, or a statement of deviations and exceptions to the provisions of the Technical Specifications; c) any other procurement specific documentation requirement as stated in the BDS.
	11.5	The required documents and other accompanying documents must be in English. In case any other language than English is used the pertinent translation into English shall be attached to the original version.
12. Documents Establishing Eligibility and Qualification of the Bidder	12.1	The bidder shall furnish, as part of its bid, all those documents establishing the bidder's eligibility to participate in the bidding process and/or its qualification to perform the contract if its bid is accepted.
	12.2	The documentary evidence of the bidder's eligibility to bid shall establish to the satisfaction of the Procuring agency/Employer that the bidder, at the time of submission of its bid, is from an eligible country as defined in Section-IV titled as "Eligible Countries".
	12.3	The documentary evidence of the bidder's qualification to perform the contract if its bid is accepted shall establish to the satisfaction of Procuring agency/Employer that: a) The bidder has the financial and technical capability necessary to perform the Contract, meets the qualification criteria specified in Section-V, Evaluation and Qualification Criteria and BDS. b) In the case of a bidder not doing business within Pakistan, the bidder is or will be (if awarded the contract) represented by a local bidder (Joint Venture) in accordance with the PEC works bylaws, and in case of award of works such foreign firm is required to participate in the execution of works to carry out its obligations as prescribed in the Conditions of Contract and /or Technical Specifications. c) That the bidder meets the qualification criteria listed in Section-V, Evaluation and Qualification Criteria and BDS.
13. Letter of Bid and Schedules	13.1	The Letter of Bid (Technical or Financial as the case may be) and Schedules, including the Bill of Quantities, shall be prepared using the relevant forms furnished in Standard Bid Forms. The forms must be completed without any alterations to the text, and no substitutes shall be accepted except as provided under ITB 22 . All blank spaces shall be filled in with the information requested.
14. Letter of Bid	14.1	The bidder shall fill the Letter of Bid (Technical or Financial as the case may be) furnished in the bidding documents. The Standard Bid Forms must be completed without any alterations to its format and no substitute shall be accepted.
15. Bid Prices	15.1	The bid prices quoted by the bidder in the Standard bid Forms, Bill of Quantities and in the Price Schedules shall conform to the requirements specified below or exclusively mentioned hereafter in the bidding documents.
	15.2	The bidder shall fill in rates and prices for all items of the Works described in the Bill of Quantities. If a Price Schedule shows items listed but not priced, their prices shall be construed to be included in the prices of other items in the Bill of Quantities and will not be paid for separately by the Procuring agency/Employer.

	15.3	Items not listed in the Price Schedule shall be assumed not to be included in the bid, and provided that the bid is still substantially responsive in their absence or due to their nominal nature, the corresponding average price of the respective item(s) of the remaining substantially responsive bidder(s) shall be construed to be the price of those missing item(s): Provided that: a) where there is only one (substantially) responsive bidder, or b) where there is provision for alternate proposals and the respective items are not listed in the other bids, The Procuring agency/Employer may fix the price of missing items in accordance with market survey, and the same shall be considered as final price.
	15.4	The Bid price to be quoted in the Form of Bid in accordance with ITB 15.1 shall be the total price of the bid.
	15.5	Unless otherwise specified in the BDS and the Contract, the rates and prices quoted by the bidder are subject to adjustment during the performance of the Contract in accordance with the provisions of the Conditions of Contract.
	15.6	If so specified in ITB 1.1 , bids may be invited for individual lots (contracts) or for any combination of lots (packages).
	15.7	Prices quoted by the Bidder shall be fixed during the bidder's performance of the contract and not subject to variation on any account. A bid submitted with an adjustable price will be treated as non-responsive and shall be rejected, pursuant to ITB 30 , unless otherwise price adjustment is permissible under Conditions of the Contract.
	15.8	All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, as of the date twenty-eight (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 the bidder.
16. Currencies of Bid and Payment	16.1	The currency(ies) of the bid and the currency(ies) of payments shall be as specified in the BDS .
	16.2	For the purposes of comparison of bids quoted in different currencies, the price shall be converted into a single currency specified in the bidding documents. The rate of exchange shall be the selling rate, prevailing on the date of opening of (financial part of) bids specified in the bidding documents, as notified by the State Bank of Pakistan on that day.
	16.3	Bidders shall indicate details of their expected foreign currency requirements in the Bid, if prescribed in the BDS .
	16.4	Bidders may be required by the Procuring agency/Employer to clarify their foreign currency requirements, if prescribed in the BDS and to substantiate that the amounts included in Lump Sum and in the SCC are reasonable and responsive to ITB 16.1 .
17. Documents Comprising the Technical Proposal	17.1	The bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, schedule and any other information as stipulated in Section IV – Standard Bid Forms , in sufficient detail to demonstrate the adequacy of the bidder's proposal to meet the work requirements and the completion time.
18. Bid Validity Period	18.1	Bids shall remain valid for the period specified in the BDS after the bid submission deadline prescribed by the Procuring agency/Employer. A bid valid for a shorter period shall be rejected by the Procuring agency/Employer as non-responsive. The period of bid validity will be determined from the complementary bid securing instrument i.e. the expiry period of bid security or bid securing declaration as the case may be.
	18.2	Under exceptional circumstances, prior to the expiration of the initial bid validity period, the Procuring agency/Employer may request the bidders' consent to an extension of the period of validity of their bids only once, for the period not more than the period of initial bid validity. The request and the bidders' responses shall be made in writing or in electronic forms that provide record of the content of communication. The Bid Security provided under ITB 19 shall also be extended 28 days beyond the deadline of extended bid validity period. A bidder may refuse the request for the extension of his bid without forfeiting his bid security or causing to be executed his Bid Securing Declaration. A bidder agreeing to the request will not be required nor permitted to modify its bid, but will be required to extend the validity of its Bid Security or Bid Securing Declaration for the period of the extension, and in compliance with ITB 19 in all respects.

19. Bid Security or Bid Securing Declaration	19.1	Pursuant to ITB 11.1 unless otherwise specified in the BDS , the bidder shall furnish as part of its bid, a Bid Security in form of fixed amount not exceeding five percent of the estimated value of procurement determined by the Procuring agency/Employer and in the amount and currency specified in the BDS or Bid Securing Declaration as specified in the BDS in the format provided in Section VI (Standard Bidding Forms) . In case Procuring agency/Employer is inviting bids in lots / packages, the bidder shall be required to submit his bid security against the respective lot/ package for which he is submitting his bid, which shall not exceed five percent of the estimated value of that particular lot/ package.
	19.2	The Bid Security or Bid Securing Declaration is required to protect the Procuring agency/Employer against the risk of Bidder's conduct before award of the contract to the most advantageous bidder which would warrant the security's forfeiture, pursuant to ITB 19.9 .
	19.3	The Bid Security shall be denominated in the local currency or in another freely convertible currency, and it shall be in the form specified in the BDS which shall be in any of the following: a) A bank guarantee, an irrevocable letter of credit issued by a Scheduled bank in the form provided in the Bidding Documents or another form acceptable to the Procuring agency/Employer and valid for twenty-eight (28) days beyond the end of the validity of the Bid. This shall also apply if the period for Bid Validity is extended. In either case, the form must include the complete name of the bidder; b) A cashier's or certified cheque; or c) Another security as indicated in the BDS .
	19.4	The Bid Security or Bid Securing Declaration shall be in accordance with the Form of the Bid Security or Bid Securing Declaration included in Section VI (Standard Bidding Forms) or another form approved by the Procuring agency/Employer prior to the bid submission.
	19.5	The Bid Security shall be payable promptly upon written demand by the Procuring agency/Employer in case any of the conditions listed in ITB 19.9 are invoked.
	19.6	Any bid not accompanied by a Bid Security or Bid Securing Declaration in accordance with ITB 19.1 or 19.3 shall be rejected by the Procuring agency/Employer and shall be declared as non-responsive bid, pursuant to ITB 30 .
	19.7	Unsuccessful bidders' Bid Security will be discharged or returned as promptly as possible, however in no case later than thirty (30) days after the expiration of the period of Bid Validity prescribed by the Procuring agency/Employer pursuant to ITB 18 . The Procuring agency/Employer shall make no claim to the amount of the Bid Security, and shall promptly return the Bid Security document, after whichever of the following that occurs earliest: (a) The expiry of the Bid Security; (b) The entry into force of a procurement contract and the provision of a performance security (or guarantee), for the performance of the contract if such a security (or guarantee), is required by the Bidding documents; (c) The rejection by the Procuring agency/Employer of all Bids; (d) The withdrawal of the bid prior to the deadline for the submission of bids, unless the bidding documents stipulate that no such withdrawal is permitted.
	19.8	The successful bidder's Bid Security will be discharged upon the bidder signing the contract pursuant to ITB 47 , or furnishing the performance security (or guarantee), pursuant to ITB 48 .
	19.9	The Bid Security may be forfeited or the Bid Securing Declaration executed: a) if a Bidder: i) Withdraws its Bid during the period of Bid Validity as specified by the Procuring agency/Employer, and referred by the bidder on the Form of Bid except as provided for in ITB 18.2 ; or ii) Does not accept the correction of errors pursuant to ITB 32 ; or b) In the case of a successful bidder, if the bidder fails: i) to sign the contract in accordance with ITB 47 ; or

		ii) to furnish performance security (or guarantee) in accordance with ITB 48 .
	19.10	In case of Bid Security issued by the foreign bank is allowed by the Procuring agency/Employer, the same should be counter guaranteed by a corresponding bank in Pakistan. Furthermore, in case of joint venture, it should be in the name of Joint venture to ensure joint responsibility.
20. Alternative Bids by Bidders	20.1	Bidders shall submit offers that comply with the requirements of the bidding documents, including the basic bidder's technical design as indicated in the specifications and Bill of Quantities. Alternatives will not be considered, unless specifically allowed for in the BDS . If so allowed, ITB 20 shall prevail.
	20.2	When alternative schedule for execution of works is explicitly invited, a statement of that effect will be included in the BDS as will the method for evaluating different schedule for execution of works.
	20.3	If so allowed in the BDS , bidders wishing to offer technical alternatives to the requirements of the bidding documents must also submit a bid that complies with the requirements of the bidding documents, including the basic technical design as indicated in the specifications. In addition to submitting the basic bid, the bidder shall provide all information necessary for a complete evaluation of the alternative by the Procuring agency/Employer, including technical specifications, breakdown of prices, and other relevant details. Only the technical alternatives, if any, of the Most Advantageous Bidder conforming to the basic technical requirements (without altering the bid price) shall be considered by the Procuring agency/Employer.
21. Withdrawal of Bids	21.1	Before bid submission deadline, any bidder may withdraw, substitute, or modify its bid after it has been submitted by sending a written notice, duly signed by an authorized representative, and the corresponding must accompany the respective written notice.
	21.2	Bids requested to be withdrawn in accordance with ITB 21.1 shall be returned unopened to the bidders.
22. Format and Signing of Bid	22.1	The Bidder shall prepare an original and the number of copies of the bid as indicated in the BDS , clearly marking each " ORIGINAL " and " COPY " as appropriate. In the event of any discrepancy between them, the original shall prevail: <i>Provided that except in Single Stage One Envelope Procedure, the bid shall include only the copies of technical proposal.</i>
	22.2	The original and the copy (ies) of the bid shall be typed or written in indelible ink and shall be signed by the bidder or a person or persons duly authorized to sign on behalf of the bidder. This authorization shall consist of a written confirmation as specified in the BDS 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 un-amended printed literature, shall be initialed by the person or persons signing the bid.
	22.3	Any interlineations, erasures, or overwriting shall be valid only if they are signed by the person(s) authorized for signing the Bid.
D. Submission of Bids		
23. Sealing and Marking of Bids	23.1	In case of Single Stage One Envelope Procedure, the bidder shall seal the original and each copy of the bid in separate envelopes, duly marking the envelopes as " ORIGINAL " and " COPY ". The envelopes shall then be sealed in an outer envelope securely sealed in such a manner that opening and resealing cannot be achieved undetected. Note: <i>The envelopes shall be sealed and marked in accordance with the bidding procedure adopted as referred in Rule-36 of Public Procurement Rules, 2004.</i>
	23.2	The inner and outer envelopes shall: a) be addressed to the Procuring agency/Employer at the address given in the BDS ; and b) bear the title of the subject procurement or project name, as the case may be as indicated in the BDS , the Invitation for Bids (ITB) title and number indicated in the BDS , and a statement: " DO NOT OPEN BEFORE ", to be completed with the time and the date specified in the BDS , pursuant to ITB 24.1 .
	23.3	In case of Single Stage Two Envelope Procedure, The Bid shall comprise two envelopes submitted simultaneously, one called the Technical Proposal and the other Financial

		Proposal. Both envelopes to be enclosed together in an outer single envelope called the Bid. Each Bidder shall submit his bid as under: a) Bidder shall submit his TECHNICAL PROPOSAL and FINANCIAL PROPOSAL in separate inner envelopes and enclosed in a single outer envelope. b) ORIGINAL and each copy of the Bid shall be separately sealed and put in separate envelopes and marked as such. c) The envelopes containing the ORIGINAL and copies will be put in one sealed envelope and addressed / identified as given in ITB 23.2.
	23.4	The inner and outer envelopes shall: a) be addressed to the Procuring agency/Employer at the address provided in the BDS; b) bear the name and identification number of the contract as defined in the BDS; and provide a warning not to open before the time and date for bid opening, as specified in the BDS pursuant to ITB 24.1. c) In addition to the identification required in ITB 23 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 ITB 25.
	23.5	If all envelopes are not sealed and marked as required by ITB 23.2 , ITB 23.3 and ITB 23.4 or incorrectly marked, the Procuring agency/Employer will assume no responsibility for the misplacement or premature opening of bid.
24. Deadline for Submission of Bids	24.1	Bids shall be received to the Procuring agency/Employer no later than the date and time specified in the BDS .
	24.2	The Procuring agency/Employer may, under exceptional circumstances and at its discretion, extend the deadline for the submission of bids by amending the Bidding Documents in accordance with ITB 9 , in which case all rights and obligations of the Procuring agency/Employer and bidders previously subject to the deadline will thereafter be subject to the new deadline.
25. Late Bids	25.1	The Procuring agency/Employer shall not consider for evaluation of any bid that arrives after the deadline for submission of bids, in accordance with ITB 24 .
	25.2	Any bid received by the Procuring agency/Employer after the deadline for submission of bids shall be declared late, recorded, rejected and returned unopened to the bidder.
26. Substitution and Modification of bids	26.1	A bidder may substitute or modify his bid after it has been submitted, provided that written notice of the substitution or modification of the bid, is received by the Procuring agency/Employer prior to the deadline for submission of bids.
	26.2	Revised bid may be submitted after the substitution or modification made in the original bid in accordance with the provisions referred in ITB 22 .
E. Opening and Evaluation of Bids		
27. Opening of Bids	27.1	The Procuring agency/Employer will open all bids, in public, in the presence of bidders' or their representatives who choose to attend, and other parties with a legitimate interest in the bid proceedings at the place, on the date and at the time, specified in the BDS . The bidders' representatives present shall sign a attendance sheet as a proof of their attendance.
	27.2	First, envelopes marked " WITHDRAWAL " shall be opened and read out and the envelope with the corresponding bid shall not be opened, but returned to the bidder. No bid withdrawal shall be permitted unless the corresponding withdrawal notice contains a valid authorization to request the withdrawal and is read out at bid opening.
	27.3	Second, outer envelopes marked " SUBSTITUTION " shall be opened. The inner envelopes containing the Substitution Bid shall be exchanged for the corresponding Original Bid being substituted, which is to be returned to the bidder unopened. No envelope shall be substituted unless the corresponding Substitution Notice contains a valid authorization to request the substitution and is read out and recorded at bid opening.
	27.4	Next, outer envelopes marked " MODIFICATION " shall be opened. No Technical Proposal and/or Financial Proposal shall be modified unless the corresponding Modification Notice contains a valid authorization to request the modification and is read out and recorded at the opening of the bids. Any modification shall be read out along with the Original Bid except in case of Single Stage Two Envelope Procedure where only the

		Technical Proposal, both Original as well as Modification, are to be opened, read out, and recorded at the opening. Financial Proposal, both Original and Modification, will remain unopened till the prescribed financial bid opening date.
	27.5	Other envelopes holding the bids shall be opened one at a time, in case of Single Stage One Envelope Procedure, the bidders' names, the bid prices, the total amount of each bid and of any alternative bid (if alternatives have been requested or permitted), the presence or absence of Bid Security, Bid Securing Declaration and such other details as the Procuring agency/Employer may consider appropriate, will be announced by the Procurement Evaluation Committee.
	27.6	In case of Single Stage Two Envelope Procedure, the Procuring agency/Employer will open the Technical Proposals in public at the address, date and time specified in the BDS in the presence of bidders' designated representatives who choose to attend and other parties with a legitimate interest in the bid proceedings. The Financial Proposals will remain unopened and will be held in custody of the Procuring agency/Employer until the specified time of their opening.
	27.7	The envelopes holding the Technical Proposals shall be opened one at a time, and the following read out and recorded: (a) the name of the bidder; (b) whether there is a modification or substitution; (c) the presence of a Bid Security or Bid Securing Declaration, if required; and (d) Any other details as the Procuring agency/Employer may consider appropriate.
	27.8	Bids not opened and not read out at the bid opening shall not be considered further for evaluation, irrespective of the circumstances.
	27.9	Bidders are advised to send in a representative with the knowledge of the content of the bid who shall verify the information read out from the submitted documents. Failure to send a representative or to point out any un-read information by the sent bidder's representative shall indemnify the Procuring agency/Employer against any claim or failure to read out the correct information contained in the bidder's bid.
	27.10	No bid will be rejected at the time of bid opening except for late bids which will be returned unopened to the bidder, pursuant to ITB 25 .
	27.11	The Procuring agency/Employer shall prepare minutes of the bid opening. The record of the bid opening shall include, as a minimum: the name of the bidder and whether or not there is a withdrawal, substitution or modification, the bid price if applicable and the presence or absence of a Bid Security or Bid Securing Declaration.
	27.12	The bidders' representatives who are present shall be requested to sign on the attendance sheet. The omission of a bidder's signature on the record shall not invalidate the contents and affect the record. A copy of the record shall be distributed to all the bidders.
	27.13	A copy of the minutes of the bid opening shall be furnished to individual bidders upon request.
	27.14	In case of Single Stage -Two Envelop Bidding Procedure, after the announcement of technical evaluation report, the Procuring agency/Employer, shall at a time within the bid validity period, publicly open the financial proposals of the technically responsive bidder only. The financial proposal of bidders found technically non-responsive shall be returned un-opened to the respective bidders after seven days of the announcement of technical evaluation report, except those aggrieved bidder(s) whose complaints are pending before the Grievance Redressal Committee.
28. Confidentiality	28.1	Information relating to the examination, clarification, evaluation and comparison of bids and recommendation of contract award shall not be disclosed to bidders or any other persons not officially concerned with such process until the time of the announcement of the respective evaluation report.
	28.2	Any effort by a bidder to influence the Procuring agency/Employer processing of bids or award decisions may result in the rejection of its bid.
	28.3	Notwithstanding ITB 28.2 from the time of bid opening to the time of contract award, if any bidder wishes to contact the Procuring agency/Employer on any matter related to the

		bidding process, it should do so in writing or in electronic forms that provides record of the content of communication.
29. Clarification of Bids	29.1	To assist in the examination, evaluation and comparison of bids, the Procuring agency/Employer may, ask any bidder for a clarification of its bid including breakdown of prices invariably in writing. Any clarification submitted by a bidder that is not in response to a request by the Procuring agency/Employer shall not be considered.
	29.2	The request for clarification and the response shall be in writing or in electronic forms that provide record of the content of communication. No change in the prices or substance of the bid shall be sought, offered, or permitted, except clarification for the correction of arithmetic errors discovered by the Procuring agency/Employer during the evaluation of bids which shall be sought in accordance with ITB 32 .
	29.3	The alteration or modification in the bid which in any case affect the following parameters will be considered as a change in the substance of a bid: a) evaluation & qualification criteria; b) required scope of work; c) contract price; d) all securities requirements; e) tax requirements; f) terms and conditions of bidding documents. g) change in the ranking of the bidder
	29.4	From the time of bid opening to the time of Contract award if any bidder wishes to contact the Procuring agency/Employer on any matter related to the bid it should do so in writing or in electronic forms that provide record of the content of communication.
30. Preliminary Examination of Bids	30.1	Prior to the detailed evaluation of bids, the Procuring agency/Employer will determine whether each bid: a) meets the eligibility criteria defined in ITB 3 and ITB 4 ; b) has been prepared as per the format and contents defined by the Procuring agency/Employer in the bidding documents; c) has been properly signed; d) is accompanied by the required securities; and e) is substantially responsive to the requirements of the bidding documents. The Procuring agency/Employer's determination of a bid's substantial responsiveness will be based on the contents of the bid itself.
	30.2	A substantially responsive Bid is one which conforms to all the terms, conditions, and specifications of the Bidding Documents, without material deviation or reservation. A material deviation or reservation is one that: - a) affects in any substantial way the scope, quality, or performance of the Works; b) limits in any substantial way, inconsistent with the bidding documents, the Procuring agency/Employer's rights or the bidders' obligations under the Contract; or c) if rectified, would affect unfairly the competitive position of other bidders presenting substantially responsive bids.
	30.3	The Procuring agency/Employer will confirm that the documents and information specified under ITB 11, 12 and 13 have been provided in the bid. If any of these documents or information is missing, or is not provided in accordance with the Instructions to Bidders, the bid shall be rejected.
	30.4	The Procuring agency/Employer may waive-off any minor informality, nonconformity, or irregularity in a bid which does not constitute a material deviation, provided such waiver does not prejudice or affect the relative ranking of any Bidder. Explanation: A minor informality, non-conformity or irregularity is one that is merely a matter of form and not of substance. It also pertains to some immaterial defect in a Bid or variation of a bid from the exact requirements of the invitation that can be corrected or waived without being prejudicial to other bidders. The defect or variation is immaterial when the effect on quantity, quality, or delivery is negligible when contrasted with the total cost or scope of the works. The Procuring agency/Employer either shall give the bidder an opportunity to cure any deficiency resulting from a minor informality or irregularity in a

		<i>bid or waive the deficiency, whichever is advantageous to the Procuring agency/Employer. Examples of minor informalities or irregularities include failure of a bidder to –</i> (a) <i>Submit the number of copies of signed bids required by the invitation;</i> (b) <i>Furnish required information concerning the number of its employees;</i> (c) <i>the firm submitting a bid has formally adopted or authorized, before the date set for opening of bids, the execution of documents by typewritten, printed, or stamped signature and submits evidence of such authorization and the bid carries such a signature.</i>
	30.5	Provided that a Technical Bid is substantially responsive, the Procuring agency/Employer may request the bidder to submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities or omissions in the Technical Bid related to documentation requirements. Requesting information or documentation on such nonconformities shall not be related to any such aspect of the technical Proposal linked with the ranking of the bidders. Failure of the bidder to comply with the request may result in the rejection of its bid.
	30.6	Provided that a Technical Bid is substantially responsive, the Procuring agency/Employer shall rectify quantifiable nonmaterial nonconformities or omissions related to the Financial Proposal. To this effect, the Bid Price shall be adjusted, for comparison purposes only, to reflect the price of the missing or nonconforming item or component.
	30.7	If a bid is not substantially responsive, it will be rejected by the Procuring agency/Employer and may not subsequently be evaluated for complete technical responsiveness.
31. Examination of Terms and Conditions; Technical Evaluation	31.1	The Procuring agency/Employer shall examine the bid to confirm that all terms and conditions specified in the GCC and the SCC have been accepted by the bidder without any material deviation or reservation. For this purpose: “Deviation” means departure from the requirements specified in the Bidding Document. “Reservation” means setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Document.
	31.2	The Procuring agency/Employer shall evaluate the technical aspects of the bid submitted in accordance with ITB 31, to confirm that all requirements specified in Section V – Works Requirement, Technical Specifications of the Bidding Documents have been met without material deviation or reservation.
	31.3	If after the examination of the terms and conditions and the technical evaluation, the Procuring agency/Employer determines that the bid is not substantially responsive in accordance with ITB 30, it shall reject the bid.
32. Correction of Arithmetic Errors	32.1	Bids determined to be substantially responsive will be checked for any arithmetic errors. Errors will be corrected as follows: - a) if there is a discrepancy between unit prices and the sub-total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail, and the sub-total price shall be corrected, unless in the opinion of the Procuring agency/Employer there is an obvious misplacement of the decimal point in the unit price, in which the total price as quoted shall govern and the unit price shall be corrected; b) if there is an error in a total corresponding to the addition or subtraction of sub-totals, the sub-totals shall prevail, and the total shall be corrected; and c) where there is a discrepancy between the amounts in figures and in words, the amount in words will govern. d) Where there is discrepancy between grand total of price schedule and amount mentioned on the Form of Bid, the amount referred in Price Schedule shall be treated as correct subject to elimination of other errors.
	32.2	The amount stated in the Bid will, be rectified by the Procuring agency/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 amount, its bid shall be rejected after forfeiture of Bid Security or execution of the Bid Securing Declaration, as the case may be, in accordance with ITB 19.9.

33. Conversion to Single Currency	33.1	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 from outside the Procuring agency/Employer's country (referred to as the "Foreign Currency Requirements") shall indicate the same in the letter of bid-financial proposal. 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.
	33.2	To facilitate evaluation and comparison, the Procuring agency/Employer will convert all bid prices expressed in the amounts in various currencies in which the bid prices are payable. For the purposes of comparison of bids quoted in different currencies, the price shall be converted into a single currency specified in the bidding documents. The rate of exchange shall be the selling rate, prevailing on the date of opening of (financial part of) bids specified in the bidding documents, as notified by the State Bank of Pakistan on that day.
	33.3	The currency selected for converting bid prices to a common base for the purpose of evaluation, along with the source and date of the exchange rate, are specified in the BDS .
34. Evaluation of Bids	34.1	The Procuring agency/Employer shall evaluate and compare only the bids determined to be substantially responsive, pursuant to ITB 30 .
	34.2	In evaluating the Technical Proposal of each Bid, the Procuring agency/Employer shall use the criteria and methodologies listed in the BDS and in terms of works requirement. No other evaluation criteria or methodologies shall be permitted.
	34.3	The Procuring agency/Employer's evaluation of a bid will take into account: a) the bid price, excluding provisional sums and the provision, if any, for contingencies in the summary bill of quantities, but including day work items, where priced competitively; b) price adjustment for correction of arithmetic errors in accordance with ITB 32.1 ; c) converting the amount resulting from applying (a) and (b) above, if relevant, to a single currency in accordance with ITB 33 ;
	34.4	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.
	34.5	If these bidding documents allow bidders to quote separate prices for different lots, and the award to a single bidder of multiple lots, the methodology of evaluation to determine the lowest evaluated lot combinations in the Form of Bid, is specified in the BDS .
	34.6	If the bid, which results in the Evaluated Bid Price (Most Advantageous Bid), is seriously unbalanced or front loaded in the opinion of the Employer, 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, taking into consideration the schedule of estimated Contract payments, the Employer may require that the amount of the performance security be increased at the expense of the Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract. Explanation: <i>"Unbalanced" or "front-loaded" bids consist of deliberately submitting bids with artificially high prices or unit rates for the early stages of a construction project, offset by artificially low prices or unit rates for the later stages of the project, to improve the contractor's cash flow.</i>
35. Domestic Preference	35.1	If the BDS so specifies, the Procuring agency/Employer will grant a margin of preference to the domestic contractor in line with the rules, regulations, regulatory guides or instructions issued by the Authority from time to time.

36. Determination of Most Advantageous Bid	36.1	The Procuring agency/Employer shall compare the evaluated bids in accordance with the predefined bidding procedure, of all substantially responsive bids to determine the Most Advantageous bidder.
37. Qualification of Bidder	37.1	The Procuring agency/Employer shall determine to its satisfaction whether the bidder is substantially responsive and whose bid is declared as most advantageous bid either continues to meet (if prequalification applies) or meets (if post-qualification applies) the qualifying criteria specified in Evaluation and Qualification Criteria. <i>Note: In case of International bidding, the parameters for incorporation or licensing within Pakistan may be fulfilled as part of post qualification.</i>
	37.2	The determination shall be based upon an examination of the documentary evidence of the bidder's qualifications submitted by the bidder, pursuant to ITB 12 .
	37.3	Prior to contract award, the Procuring agency/Employer will verify that the successful bidder (including each member of a JV) is not blacklisted/debarred. The Procuring agency/Employer will conduct the same verification for each sub-contractor proposed by the successful bidder.
38. Sub-Contractors	38.1	The bidder shall provide details regarding any specialized sub-contractor to the Procuring agency/Employer. In case change of sub-contractors, the bidder shall promptly notify the Procuring agency/Employer and obtain approval for replacement of sub-contractors.
	38.2	Bidders may propose sub-contracting up to the percentage of total value of contracts or the volume of works as specified in the BDS .
39. Abnormally Low Financial Bid	39.1	Where the bid price is considered to be abnormally low, the Procuring agency/Employer shall perform price analysis either during determination of Most Advantageous Bid or as a part of the post-qualification process. The following process shall apply: a) The Procuring agency/Employer may reject a bid if the Procuring agency/Employer has determined that the price in combination with other constituent elements of the bid is abnormally low in relation to the subject matter of the procurement (i.e. scope of the procurement or ancillary services) and raises concerns as to the capability and capacity of the respective Bidder to perform that contract; b) Before rejecting an abnormally low bid the Procuring agency/Employer shall request the bidder an explanation of the bid or of those sections which it considers contribute to the bid being abnormally low; take account of the evidence provided in response to a request in writing; and subsequently verify the bid or parts of the bid being abnormally low; c) The decision of the Procuring agency/Employer to reject a bid and reasons for the decision shall be recorded in the procurement proceedings and promptly communicated to the bidder concerned; d) The Procuring agency/Employer shall not incur any liability solely by rejecting abnormally bid; and e) An abnormally low bid means, in the light of the Procuring agency/Employer's estimate and of all the bids submitted, the bid appears to be abnormally low by not providing a margin for normal levels of profit. Guidance for Procuring agency/Employer: In order to identify the Abnormally Low Bid (ALB) following approaches can be considered to minimize the scope of subjectivity: (i) Comparing the bid price with the cost estimate; (ii) Comparing the bid price with the bids offered by other bidders submitting substantially responsive bids; and (iii) Comparing the bid price with prices paid in similar contracts in the recent past either government- or development partner-funded.
	39.2	The Procuring agency/Employer will determine to its satisfaction whether the bidder that is selected as having submitted the most advantageous bid is qualified to perform the contract satisfactorily, in accordance with the criteria listed in ITB 12
	39.3	The determination will take into account the bidder's financial and technical capabilities. It will be based upon an examination of the documentary evidence of the bidder's

		qualifications submitted by the bidder, pursuant to ITB 12 , as well as such other information as the Procuring agency/Employer deems necessary and appropriate. Factors not included in these bidding documents shall not be used in the evaluation of the bidders' qualifications.
	39.4	Procuring agency/Employer may seek "Certificate for Independent Price Determination" from the bidder and the results of reference checks may be used in determining award of contract. <i>Explanation: The Certificate shall be furnished by the bidder. The bidder shall certify that the price is determined keeping in view of all the essential aspects such as raw material, its processing, value addition, optimization of resources due to economy of scale, transportation, insurance and margin of profit etc.</i>
	39.5	An affirmative determination will be a prerequisite for award of the contract to the bidder. A negative determination will result in rejection of the bidder's bid, in which event the Procuring agency/Employer will proceed to the next ranked bidder to make a similar determination of that bidder's capabilities to perform satisfactorily.
F. Award of Contract		
40. Criteria of Award	40.1	Subject to ITB 36 and 37 , the Procuring agency/Employer will award the Contract to the bidder whose bid has been determined to be substantially responsive to the bidding documents and who has been declared as Most Advantageous Bidder, provided that such bidder has been determined to be: a) eligible in accordance with the provisions of ITB 3; b) is determined to be qualified to perform the Contract satisfactorily; and c) Successful negotiations have been concluded, if any.
41. Negotiations	41.1	The Committee of the Procuring agency/Employer may negotiate with the Most Advantageous Bidder relating to the following areas: (a) a minor alteration to the technical (drawings, design technical specifications) details of the statement of works; (b) Methodology, work plan, staffing in view to streamline the work; (c) a minor amendment to the special conditions of Contract; (d) finalizing payment arrangements; (e) clarifying details that were not apparent or could not be finalized at the time of Bidding;
	41.2	Where negotiation fails to result into an agreement, the Procuring agency/Employer may invite the next ranked bidder for negotiations. Where negotiations are commenced with the next ranked bidder, the Procuring agency/Employer shall not reopen earlier negotiations.
42. Procuring agency/Employer's Right to reject All Bids	42.1	Notwithstanding ITB 37 , the Procuring agency/Employer reserves the right to reject all the bids, and to annul the bidding process at any time prior to acceptance of bid, without thereby incurring any liability to the affected bidder(s). However, the Authority (i.e. PPRA) may call from the Procuring agency/Employer the justification of those grounds.
	42.2	Notice of the rejection of all bids shall be given promptly to all bidders that have submitted bids.
	42.3	The Procuring agency/Employer shall upon request communicate to any bidder the grounds for its rejection of its bids, but is not required to justify those grounds.
43. Variations	43.1	The Engineer shall make any variation in the quantity of the Works or any part thereof that may, in his opinion, be necessary and for that purpose, or if for any other reason it shall, in his opinion, be appropriate, he shall have the authority to instruct the Contractor to do and the Contractor shall do any of the following: a) increase or decrease the quantity of any work included in the Contract, b) omit any such work (but not if the omitted work is to be carried out by the Employer or by another contractor), c) change the character or quality or kind of any such work, d) change the levels, lines, position and dimensions of any part of the Works, e) execute additional work of any kind necessary for the completion of the Works, or f) change any specified sequence or timing of construction of any part of the Works.

		No such variation shall in any way vitiate or invalidate the Contract, but the effect, if any, of all such variations shall be valued in accordance with ITB 15 . Provided that where the issue of an instruction to vary the Works is necessitated by some default of or breach of contract by the Contractor or for which he is responsible, any additional cost attributable to such default shall be borne by the Contractor.
44. Instructions for variations	44.1	The Contractor shall not make any such variation without an instruction of the Engineer. Provided that no instruction shall be required for increase or decrease in the quantity of any work where such increase or decrease is not the result of an instruction given under this Clause, but is the result of the quantities exceeding or being less than those stated in the Bill of Quantities.
45. Valuation of Variations	45.1	All variations and any additions to the Contract Price which are required to be determined in accordance with ITB 15 (for the purposes of this Clause referred to as "varied work"), shall be valued at the rates and prices set out in the Contract if, in the opinion of the Engineer, the same shall be applicable. If the Contract does not contain any rates or prices applicable to the varied work, the rates and prices in the Contract shall be used as the basis for valuation so far as may be reasonable, failing which, after due consultation by the Engineer with the Procuring agency/Employer and the Contractor, suitable rates or prices shall be agreed upon between the Engineer and the Contractor. In the event of disagreement, the Engineer shall fix such rates or prices as are, in his opinion, appropriate and shall notify the Contractor accordingly, with a copy to the Employer. Until such time as rates or prices are agreed or fixed, the Engineer shall determine provisional rates or prices to enable on-account payments to be included in certificates issued in accordance with ITB 15 .
46. Notification of Award	46.1	Prior to the award of contract, the Procuring agency/Employer shall issue a Final Evaluation Report giving justification for acceptance or rejection of the bids.
	46.2	Where no complaints have been lodged, the bidder whose bid has been accepted will be notified of the award by the Procuring agency/Employer prior to expiration of the bid validity period in writing or through electronic means that provide record of the content of communication. However, the Procuring agency/Employer shall not award any procurement contract at least for fifteen (15) days after the acceptance of bid. The notification letter (herein after and in the condition of the contract and contract form called "Letter of Acceptance" will specify the sum that the Procuring agency/Employer will pay the successful bidder in consideration for the execution and completion of the works as prescribed by the Contract (hereinafter and in the Contract called the "Contract Price).
	46.3	The notification of award will constitute the formation of the Contract, subject to the bidder furnishing the Performance Security (or guarantee) in accordance with ITB 48 and signing of the contract in accordance with ITB 47 .
	46.4	Upon the successful bidder's furnishing of the performance security (or guarantee) pursuant to ITB 48 , the Procuring agency/Employer will promptly notify each unsuccessful bidder, the name of the successful bidder and the Contract amount and will discharge the Bid Security or Bid Securing Declaration of the bidder(s) pursuant to ITB 19 .
47. Signing of Contract	47.1	Promptly after notification of award, Procuring agency/Employer shall send the successful bidder the draft agreement, incorporating all terms and conditions as agreed by the parties to the contract.
	47.2	Immediately after the Redressal of grievance by the GRC, and after fulfillment of all conditions precedent of the Contract Form, the successful bidder and the Procuring agency/Employer shall sign the contract.
	47.3	Where no formal signing of a contract is required, work order issued to the bidder shall be construed to be the contract.
48. Performance Security (or Guarantee)	48.1	After the receipt of the Letter of Acceptance, the successful bidder, within the specified time, shall deliver to the Procuring agency/Employer a Performance Guarantee in the amount and in the form stipulated in the BDS and SCC , denominated in the type and

		proportions of currencies in the Letter of Acceptance and in accordance with the Conditions of Contract.
	48.2	If the Performance Guarantee is provided by the successful bidder and it shall be in the form specified in the BDS which shall be in any of the following: (a) certified cheque, cashier's or manager's cheque, or bank draft; (b) irrevocable letter of credit issued by a scheduled bank of Pakistan or in the case of an irrevocable letter of credit issued by a foreign bank, the letter shall be confirmed or authenticated by a scheduled bank of Pakistan; (c) bank guarantee confirmed by a reputable local bank or, in the case of a successful foreign bidder, bonded by a foreign bank; or (d) surety bond callable upon demand issued by any reputable surety or insurance company. Any Performance Guarantee submitted shall be enforceable in Pakistan.
	48.3	Failure of the Most Advantageous Bidder to comply with the requirement of ITB 47 shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Security or declare blacklisted (in case bid securing declaration is submitted) in which event the Procuring agency/Employer may make the award to the next most advantageous bidder or reinstate the procurement process afresh (as a case may be).
49. Advance Payment	49.1	Advance payment will be provided to the bidder in percentage and in the manner as agreed by the both parties in terms of Conditions of the Contract.
	49.2	The Procuring agency/Employer will provide an advance payment as stipulated in the Conditions of Contract, subject to a maximum amount, as stated and/or Conditions of the Contract. The advance payment request shall be accompanied by an advance payment security (guarantee) in the form provided in Section X. For the purpose of receiving the advance payment, the bidder shall make and estimate of, and include in its bid, the expenses that will relate to the purchase of equipment, machinery, materials, and on the engagement of labor during the first month beginning with the date of the Procuring agency/Employer's "Notice to Commence" as specified in the SCC .
50. General Performance of the Bidders 51.	50.1	The Procuring agency/Employer reserves the right to obtain information regarding performance of the bidders on their previously awarded contracts / works. The Procuring agency/Employer may seek information / report from the previous employer for consideration. However, the Procuring agency/Employer shall incorporate such parameters in the evaluation criteria and accordingly decide the fate of the bid submitted.
52. Corrupt & Fraudulent Practices	51.1	Procuring agencies (including beneficiaries of Government funded projects and procurement) as well as Bidders/Suppliers/Contractors under Government financed contracts, observe the highest standard of ethics during the procurement and execution of such contracts, and will avoid to engage in any corrupt and fraudulent practices.
G. Grievance Redressal & Complaint Review Mechanism		
53. Constitution of Grievance Redressal	52.1	Procuring agency/Employer shall constitute a Grievance Redressal Committee (GRC) comprising of odd number of persons with proper power and authorization to address the complaint. The GRC shall not have any of the members of Procurement Evaluation Committee. The committee must have one subject specialist depending the nature of the procurement.
54. GRC Procedure	53.1	Any party can file its written complaint against the eligibility parameters or any other terms and conditions prescribed in the prequalification or bidding documents found contrary to provision of Procurement Regulatory Framework, and the same shall be addressed by the GRC well before the bid submission deadline.
	53.2	Any bidder feeling aggrieved by any act of the Procuring agency/Employer after the submission of his bid may lodge a written complaint concerning his grievances not later than seven days of the announcement of technical evaluation report and five days after issuance of final evaluation report.

	53.3	In case, the complaint is filed against the technical evaluation report, the GRC shall suspend the procurement proceedings.
	53.4	In case, the complaint is filed after the issuance of the final evaluation report, the complainant cannot raise any objection on technical evaluation of the report: Provided that the complainant may raise the objection on any part of the final evaluation report in case where single stage one envelope bidding procedure is adopted.
	53.5	The GRC, in both the cases shall investigate and decide upon the complaint within ten days of its receipt.
	53.6	Any bidder or the Procuring agency/Employer not satisfied with the decision of the GRC may file Appeal before the Appellate Committee of the Authority on prescribed format after depositing the Prescribed fee.
	53.7	The Committee, upon receipt of the Appeal against the decision of the GRC complete in all respect shall serve notices in writing upon all the parties to Appeal.
	53.8	The committee shall call the record from the concerned Procuring agency/Employer or the GRC as the case may be, and the same shall be provided within prescribed time.
	53.9	The committee may after examination of the relevant record and hearing all the concerned parties, shall decide the complaint within fifteen (15) days of receipt of the Appeal.
	53.10	The decision of the Committee shall be in writing and shall be signed by the Head and each Member of the Committee. The decision of the committee shall be final.
H. Mechanism of Blacklisting		
55. Mechanism of Blacklisting	54.1	The Procuring agency/Employer shall bar for not more than the time prescribed in Rule-19 of the Public Procurement Rules, 2004, from participating in their respective procurement proceedings, bidder or contractor who either: Involved in corrupt and fraudulent practices as defined in Rule-2 of Public Procurement Rules; i) Fails to perform his contractual obligations; and ii) Fails to abide by the id securing declaration;
	54.2	The show cause notice shall contain: (a) precise allegation, against the bidder or contractor; (b) the maximum period for which the Procuring agency/Employer proposes to debar the bidder or contractor from participating in any public procurement of the Procuring agency/Employer; and (c) the statement, if needed, about the intention of the Procuring agency/Employer to make a request to the Authority for debarring the bidder or contractor from participating in public procurements of all the procuring agencies.
	54.3	The Procuring agency/Employer shall give minimum of seven days to the bidder or contractor for submission of written reply of the show cause notice.
	54.4	In case, the bidder or contractor fails to submit written reply within the requisite time, the Procuring agency/Employer may issue notice for personal hearing to the bidder or contractor/ authorize representative of the bidder or contractor and the Procuring agency/Employer shall decide the matter on the basis of available record and personal hearing, if availed.
	54.5	In case the bidder or contractor submits written reply of the show cause notice, the Procuring agency/Employer may decide to file the matter or direct issuance of a notice to the bidder or contractor for personal hearing.
	54.6	The Procuring agency/Employer shall give minimum of seven days to the bidder or contractor for appearance before the designated officer of the Procuring agency/Employer for personal hearing. The designated officer shall decide the matter on the basis of the available record and personal hearing of the bidder or contractor, if availed.

	54.7	The Procuring agency/Employer shall decide the matter within fifteen (15) days from the date of personal hearing unless the personal hearing is adjourned to a next date and in such an eventuality, the period of personal hearing shall be reckoned from the last date of personal hearing.
	54.8	The Procuring agency/Employer shall communicate to the bidder or contractor the order of debarring the bidder or contractor from participating in any public procurement with a statement that the bidder or contractor may, within thirty (30) days, prefer a representation against the order before the Authority.
	54.9	Such blacklisting or barring action shall be communicated by the Procuring agency/Employer to the Authority and respective bidder or bidders in the form of decision containing the grounds for such action. The same shall be publicized by the Authority after examining the record whether the procedure defined in blacklisting and debarment mechanism has been adhered to by the Procuring agency/Employer.
	54.10	The bidder may file the review petition before the Review Petition Committee Authority within thirty (30) days of communication of such blacklisting or barring action after depositing the prescribed fee and in accordance with “Procedure of filing and disposal of review petition under Rule-19(3) Regulations, 2021”. The Committee shall evaluate the case and decide within ninety (90) days of filing of review petition.
	54.11	The committee shall serve a notice in writing upon all respondent of the review petition. The notices shall be accompanied by the copies of review petition and all attached documents of the review petition including the decision of the Procuring agency/Employer. The parties may file written statements along with essential documents in support of their contentions. The Committee may pass such order on the representation may deem fit.
	54.12	The Authority on the basis of decision made by the committee either may debar a bidder or contractor from participating in any public procurement process of all or some of the procuring agencies for such period as the deemed appropriate or acquit the bidder from the allegations. The decision of the Authority shall be final.

SECTION III: BID DATA SHEET

The following specific data for the for the procurement of work shall complement, supplement, or amend the provisions in the Instructions to Bidders (ITBs). Whenever there is a conflict, the provisions herein shall prevail over those in ITBs.

BDS Clause Number	ITB Number	Amendments of, and Supplements to, Clauses in the Instruction to Bidders
A. Introduction		
1.	1.1	Name of Procuring Agency: SBP Banking Services Corporation The Description (as specified in ITB) of the Goods is: Construction of additional slab for HVAC Cooling Towers and structural strengthening of existing HVAC Plant Room and Store Building, SBP Head Office Karachi Period for Contract: 230 days. Method/Procedure: Single Stage - Two Envelope Procedure - Rule 36 (b) of the open competitive bidding. Name and identification number of the Contract: ED/PROC-HOK/1083186/2026/308 Commencement date for delivery: To be notified in work order.
2.	2.1	Financial year for the operations of the Procuring Agency: [2025-26] Source of Funding: Own Funding
3.	3.1	Joint Venture is NOT Applicable
B. Bidding Documents		
4.	7.2	Copy (in hard form) of bid is not required. Bid shall be submitted through EPADS.
5.	8.1	The Bidders may seek clarifications through EPADS. Clarifications of the bidding documents may be requested in writing through EPADS by any bidder up to seven days prior to the deadline for the submission of bids. Responses to requests for clarification shall be communicated to all bidders participating in the procurement proceedings through EPADS within three days prior to closing date of Bids.
6.	8.5	No pre-bid meeting shall be conducted.
7.	9.2	Any addendum, in case issued, including the notice of any extension of the deadline shall be published on EPADS and on SBP Banking Services Corporation website [Website: www.sbp.org.pk] and shall be part of the Bidding Document pursuant to ITB 7.1
C. Preparation of Bids		
8.	10.1	The Language of all correspondences and documents related to the Bid is English / Urdu.
9.	12.3 (c)	The documents required under ' Eligibility Criteria / Qualification Criteria '.
10.	15.5	The price shall be fixed.
11.	16.1	The currency of the Bid shall be <i>(Pak Rupees)</i> ;
12.	18.1	The Bid Validity period shall be 180 days.
13.	19.1	The amount of Bid Security shall be Rs.500,000/- . The currency of the Bid Security shall be: Pakistani Rupees The scanned copy of the Bids Security shall be uploaded in the EPADS while submitting bid, whereas the original forms of Bid Security shall be submitted to the procuring agency before the bid opening deadline. The bidder who failed to submit the original bid security shall be disqualified straightaway.
14.	19.3	The Bid Security shall be in favor of 'SBP Banking Services Corporation' in the form of: <i>either Payment Order/Bank Draft or an unconditional Bank Guarantee</i> enforceable in Pakistan and valid for twenty-eight (28) days beyond the end of the validity of the Bid. This shall also apply if the period for Bid Validity is extended.
15.	19.3 (c)	Other forms of Security: Not Applicable.
16.	20.1	Alternative and conditional Bids to the requirements of the Bidding Documents are not permitted and bid will be held non-responsive.
17.	20.2	If alternative scheduled for execution of work is explicitly invited Not Applicable.
18.	22.1	The bidder shall prepare and submit his bid with due diligence after carefully reading all the terms and conditions before submission through EPADS. Copy (in hard form) of bid is not required.
D. Submission of Bids		

19.	23.1	Bid shall be submitted online on EPADS as per the method / procedure Single Stage - Two Envelope Procedure - Rule 36 (b) of the open competitive bidding. Manual submission of Bids shall not be entertained.
20.	24.1	The Technical and Financial Bids as the case may be, shall be submitted in the due portion of the EPADS, before bid submission deadline i.e., 12-Mar-26 till 12:00 PM . The bid submission option shall be automatically disabled once the deadline is over.
E. Opening and Evaluation of Bids		
21.	27.1	The Procuring Agency will open all bids on 12-Mar-26 at 12:30 PM through EPADS, in the presence of bidders or their representatives who choose to attend.
22.	27.14	Following the evaluation and approval of the technical proposals, the Procuring Agency shall, at a time within the bid validity period, open the financial proposals of only those bids that have been determined to be technically responsive, through the EPADS. Bids found to be technically non-responsive shall be rejected, and their financial proposals shall remain unopened.
23.	29.1	No bidder shall be allowed to alter or modify his bid after the bids have been opened however, the procuring agency may seek and accept clarification to the bid that do not change the substance of the bid, through EPADS.
24.	33.2	Bid is required to be quoted in Pak Rupees.
25.	33.3	The bids shall be quoted in Pak Rupees.
26.	34.5	Bid is required for complete scope of Works
27.	35	Domestic preference is not applicable.
28.	36	Evaluation Techniques Least Cost Based Selection (LCBS) After meeting the requirements of eligibility, qualification and substantial responsiveness, the bid in compliance with all the mandatory (drawings/ design/ technical specifications /requirements and/or requisite quality threshold (if any) and having lowest evaluated cost (or financial proposal) shall be considered highest ranked bid.
29.	38.2	Sub-contracting of the total value of the contract is not allowed. Sub-contracting for HVAC works is allowed.
F. Award of Contract		
30.	48.1	The amount of performance security (or guarantee), as a percentage of the Contract Price, shall be 10% of the Contract Price state in the Letter of Acceptance / Award in favour of SBP-Banking Services Corporation. OR In case, the cost of the Contract is less than four million, the Bid Security of the successful bidder shall be retained as Performance Security.
31.	48.2	a. The Performance Security (Guarantee) shall be in in the form of Pay Order / Demand Draft / unconditional Bank Guarantee 28 days beyond the defect liability period enforceable in Pakistan as per Performance Security (Guarantee) form specified in the Bidding Documents. b. The Performance Security shall be valid till successful completion of Defect Liability Period / Warranty Period and will be released after successful expiry of Defect Liability Period / Warranty Period.
G. Review of Procurement Decisions		
32.	53.6	Any bidder feeling aggrieved may lodge complain through EPADS before Grievance Redressal Committee and deal in accordance with Public Procurement Rules 2004, E-Pak Procurement Regulations, 2023 etc.

SECTION IV: ELIGIBLE COUNTRIES, AND QUALIFICATION CRITERIA**Eligible Countries**

All the bidders are allowed to participate in the subject procurement without regard to nationality, except bidders of some nationality, prohibited in accordance with policy of the Federal Government.

Following countries are ineligible to participate in the procurement process:

1. India
2. Israel

Evaluation and Qualification Criteria**1. Qualification Criteria****1.1. General**

Qualification will be based on all the criteria given in succeeding para. Employer reserves the right to waive minor deviations, if these don't materially affect the capability of an applicant to perform the contract. Joint Venture or consortium is not allowed. The Employer reserves the right to seek further information and / or verify the information furnished by the applicants. In this regard, Employer reserve the right to have site visit to verify the previous installation /work experience etc. The Employer may reject any application for any misrepresentation knowingly made by any applicant in, or pursuant to, their application or for any statement furnished in connection therewith, and intended to be relied upon by the Employer, which is incorrect in any respect.

1.2. Parameters of Bid Evaluation & Qualification

SNO.	Description	Annexure / Page No. of attached Document
1.	Bid Security Bid Security in original is required to be submitted through sealed envelope before opening of Bid.	
2.	ATL FBR Bidder must be registered with FBR in Income Tax and sales tax and must be active taxpayer as per Federal Board of Revenue (FBR's) Data base i-e Active Taxpayer List. (NTN)	
3.	Revenue Authority Registration The Bidder should be registered with relevant / concerned Provincial Revenue Authority. If not registered, the 100% tax shall be deducted at source as per applicable law and credited to relevant account.	
4.	PEC Valid Registration The bidder should have valid registration with Pakistan Engineering Council at least in Category of C-5 or above with specialization in CE-10.	
5.	Bidding Documents Volume-I of the Bidding document including all required Forms.	
6.	Undertaking/Letter of Bid (As per Format attached) The bidder is required to submit an undertaking/letter of bid as per format attached.	
7.	Experience The bidder has completed/ awarded/ in-hand at least 02 projects pertaining to civil works (construction/ repair/ renovation) each of min. cost Rs. 20 M, during last five (05) years. (Copies of work orders/ completion certificates/ contract agreements or equivalent documents / list of projects executed with SBP to be attached).	
8.	Financial Capability/Liquid Assets Annual Sales volume or Gross Turnover available of at least Rs.50 M in any of the last five years. Attach Copy(s) of Audited Financial Statements or Income Tax return filed in FBR. OR Bank Credit Line facility available of Rs.25 M or above during last one year or Liquid Assets etc.) OR Financial Capability Available of Rs.5 M or above. (Submit Bank statement as evidence showing required balance at any one instant in the statement of last three months before date of publication of tender notice.)	

SECTION V: WORKS REQUIREMENT, SCHEDULE**Scope of Works****1. Location of Site:**

“State Bank of Pakistan, I.I. Chundrigar road, Karachi”

2. Major Items of Contract:

Construction of additional slab for HVAC Cooling Towers and structural strengthening of existing HVAC Plant Room and Store Building, SBP Head Office Karachi but not limited to.

- Excavation & Dismantling Works
- Masonry Works
- Reinforced/ plain concrete works
- Paint Works
- Waterproofing Works
- Plumbing Works
- Electrification Works

Construction Schedule

Completion / Delivery Time: 230 days

Bidder shall provide a program in a bar-chart showing the sequence of work items by which he proposes to complete the Works of the entire Contract. The program should indicate the sequence of work items and the period during which he proposes to complete the Works including the activities like designing, schedule of submitting drawings, ordering and procurement of materials, manufacturing, delivering, construction of civil works, erection, testing and commissioning of Works to be supplied under the Contract. The proposed sequence of execution of various sections of the project shall be according to the given Key Performance Indicators (KPIs) as follows.

Sr.	Description of Activity	Total Days	Start Date	Finish Date	Execution Scheduled Days			
					0-60	61-120	121-180	181-240
01	Dismantling Works	20			■			
02	Excavation Works	15			■			
03	PCC/RCC Concrete in foundation	50			■			
04	RCC concrete in Plinth Beams/columns & Slab at GF	60				■		
05	RCC concrete in Beams/columns & Slab at FF	60					■	
06	Masonry Work at GF/FF	40					■	
07	RCC foundations for cooling towers, re-strengthening works	20						■
08	Plaster work internal/external	30					■	
09	Water proofing Works	20						■
10	Electrical Works	30				■	■	■
11	Paint works	20					■	
12	Doors and Windows works	20					■	
13	Punch List works & Handing/Taking Over	30						■

The above Key Performance Indicators should be taken into consideration by the bidder in order to execute the works.

If the above KPI is not acceptable to any bidder, the bidder will prepare its own Work Program along with detailed justification for its change. Bids without above given Work Program or bidder's own proposed Work Program without justification shall not be considered responsive.

SECTION VI: STANDARD BIDDING FORMS**Letter of Bid – Technical Proposal**

Date of this Bid submission: [_____]

RFB No.: [_____]

To: *[SBP Banking Services Corporation]*

We, the undersigned Bidder, hereby submit the first part of our Bid, the Technical Proposal

In submitting our Bid, we make the following declarations:

- (a) **No reservations:** We have examined and have no reservations for the bidding document, including addenda issued in accordance with Instructions to Bidders (ITB 9);
- (b) **Eligibility:** We meet the eligibility requirements and have no conflict of interest in accordance with ITB 3.
- (c) **Bid/Proposal-Securing Declaration:** We have not been suspended nor declared ineligible by the Procuring Agency based on execution of a Bid Securing Declaration or Proposal Securing Declaration in the Procuring Agency's country in accordance with ITB 4.
- (d) **Conformity:** We offer to supply in conformity with the bidding document and in accordance with the Delivery Schedules specified in the Schedule of Requirements.
- (e) **Bid Validity Period:** Our Bid shall be valid for the period specified in **BDS 17.1** (as amended, if applicable) from the date fixed for the Bid submission deadline specified in **BDS 23.1** (as amended, if applicable), and it shall remain binding upon us, and may be accepted at any time before the expiration of that period.
- (f) **Performance Security:** If our Bid is accepted, we commit to obtain performance security in accordance with the bidding document.
- (g) **One Bid per Bidder:** We are not submitting any other Bid(s) as an individual Bidder, and we are not participating in any other bid(s) as a Joint Venture member or as a subcontractor, and meet the requirements, other than Alternative Bids submitted in accordance with **ITB 19**.
- (h) **Suspension and Debarment:** We, along with any of our subcontractors, suppliers, consultants, manufacturers, or service providers for any part of the contract, are not subject to, and not controlled by, any entity or individual that is subject to, a temporary suspension or a debarment imposed by the Procuring Agency. Further, we are not ineligible under Pakistan laws.
 - 1) We have not been declared in-eligible or debarred, blacklisted/sanctioned by any Federal or Provincial Government Department, National Counter Terrorism Authority (NACTA), Agency, Organization or Autonomous Body anywhere in Pakistan or fraudulent practices, or no failure to perform with the Procuring Agency.
 - 2) We agree unconditionally that in case we, fail to abide by any of the terms of Contract, the Procuring Agency shall be at liberty to terminate the Contract without prejudice to any other rights / remedy available in the Contract.
- (i) **State-owned enterprise or institution:** *[select the appropriate option]*
 - ☐ - *[We are not a state-owned enterprise or institution]*
 - ☐ - *[We are a state-owned enterprise or institution but meet the requirements of]; _____*
- (j) **Binding Contract:** We understand that this Bid, together with your written acceptance thereof included in your Letter of Acceptance, shall constitute a binding contract between us, until a formal contract is prepared and executed.
- (k) **Not Bound to Accept:** We understand that you are not bound to accept the Most Advantageous Bid or any other Bid that you may receive; and
- (l) **Fraud and Corruption:** We hereby certify that we have taken steps to ensure that no person acting for us, or on our behalf, engages in any type of Fraud and Corruption.

IFB No: ED/PROC-HOK/1083186/2026/308

Title: Construction of additional slab for HVAC Cooling Towers and structural strengthening of existing
HVAC Plant Room and Store Building, SBP Head Office Karachi

Bidder:

UNDERTAKING

1. I/We hereby confirm and declare that I/We, has/have not been declared in-eligible or debarred, blacklisted/sanctioned by any Federal or Provincial Government Department, National Counter Terrorism Authority (NACTA), Agency, Organization or Autonomous Body anywhere in Pakistan or fraudulent practices, or no failure to perform with SBP.
2. I/We understand and agree unconditionally that in case I/We fail to abide by the above undertaking or any of terms of the Contract, the Client/ SBP BSC shall be at liberty to terminate the Contract without prejudice to any other rights / remedy available in the Contract.

Form T7 – S2 Form

		STATE BANK OF PAKISTAN BANKING SERVICES CORPORATION Supplier Bank Account (IBAN) Details Form				S-2	
1. For Office use:							
*Office/Deptt Supplier *Supplier Type					*Supplier No.		WHT Rate
	New		Update		*Liability A/C		
					*Prepayment A/C		
2. Supplier Information							
*Supplier Name							
*Supplier NTN				CNIC No.			
Supplier Address							
						Supplier City	
Contact No.						Mobile	
E-mail Address						Fax No.	
3. Bank Account Information							
*Bank Name							
*IBAN (24 Characters)						*Supplier Stamp & Signature	
*Branch Type		Islamic		Commercial			
*Title of Account							
(For Office use only)							
Forwarded By		Verified By			Entered By (Supplier Mgt User)		
(Procurement Function)							
					Date		
Field marked with * are mandatory. Information without complete Bank Account Details (IBAN) & NTN/ CNIC will not be accepted. Any changes in Supplier's particulars should be conveyed immediately to SBP BSC. SBP BSC will not be responsible for credit into wrong account of supplier due to change in bank account details not conveyed to SBP BSC or delay in settlement of supplier's claims.							

Appendix-A

Form of Bid Security

(Bank Guarantee)

[The bank shall fill in this Bank Guarantee Form in accordance with the instructions indicated.]

[Guarantor letterhead or SWIFT identifier code]

Beneficiary: *[Purchaser to insert its name and address]*

No.: *[Purchaser to insert reference number for the Request for Bids]*

Alternative No.: *[Insert identification No if this is a Bid for an alternative]*

Date: *[Insert date of issue]*

BID GUARANTEE No.: *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that _____ *[insert name of the Bidder, which in the case of a joint venture shall be the name of the joint venture (whether legally constituted or prospective) or the names of all members thereof]* (hereinafter called "the Applicant") has submitted or will submit to the Beneficiary its Bid (hereinafter called "the Bid") for the execution of _____ under Request for Bids No. _____ ("the RFB").

Furthermore, we understand that, according to the Beneficiary's conditions, Bids must be supported by a Bid guarantee.

At the request of the Applicant, we, as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of _____ (_____) upon receipt by us of the Beneficiary's complying demand, supported by the Beneficiary's statement, whether in the demand itself or a separate signed document accompanying or identifying the demand, stating that either the Applicant:

- (a) has withdrawn its Bid during the period of Bid validity set forth in the Applicant's Letter of Bid ("the Bid Validity Period"), or any extension thereto provided by the Applicant; or
- (b) having been notified of the acceptance of its Bid by the Beneficiary during the Bid Validity Period or any extension thereto provided by the Applicant, (i) has failed to sign the contract agreement, or (ii) has failed to furnish the performance security, in accordance with the Instructions to Bidders ("ITB") of the Beneficiary's bidding document.

This guarantee will expire: (a) if the Applicant is the successful Bidder, upon our receipt of copies of the Contract agreement signed by the Applicant and the performance security issued to the Beneficiary in relation to such Contract agreement; or (b) if the Applicant is not the successful Bidder, upon the earlier of (i) our receipt of a copy of the Beneficiary's notification to the Applicant of the results of the Bidding process; or (ii) twenty-eight days after the end of the Bid Validity Period.

Consequently, any demand for payment under this guarantee must be received by us at the office indicated above on or before that date.

[Signature(s)]

Note: *All italicized text is for use in preparing this form and shall be deleted from the final product.*

Appendix-B

Form of Bid Securing Declaration

[The bidder shall fill in this form in accordance with the instructions indicated]

Not Applicable

Appendix-C

Formula for Price Adjustment

Not applicable

SECTION VII: GENERAL CONDITIONS (GC)**Red Book:**

© FIDIC 2017. All rights reserved.

The Conditions of Contract are the “General Conditions” which form part of the “Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer (“Red book”) Second edition 2017” published by the Federation Internationale Des Ingenieurs – Conseils (FIDIC) and the following “Particular Conditions” which shall complement the General Conditions of the Contract.

The prospective bidders may obtain copy of the above-mentioned Conditions of Contract directly from Head Office of FIDIC, on the address indicated below against payment of their usual charges. However, a copy of the aforesaid FIDIC Conditions of Contract is available in Engineering Department, which can be seen on any working day during office hours if so desired for ready reference.

International Federation of Consulting Engineers (FIDIC)

FIDIC Bookshop – Box- 311 – CH – 1215 Geneva 15 Switzerland

Fax: +41 22 799 49 054

Telephone: +41 22 799 49 01

E-mail: fidic@fidic.org

www.fidic.org

FIDIC code: ISBN13: 978-2-88432-084-9

SECTION VIII: SPECIAL CONDITIONS OF THE CONTRACT

The Special Conditions of Contract (SCC) complement the General Conditions of Contract (GCC) to specify data and contractual requirements of the Procuring agency/Employer/ Employer, the engineer, the sector, the overall project, and the works. In the event of a conflict, the provisions herein shall prevail over those in the GCC.

PART A – CONTRACT DATA

Contract data of the SCC, includes data to complement the GCC in a manner similar to the way in which the Bid Data Sheet complements the Instructions to Bidders.

PC Clause Number	GCC Clause Number	Amendments of, and Supplements to, Clauses in the GCC
General Provision (GCC 1)		
1.	1.1.27	Defects Notification Period (DNP): 365 days
2.	1.1.85	Time for Completion: 230 days
3.	1.3	For Notices Procuring agency/Employer/ Engineer's Authorized representatives name and address: Director Engineering, SBP Banking Services Corporation
4.	1.4	Governing Law; The Applicable Law shall be: Laws of the Pakistan
5.	1.4	Communication Language: The Communication Language shall be: Urdu / English
The Employer/ Procuring agency/Employer (GCC Clause 2)		
6.	2.1	Time for access to the Site: Immediately after Commencement Date
7.	2.2	Not Applicable
The Engineer (GCC Clause 3)		
8.	3.2	Engineer's Duties and Authority: Variations resulting in an increase of the Accepted Contract Amount in excess of 1 % shall require approval of the Procuring agency/Employer.
9.	3.7.5	Dissatisfaction with Engineer's determination: The contents of last paragraph of this clause are replaced as under; In the event that a Party fails to comply with an agreement of the Parties under this Sub-Clause 3.7 or a final and binding determination of the Engineer, the other Party may, without prejudice to any other rights it may have, refer the failure itself directly to arbitration under Sub-Clause 21.8 [Arbitration].
The Contractor (GCC Clause 4)		
10.	4.2	The amount of performance security (or guarantee), as a percentage of the Contract Price, shall be 10% of the Contract Price state in the Letter of Acceptance / Award in favour of SBP-Banking Services Corporation. OR In case, the cost of the Contract is less than four million, the Bid Security of the successful bidder shall be retained as Performance Security.
11.	4.7.2(a)	Clause 4.7 Setting out Period for notification of errors in the items of reference "[3 days]"
Sub-Contracting (GCC Clause 5)		
12.	5.1(a)	Maximum allowable accumulated value of work subcontracted (as a percentage of the Accepted Contract Amount)
13.	5.1 (b)	Sub-contracting is not permitted.
Staff and Labour (GCC Clause 6)		
14.	6.5	Normal working hours: As per applicable law
Plant, Material and Workmanship (GCC Clause 7)		
15.	7.2	Samples [N/A]
Commencement, Delays and Suspension (GCC Clause 8)		
16.	8.3	Number of additional paper copies of program [N/A]
17.	8.8	@ 0.1% of total work done/ day to a maximum of 10% of the total work done.
Measurement and Valuation (GCC Clause 12)		

18.	12.2	Method of measurement shall be net except otherwise provided in the Contract
19.	12.3	Percentage profit [specify]
Variations and Adjustments (GCC Clause 13)		
20.	13.4 (b)(ii)	Percentage rate to be applied to Provisional Sums for overhead charges and profit is : N/A
21.	13.7	Not applicable.
Contract Price and Payment (GCC Clause 14)		
22.	14.2	If requested by the Contractor, an interest-free Advance up to 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 an Advance Guarantee for the full amount of the Advance in the specified form from a Scheduled Bank in Pakistan subject to approval of Director/Head Engineering Payments shall be made as per the following criteria; a) First part of the Mobilization Advance within twenty (20) days after verification of the approved/ legible Bank Guarantee from the issuing bank. b) Second part of the mobilization advance on arrival of required tools & plants and commencement of Works at site to the entire satisfaction of the Employer.
23.	14.2.3	Advance paid to the Contractor shall be recovered from the interim bills of the Contractor @ 15% of total amount of work done at site for the bill being processed till the time that whole of the amount of Mobilization Advance has been recovered.
24.	14.3(iii)	Percentage of retention: 10% Limit of Retention Money : 10% <u>Retention Money</u> 10% of the net payable amount from each bill (except Mobilization Advance) of the Contractor will be deducted as retention money. The retention money would be released as follows: i. 5% on Completion of the whole work, ii. Balance 5% after successful completion of the Defects Liability Period / Warranty Period.
25.	14.5(b)(i)	Plant and Materials: If Sub-Clause 14.5 applies: N/A
26.	14.5(c)(i)	Plant and Materials: Not Applicable.
27.	14.7(a)	Period of payment of Advance Payment to the Contractor 28days
28.	14.7b(i)	Period for the Procuring agency/Employer to make interim payments to the Contractor under Sub-Clause 14.6 (interim Payment) 30days
29.	14.7b(ii)	Period for the Procuring agency/Employer to make interim payments to the Contractor under Sub-Clause 14.13 (Final Payment) 60days
30.	14.7(c)	Period for the Procuring agency/Employer to make final payment to the Contractor : 56days
31.	14.8	N/A
32.	14.11.1(b)	Number of additional paper copies of draft Final Statement :1
33.	14.15	Currencies of Payment Pak Rupees
34.	14.15 (a)(i)	The proportions or amounts of the Local and Foreign Currencies, and the fixed rates of exchange to be used for calculating the payments, shall be as stated in the Contract Data, except as otherwise agreed by both parties.
35.	14.15 (c)	Pak Rupees.
36.	14.15 (f)	If no rates of exchange are stated in the Contract Data, they shall be those prevailing on the Base Date and published by the central bank of the Country.
Insurance (GCC Clause 19)		
37.	19.2.	From AA rated Insurance Company of PACRA/ JCR. The Works Amount of Cover: The sum stated in Letter of Acceptance plus fifteen percent 15%. Contractor 's equipment Amount of Cover: Full replacement Cost Injury to Person and Damaged to Property including Third Party Insurance Amount of Cover:

		I) As per workmen compensation act II) Contractor's all Risk including Third party III) damages to the Structure, stores if supplied by the Bank
Dispute Avoidance/ Adjudication Board (GCC Clause 21)		
38.	21.1	Time for appointment of DAAB <u>28</u> days. The DAAB shall comprise <u>Sole</u> member and Location for DAAB is Karachi.

PART B – SPECIAL PROVISIONS

Sr. No.	GCC Clause No.	Clause Description	Amendments of, and Supplements to, Clauses in the GCC
1.	1.1	Definitions	1.1.76 “Specification” Following is added at the end: “and consists of two parts i.e., i) “Part A - Specific Provisions”; and ii) “Part B - Technical Provisions”.”
2.	1.2	Interpretation	“and” is deleted from the end of sub-paragraph (i) and added at the end of sub-paragraph (j). Sub-paragraph (k) is added: “(k) The word “tender” is synonymous with “bid” the word tenderer with “bidder”, the words “tender documents” with “bidding documents” and “Schedule of Prices” with “Bill of Quantities”, as applicable.”
3.	1.5	Priority of Documents	The documents listed at (a) through (k) of this Sub-Clause are deleted and substituted with the following: (a) the Contract Agreement; (b) the Letter of Acceptance; (c) the Letter of Bid; (d) the Special Conditions Part A - Contract Data; (e) the Particular Conditions Part B - Special Provisions; (f) the General Conditions; (g) The completed Appendices to Bid at Section-V (A to N), (excluding Appendix-K to Bid); (h) the completed Schedules to Bid including Bill of Quantities; (i) the Drawings; (j) the Specification Part A - Special Provisions; (k) the Specification Part B - Technical Provisions; (l) Operation and Maintenance Services; (m) any other documents forming part of the Contract. The addenda/corrigenda, if any, shall be deemed to have been incorporated at the appropriate places in the documents forming the Contract.
4.	1.6	Contract	In the last line of the 1st paragraph the text “shall be borne by the Employer” is substituted by “shall be borne by the Contractor
5.	1.9	Delayed Drawings or Instructions	Contractor shall only be entitled to Extension of Time.
6.	1.13	Compliance with Laws	Contractor shall only be entitled to Extension of Time.
7.	2.1	Right of Access to the Site	Contractor shall only be entitled to Extension of Time.
8.	2.2	Assistance	This clause is not applicable
9.	3.1	The Engineer	In sub-paragraph (a) the text “as defined in the Pakistan Engineering Council Act, 1975 (Act No. V of 1976)” are added after the words “professional engineer”.
10.	3.2	Engineer’s Duties and Authority	The Engineer shall obtain the consent in writing of the Employer before taking action under the following Sub-Clauses of these Conditions: (a) (a) Consenting to the subcontracting of any part of the Works under Sub-Clause 5.1 [Subcontractors], 5.2 [Nominated Subcontractor] (b) Any action under Sub-Clauses 8.9 [Employer’s Suspension] and 8.12 [Prolonged Suspension] (c) Issuance of “Taking Over Certificate” under Sub-Clause 10.1 [Taking Over the Works and Sections]. (d) Issuing the “Performance Certificate” under Sub-Clause 11.9 [Performance Certificate]. (e) Sub-Clause 13.1 [Right to Vary]: instructing a Variation, except; i. in an emergency situation as determined by the Engineer, or ii. if such a Variation would increase the Accepted Contract Amount by less than the percentage specified in the Contract Data. (f) Sub-Clause 13.3 [Variation Procedure]: approving a proposal for Variation submitted by the Contractor in accordance with Sub-Clause 13.3.2 [Variation by Request for Proposal] or 13.2 [Value Engineering].

			(g) Certifying release of second half of the Retention Money under Sub-Clause 14.9 [Release of Retention Money]. (h) Issuing Final Payment Certificate under Sub-Clause 14.13 [Issue of FPC]. Any such requirement shall not be applied to any action by the Engineer under Sub-Clause 3.7 [Agreement or Determination], as stated in Sub-Clause 3.2 [Engineer's Duties and Authority] of the General Conditions. Notwithstanding the obligation, as set out above, to obtain approval, if, in the opinion of the Engineer, an emergency occurs affecting the safety of life or of the Works or of adjoining property, he may, without relieving the Contractor of any of his duties and responsibility 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, despite the absence of approval of the Employer, 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 13 and shall notify the Contractor accordingly, with a copy to the Employer. Following is added after the words "the Employer's consent is required" in 4th paragraph: "stating that the Employer's consent has been obtained for that specified authority"
11.	3.7	Agreement or Determination	3.7.5 Dissatisfaction with Engineer's determination The contents of last paragraph of this clause are replaced as under; In the event that a Party fails to comply with an agreement of the Parties under this Sub-Clause 3.7 or a final and binding determination of the Engineer, the other Party may, without prejudice to any other rights it may have, refer the failure itself directly to arbitration under Sub-Clause 21.8 [Arbitration].
12.	4.3	Contractor's Representative	In second paragraph the text "professional engineer as defined in the Pakistan Engineering Council Act, 1975 (Act No. V of 1976) (having temporary licence in case of foreign engineer under Section 12 of the Pakistan Engineering Council Act, 1975 (Act No. V of 1976)" are added after the words "qualified, experienced". In 2nd line of 4th paragraph the text "or appoint a replacement" is substituted by "except appointment of a suitable temporary replacement is deployed at the Site"
13.	4.4	Contractor's Documents	4.4.2 As-Built Records First paragraph is deleted and the text in the last paragraph is substituted with the following: "The Contractor shall furnish to the Engineer 6 copies, one reproducible and one electronic copy (provided the Engineer has made available to the Contractor editable form of the Drawings) of all Drawings amended to conform to the Works as built. In case the Engineer does not make available to the Contractor editable form of the Drawings, the Contractor shall furnish to the Engineer as-built data for incorporation in the Drawings. Upon receipt of PDF versions of the as-built drawings prepared by the Engineer, the Contractor shall furnish to the Engineer 6 copies and one reproducible of these Drawings. The price of such Drawings shall be deemed to be included in the Contract Price Following Sub-Clause is added: <u>4.4.4 Shop Drawings</u> 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 exceed 21 days and be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory and the Engineer's review or approval shall not relieve the Contractor of any of his responsibilities under the Contract.
14.	4.7.	Setting Out	4.7.3 (c)ii. Contractor shall only be entitled to Extension of Time.

15.	4.8	Health and Safety Obligations	The following text is added at the end of this Sub-Clause: In the event of work being carried out outside the normal working hours and 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.
16.	4.12.	Unforeseeable Physical Conditions	4.12.4. Contractor shall only be entitled to Extension of Time.
17.	4.15	Access Rout	Contractor shall only be entitled to Extension of Time.
18.	4.20	Progress Reports	The words “one paper-original.” In first paragraph is deleted and substituted with the “03 paper-original” At the end of sub-paragraph (g) the word “and” is deleted and at the end of sub-paragraph (h) the full stop (.) is replaced with “;”, and the following new sub-paragraphs are added as: (i) planned programme for the execution of the Works for next 56 days to enable the Engineer to determine its programme of inspection and testing; (j) monthly summery of daily job record indicating weather conditions, deployment of Contractor’s Equipment, labour employment, local material procurement and material import, if any; (k) salient contractual and project information
19.	4.23	Archaeology and Geological Findings	Contractor shall only be entitled to Extension of Time.
20.	5.1	Subcontractors	Add the following text at the end of paragraph (ii): “under Schedule to Bid” The following is added at the end of the last paragraph of Sub- Clause 5.1: “All subcontracts relating to the Works shall include provisions which entitle the Employer to require the subcontract to be assigned to the Employer under sub-paragraph (a) of Sub- Clause 15.2.3 [After Termination]. The Contractor shall give reasonable opportunity to contractors from Islamic Republic of Pakistan for subcontracts for the Works, and endeavour to employ such contractors as Subcontractors.”
21.	5.2	Nominated Subcontractors	5.2.2 Objection to Nomination In sub-paragraph (c), “and” is deleted from the end of (i); “.” at the end of (ii) is replaced with: “, and”. The following is then added as (iii): “(iii) be paid only if and when the Contractor has received from the Employer payments for sums due under the Subcontract referred to under Sub-Clause 5.2.3 [Payment to nominated Subcontractors].”
22.	6.1	Engagement of Staff and Labour	The following paragraph is added at the end of the Sub-Clause: “The Contractor shall, to the extent practicable and reasonable, employ staff (100%) and labour (100%) with appropriate qualifications and experience from sources within the Islamic Republic of Pakistan.”
23.	6.7	Health and Safety of Personnel	The existing text is substituted with the following: “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 authorize 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 also provide all other medical services and appoint a health and safety officer at Site if stated in the Specifications. In case of any fatality or serious accident, the Contractor shall, in addition, notify the Engineer immediately by the quickest available means.”
24.	6.8	Contractor’s Superintendence	Insert at the end of sub-paragraph (a) of this Sub-Clause: “or, if not, the Contractor shall make competent interpreters available

			during all working hours, in a number sufficient for those persons to properly perform their superintendence duties" The following text is added at the end of this Sub-Clause: “The Contractor’s authorized representative and his other engineers working at site shall possess valid registration with the Pakistan Engineering Council. The Contractor’s authorized representative at Site shall be authorized to exercise adequate administrative and financial powers on behalf of the Contractor so as to achieve completion of the Works as per the Contract.”
25.	6.12	Key Personnel	The following is inserted at the end of the last paragraph: “If any of the Key Personnel are not fluent in this language, the Contractor shall make competent interpreters available during all working hours in a number deemed sufficient by the Engineer.”
The following Sub-Clauses 6.13 to 6.26 are added at the end of Sub-Clause 6.12:			
26.	6.13	Supply of Foodstuffs	The Contractor shall arrange for the provision of a sufficient supply of suitable food as may be stated in the Specification at reasonable prices for the Contractor’s Personnel for the purposes of or in connection with the Contract.
27.	6.14	Supply of Water	The Contractor shall, having regard to local conditions, provide on the Site an adequate supply of drinking and other water for the use of the Contractor’s Personnel.
28.	6.15	Measures against Insect and Pest Nuisance	The Contractor shall at all times take the necessary precautions to protect the Contractor’s Personnel employed on the Site from insect and pest nuisance, and to reduce the danger to their health. The Contractor shall comply with all the regulations of the local health authorities, including use of appropriate insecticide.
29.	6.16	Alcoholic Liquor or Drugs	The Contractor shall not, otherwise than in accordance with the Laws of the Country, import, sell, give, barter or otherwise dispose of any alcoholic liquor or drugs, or permit or allow importation, sale, gift, barter or disposal thereto by Contractor’s Personnel.
30.	6.17	Arms and Ammunition	The Contractor shall not give, barter, or otherwise dispose of, to any person, any arms or ammunition of any kind, or allow Contractor’s Personnel to do so.
31.	6.18	Festivals and Religious Customs	The Contractor shall respect the Country’s recognized festivals, days of rest and religious or other customs
32.	6.19	Funeral Arrangements	The Contractor shall be responsible, to the extent required by local regulations, for making any funeral arrangements for any of its local employees who may die while engaged upon the Works.
33.	6.20	Forced Labour	The Contractor, including its Subcontractors, shall not employ or engage forced labour which consists of any work or service, not voluntarily performed, that is exacted from an individual under threat of force or penalty, and includes any kind of involuntary or compulsory labour, such as indentured labour, bonded labour or similar labour-contracting arrangements.
34.	6.21	Child Labour	The Contractor, including its Subcontractors, shall not employ or engage child labour in accordance with relevant law(s) in force in Islamic Republic of Pakistan.
35.	6.22	Employment Records of Workers	The Contractor shall keep complete and accurate records of the employment of labour at the Site. The records shall include the names, ages, genders, hours worked and wages paid to all workers. These records shall be summarized on a monthly basis and submitted to the Engineer. These records shall be included in the details to be submitted by the Contractor under Sub-Clause 6.10 [Contractor’s Records].
36.	6.23	Workers’ Organizations	The Contractor shall comply with the relevant labour laws of Pakistan which recognize workers’ rights to form and to join workers’ organizations/Trade Union of their choosing and to bargain collectively without interference.

37.	6.24	Non-Discrimination and Equal Opportunity	The Contractor shall not make decisions relating to the employment or treatment of Contractor's Personnel on the basis of personal characteristics unrelated to inherent job requirements. The Contractor shall base the employment of Contractor's Personnel on the principle of equal opportunity and fair treatment, and shall not discriminate with respect to any aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, job assignment, promotion, termination of employment or retirement, and disciplinary practices. Special measures of protection or assistance to remedy past discrimination or selection for a particular job based on the inherent requirements of the job shall not be deemed discrimination. The Contractor shall provide protection and assistance as necessary to ensure non-discrimination and equal opportunity, including for specific groups such as women, persons with disabilities, migrant workers and children (of working age in accordance with Sub-Clause 6.22).
38.	6.25	Epidemics	In the event of any out-break of illness of 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 the purpose of overcoming the same.
39.	7.4	Testing by the Contractor	Contractor shall only be entitled to Extension of Time.
40.	7.6	Remedial Work	7.6 9(i) Contractor shall only be entitled to Extension of Time.
41.	7.7	Ownership of Plant and Materials	The following is added before the first paragraph: "Except as otherwise provided in the Contract," The following is added at the end of the Sub-Clause: "No Plant and/or Materials that is the property of the Employer shall be removed from the Site. If it becomes necessary to: (i) remove any item of such Plant from the Site for the purposes of repair, the Contractor shall give a Notice, with reasons, to the Engineer requesting consent to remove the defective or damaged item off the Site. This Notice shall clearly identify the item of defective or damaged Plant, and shall give details of: the defect or damage to be repaired; the place to which defective or damaged item of Plant is to be taken for repair; the transportation to be used (and insurance cover for such transportation); the proposed inspections and testing off the Site; and the planned duration required before the repaired item of Plant shall be returned to the Site. The Contractor shall also provide any further details that the Employer may reasonably require; or (ii) replace any item(s) of such Plant and/or Materials, the Contractor shall give a Notice, with reasons, to the Engineer clearly identifying the item(s) of Plant and/or Materials to be replaced, and giving details of the due date of delivery to the Site of the replacement item(s). Where any item of Plant and/or Materials has become the property of the Employer under this Sub-Clause before it has been delivered to the Site, the Contractor shall ensure that such an item is not moved except for its delivery to the Site. The Contractor shall indemnify and hold the Employer harmless against and from the consequences of any defect in title or encumbrance or charge (except any reasonable restriction arising from the intellectual property rights of the manufacturer or producer) on any item of Plant and/or Materials that has become the property of the Employer under this Sub-Clause."
42.	The following Sub-Clause 7.9 is added after Sub Clause 7.8:		
43.	7.9	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.
44.	8.1	Commencement of Works	The following is added before the first paragraph: "After signing of the Contract Agreement by both Parties," and

			thereafter the word “The” is replaced with the word “the”.
45.	8.5	Extension of Time for Completion	The Contractor shall only be entitled for Extension of Time. The following is added after paragraph (c): “for last five years”.
46.	8.10	Consequences of Employer’s Suspension	The Contractor shall only be entitled for Extension of Time.
47.	10.2	Taking Over Parts	Contractor shall only be entitled to Extension of time.
48.	10.3	Interference with Tests on Completion	Contractor shall only be entitled to Extension of time.
49.	The following Sub-Clause 11.12 is added after Sub-Clause 11.11:		
50.	11.12	Supervisory Assistance During DNP	If provided under the Schedule of Prices, the Contractor shall provide supervisory assistance to the Employer during the DNP for the Works. Such supervisory assistance shall be as described in the Specification for the purpose of supporting the Employer's operation and maintenance of the Plant for the period specified in the Schedule of Prices after the Date of Completion.
51.	11.7	Right of Access after Taking Over	Contractor shall only be entitled to Extension of time.
52.	11.8		Contractor shall only be entitled to Extension of time.
53.	12.2	Method of Measurement	The following paragraph is added at the end of the Sub-Clause: “Summary of measured quantity for payment shall be delineated item-wise under four heads namely; “Schedule of Prices Quantity”, “Quantity Executed To-date”, “Quantity Certified Previously” and “Net Quantity Executed under this Certificate”. or as required by Engineer”
54.	12.3	Valuation of the Works	The text is deleted and replaced with following: Variations shall be valued as follows: a) at a lump sum price agreed between the Parties, or b) where appropriate, at rates in the Contract, or c) rates notified by the Government Departments/agencies, or d) in the absence of appropriate rates, the rates in the Contract shall be used as the basis for valuation, or failing which e) at appropriate new rates, as may be agreed or which the Engineer/Employer considers appropriate, Contractor’s profit & overheads shall be up to 15% of the cost of labour & materials, cartage, etc. Taxes shall be considered as per actual rate while analyzing rates for any extra items. For valuation of variations and approval of rates for non-BOQ/extra items, the decision of the Director Engineering will be final & binding upon the parties. The approval / finalization of rates of all variations shall not relieve the Contractor of his obligations under the Contract. The Contractor shall neither stop the work nor slow down the progress of the Works in awaiting the approval of rates of all variations.
55.	13.6	Adjustments for Changes in Laws	Contractor shall only be entitled for extension of Time. Further, if the relevant delay has not already been taken into account in the determination of a previous extension of time.
56.	14.2.4	Secure Advance on Material	Add the following sub clause 14.2.4 after clause 14.2.3 The Employer at his sole discretion may provide to Contractor Secured Advance against an indemnity bond acceptable to the Employer of such sum as the Engineer in charge may consider proper in respect of non-perishable materials brought at the Site but not yet incorporated in the permanent Works subject to approval of Director/Head of Engineering, provided that: (a) The materials are in accordance with the Specifications for the permanent works; (b) 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 in charge but at the risk to cost of the Contractor; (c) The Contractor’s records of the requirements, orders, receipts and use of materials are kept in a form approved by the Engineer in charge, and such records shall be available for inspection by the Engineer in charge;

			(d) 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 in charge for the purpose of valuation of materials and providing evidence of ownership and payment therefore; (e) 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. (f) 60% of the purchase price of the item/material or 50% of tender price of the item/material whichever is lesser, after measuring the quantity & verification of the quality of materials at site by the Employer may be paid The amount of Secured Advance against any item(s)/materials shall be recovered from the next three (03) bill of the Contractor in the form of three equal installments. The Employer reserves the right to recover all outstanding amount of the Secured Advance from very 1st bill of the Contractor submitted after release of the Secured Advance.
57.	14.3	Application for Interim Payment	<u>Imbalance Bid</u> Add following paragraph at end of sub-clause: In case of imbalanced bid (abnormally high/low rates than market/ Employer's Engineer's estimate) duly justified by the contractor, the payments against such running bills will be made by the employer up to 80% of the running bill after required deductions. The remaining amount will be settled at the time of final settlement upon completion of work to the satisfaction of the Employer.
58.	14.8	Delayed Payment	The clause is deleted in its entirety
59.	15.2	Termination for Contractor's Default	<u>15.2.1 Notice</u> Following text is added at the end of sub-paragraph (h) of this Sub-Clause: "For the purposes of this Contract, corrupt and fraudulent practices have been defined in Public Procurement Rules 2004." <u>15.2.4 Completion of Works</u> The first paragraph is replaced with following After termination under this Sub-Clause, the Employer may complete the Works and/or arrange for any other entities to do so at the risk and cost of the Contractor. The Employer and/or these entities may then use any Goods and Contractor's Documents (and other design documents, if any) made by or on behalf of the Contractor to complete the Works. The following text is added at the end of this Sub-Clause
60.	15.2.5	Blacklisting	The Procuring agency/Employer shall bar for not more than the time prescribed in Rule-19 of the Public Procurement Rules, 2004, from participating in their respective procurement proceedings, bidder or contractor who either: (a) Involved in corrupt and fraudulent practices as defined in Rule-2 of Public Procurement Rules; (b) Fails to perform his contractual obligations; and Fails to abide by the id securing declaration
61.	15.4	Payment after Termination	"The Employer shall be entitled to sell any of the Contractor's Equipment, Temporary Works and unused materials and apply the proceeds of sale towards payment of any debt due from the Contractor to the Employer under this Clause
62.	16.1	Suspension by Contractor	c. Not applicable d. Not applicable Contractor shall only be entitled for extension of Time
63.	16.2	Termination by Contractor	e. Not applicable d. Not applicable e. Not applicable h. Not applicable 16.2.2 - Contractor shall only be entitled for extension of Time
64.	16.3	Contractor's Obligations After Termination	Sub-paragraph (c) is deleted and replaced with: "(c) deliver to the Engineer all Employer-Supplied Materials and/or Employer's Equipment made available to the Contractor in accordance with Sub-Clause 2.6 [Employer-

			<i>Supplied Materials and Employer's Equipment</i>]; and (d) remove all other Goods from the Site, except as necessary for safety, and leave the Site."
65.	17.7	Use of Employer's Accommodation/Facilities	The following Sub-Clause 17.7 is added after Sub-Clause 17.6: The Contractor shall take full responsibility for the care of the items of the Employer's facilities and/or accommodation, if any, as detailed in the Specification, from the date of use and/or occupation by the Contractor until the date on which such use and/or occupation is re-vested in the Employer. If any loss or damage happens to any of the above items during time while the Contractor is responsible for its care, arising from any cause other than a cause for which the Employer is responsible or liable, the Contractor shall promptly rectify the loss or damage at the Contractor's risk and cost.
66.	18.1	Exceptional Events	The words "or disorder" are replaced with "disorder or sabotage" in sub-paragraph (c) of the Clause.
67.	18.4	Consequences of an Exceptional Event	Contractor shall only be entitled for extension of Time
68.	18.5	Optional Termination	The sub clause is deleted in its entirety
69.	19.1	General Requirements	Following text is added at the end of first paragraph: "The Contractor shall immediately after the date of the Letter of Acceptance submit the draft of insurance policies for the Employer's consent." Following text is added at the end of third paragraph: "The Contractor shall, within the respective periods stated in the Contract Data submit to the Engineer and the Employer a) evidence that the insurances described in this Clause have been effected, and b) copies of policies of the insurances described in Sub-Clauses 19.2.1, 19.2.4 and 19.2.5."
70.	20	Claims for Payment and/or EOT	Contractor shall only be entitled for extension of Time
71.	21.1	Constitution of the DAAB	The DAAB will be constituted with mutual consent at the time of any dispute if arises between Employer and Contractor.
72.	21.9	Arbitration	The following Clause 21.9 is added Any dispute in respect of which the decision, if any, of the Engineer has not become final and binding pursuant to Sub-Clause 3.7 shall be finally settled, under the provisions of the Arbitration Act, 1940 as amended from time to time or any statutory modification or re-enactment thereof for the time being in force. The said arbitrator/s shall have full power to open up, review and revise any decision, opinion, instruction, determination, certificate or valuation of the Engineer related to the dispute. Neither party shall be limited in the proceedings before such arbitrator/s to the evidence or arguments put before the Engineer for the purpose of obtaining his said decision pursuant to Sub-Clause 3.7. No such decision shall disqualify the Engineer from being called as a witness and giving evidence before the arbitrator/s on any matter whatsoever relevant to the dispute. Arbitration may be commenced prior to or after completion of the Works, provided that the obligations of the Employer, the Engineer and the Contractor shall not be altered by reason of the arbitration being conducted during the progress of the Works. The place of arbitration shall be Karachi, Pakistan
73.	The following Clauses are added after Clause 21		
74.	22	Electric Power Generating Set	Water for construction purposes will be provided by the Employer. Electricity will be provided by the Employer for all minor equipment & tools. Expense regarding the required cables/wires and sub-meters,

			switches etc. shall have to be borne by the Contractor. The Contractor shall make his own arrangement at his own expenses for the telephone & fax etc. at the Site of Works. If these facilities are to be provided by the Employer at the request of the Contractor, the Contractor shall have to pay the bills/ expenses as per mutually agreed terms & conditions at that time. Hutting/ tenting etc. for the workers or storage of the materials of the contractor shall be the responsibility of the contractor.
75.	23	Fire Protection and loss control	The Contractor shall be aware of necessary precautions & controls concerning cutting, welding, and hot work, fire precautions and ensure compliance. The Contractor shall be responsible for the fire watch as necessary and meet the fire prevention / fighting practices. The Contractor shall, in his work plan, forecast any extra hazardous area or adjacent to the site of the work and provide curtains, shields, or any other specialized equipment to adequately shield flames and sparks from combustibles. Where the Contractor requires the utilization of flammable liquids, approved devices and containers for transfer or storage of the same shall be used. The Contractor is responsible for disposal of deleterious substances such as lubrication oil, solvents, diesel fuel etc. which shall be contained in suitable containers and be disposed of away from the site and in no case disposed in sewers or water course(s) or drains. The Contractor shall provide and maintain adequate fire protection in the form of barrels of water with buckets, fire bucket tanks, fire extinguisher, or other effective means ready for instant use, distributed around the project and in and about temporary inflammable structures during construction of the works. Gasoline and other flammable liquids shall be stored in and dispensed from safety containers approved by the Engineer and storage shall not be within building. Torch-cutting and welding operations performed by the Contractor shall have the approval of the Engineer before such work is started and a chemical extinguisher is to be available at the location where such work is in progress. The Contractor shall follow the instructions and specifications of the Civil Defense Department or any other local department concerned with such activities.
76.	24	Safety Regulation	1) General; It is the Contractors responsibility to assure that the safety regulations, are followed at all times and that all his employees at site have a thorough knowledge and understanding of the safety regulations and are complying with all the safety requirements. The Contractor must comply with all applicable accident prevention regulations and other safety work practices governed under any law of any local or provincial authority of Pakistan. The Contractor shall comply and enforce compliance by all his sub-contractors with the highest standards of safety and accident prevention in accordance with international standards and in compliance with all applicable laws, ordinances and statutory provisions. The Employer requires that all the Contractors' workers wear hard hats, safety shoes, and where necessary gloves, and shirts at all times while on site. All requisite barriers, fences, warning signs, lights and other safety precautions as required for the protection of persons and property on or adjacent to the site shall be provided at the Contractor's cost. All false work, scaffolding and handrails shall be well constructed and secured at all times. Where overhead work is being carried out, warning signs shall be installed at ground level clearly warning of the overhead work. All warning signs shall be in two languages, English and Urdu, and shall at all times be maintained in a clean and legible condition, to the satisfaction of the Engineer. Trash shall be removed at frequent intervals to the satisfaction of the Engineer. Netting shall be provided at all levels where work is in progress, all around the building.

77.			2) Fire Protection Equipment The Contractor is responsible to provide the required number of fire extinguishers as well as the necessary hose line for his area of work. The type and size of fire-fighting equipment have to be approved by the Engineer. i. Welding / burning requires permission from the Engineer Closing, sealed or locked walls of any fire system requires an impairment lock out notification from the Engineer.
78.			3) Hazardous Area Before entering any area, the Contractor must familiarize himself of the existing hazards and inquire from the Engineer necessary precautions to be taken for the protection of himself, other workers and equipment.
79.			4) Waste Material Removal and environmental control If the work requires the removal of any material hazardous to industrial or public / environment, then the Contractor shall remove it in compliance with industrial health and safety regulations.
80.	25	Labour Conditions	The Contractor acknowledges that some or all other Contractors or sub-contractors or suppliers or persons working at or delivering to or for the site or the work being carried out at or near the site may be union or non-union, Labour peace shall be maintained at the site. The Contractor shall carry out the work in a manner which ensures that there are no labour problems, work stoppages, or other labour disputes or disruptions which might affect the Contractors work, any other work at the Site or the Employers operations. The Contractor warrants and confirms that no agreement with its employees or trade unions representing his Employees or between his subcontractors. Suppliers sub-contractors and their employees or labour union representing those Employees will affect the Contractor's performance under the Contract, any other work at the site or the Employers operations. The Contractor acknowledges that the site is considered an open site, not exclusively union or non-union.
81.	26	The Contractor Shall be Liable & Indemnify The Employer	Contractor shall be exclusively liable for and shall indemnify and hold harmless the Employer, its agents and employees from: i. Making good all losses arising out of the Contractor's negligence or breach of the Contract. This may include damage to the paints/ polish works, false ceilings, wooden or metallic works, tiles, marbles, plants, wires, pipes, electrical and mechanical items, fixtures of any kind, antiques, glass items, window blinds, etc. The Employer shall determine the amounts of such losses/ damages and the Contractor hereby expressly waives his all or any right to change or challenge the same. The Contractor shall have to make good all such losses/ damages within time frame specified in the Notice, to the entire satisfaction of the Employer. ii. Any tax, government duties, insurance contributions and other taxes or social security contributions in respect of Contractor's employee(s) or sub-Contractor together in each case with any interest, fines or penalties thereon. iii. Any claims of Contractor / service provider's current employees or ex-employees, or associates, or their heirs whether against the Contractor, other Contractors working within the same premises or any other person, regarding deals made at personal level by the staff or personal matters or deals carried out as an Employer, in whatsoever form, manner or capacity. iv. Any Government Permits, Licenses, etc. that may be required for performing the services contemplated under the Contract. v. All claims of compensation by an employee of Contractor / Service Provider, his family or legal heirs or any other agency, autonomous body, any NGO or government department, arising from injury, disability, ill health or death of any of his employees during the currency or expiry of this Contract while performing any services under this Contract or any claim regarding the medical care or treatment expenses submitted by the employee or ex-employee of the Contractor / Service Provider or their legal heirs. Save for the willful or deliberate breach of its obligations under the

			Contract or, as set out above, neither party shall be liable for any consequential or indirect loss or damage.
82.	27	Contractor's Warranties	The Contractor undertakes and represents that at all times: i. It has the requisite power and authority to enter into and perform this Agreement; ii. It holds valid license and authority to carry out the Services; iii. It shall execute the services in professional manner through competent, skilled, qualified human resource. iv. Contractor shall not act in a way which is prejudicial to Employer's interests or business; v. The Services shall be fit for the express or implied purposes for which supplied. vi. The Contractor shall follow the instructions to be issued by the Employer when at Employer's premises, all rules and security policies and the Employer may exclude any person from its premises for any actual or anticipated breach of these policies. Any breach by Contractor of this Clause, constitutes a material breach of the Contract and may lead towards Termination of Contract. In addition to Employer's rights under the Contract, the Employer shall be entitled to require Contractor to (a) remedy the breach at its cost; (b) pay for it to be remedied; or / and (c) repay all amounts already paid for the defective Services.
83.	28	Confidentiality	Except with the consent in writing of the Employer, Contractor shall keep strictly confidential and not make use of any confidential information - supplied by the Employer other than to perform this Contract, and shall impose the same obligations on its employees and other third parties (including sub-service provider). Contractor may disclose confidential information if required to do so by law, court order, rules or regulation provided (to the extent permissible by law) it has notified the Employer in advance and agreed the scope of disclosure with the Employer.

SECTION IX: CONTRACT FORMS**Form of Contract**

THIS AGREEMENT made the ____ day of _____ 20____ between *[name and address of Procuring agency/Employer]* of Pakistan (hereinafter called “the Procuring agency/Employer”) of the one part and *[name of Contractor]* of *[city and country of Contractor]* (hereinafter called “the ”) of Contractor other part:

WHEREAS the Procuring agency/Employer desired that the works *[brief description of works]* should be executed by the contractor, and has accepted a Bid by the contractor for the execution and completion of these works and remedying of any defects therein, in the sum of *[contract price in words and figures]* (hereinafter called “the Contract Price”).

NOW THIS CONTRACT WITNESSETH AS FOLLOWS:

1. In this Contract words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract referred to.
2. The following documents shall be deemed to form and be read and construed as part of this Contract, In the event of any ambiguity or conflict between the Contract Documents listed below, the order of precedence shall be the order in which the Contract Documents are listed below:-
 - (a) This form of Contract;
 - (b) Letter of Acceptance;
 - (c) the Form of Bid and the Price Schedule submitted by the Bidder;
 - (d) the Works Requirements;
 - (e) the Technical Specifications;
 - (f) the Drawings;
 - (g) the General Conditions of the Contract
 - (h) the Special Conditions of Contract,
 - (i) the completed schedule including Bill of Quantities; and
 - (j) *[add here: any other documents]*
3. In consideration of the payments to be made by the Procuring agency/Employer to the contractor as mentioned in this contract, the contractor hereby covenants with Procuring agency/Employer to execute the works to remedy defects therein in conformity in all respects with the provisions of the Contract.
4. The Procuring agency/Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects therein, 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 Contract to be executed in accordance with their respective laws the day and year first above written.

Signed, sealed, delivered by _____ the _____ (for the Procuring agency/Employer)	Signed, sealed, delivered by _____ the _____ (for the Contractor)
Witness to the signatures of the Procuring agency/Employer	Witness to the signatures of the Contractor

Performance Guarantee Form

Letter of Guarantee Ref. No: _____

Date of Issue: _____

Date of Expiry: _____

Amount of Guarantee: _____

To:

SBP Banking Services Corporation,

Proc. Unit, Engg. Dept., 1st Floor Bolton Market Building, MA Jinnah Road, Karachi

WHEREAS M/s <_____> (hereinafter called “the Supplier”) has undertaken, in pursuance of Contract No. <_____> dated <_____> to delivery Construction of additional slab for HVAC Cooling Towers and structural strengthening of existing HVAC Plant Room and Store Building, SBP Head Office Karachi (hereinafter called “the Contract”).

AND WHEREAS it has been stipulated by SBP Banking Services Corporation (hereinafter called “the Procuring Agency”) in the said Contract that the Supplier shall furnish to the Procuring Agency with a Bank Guarantee by a reputable bank for the sum specified therein as security for compliance with the Supplier’s performance obligations in accordance with the Contract.

AND WHEREAS we <_____> (the Guarantor) have agreed to give the Supplier a guarantee.

THEREFORE, WE hereby affirm that we are Guarantors and responsible to the Procuring Agency, on behalf of the Supplier, up to a total of sum stated above, and we undertake to pay the Procuring Agency, upon your first written demand declaring the Supplier to be in default under the Contract and without cavil or argument, any sum or sums within the limits of amount of guarantee as aforesaid, without your needing to prove or to show grounds or reasons for your demand or the sum specified therein.

This guarantee is valid until the duration as stated above.

On behalf of Click or tap here to enter text.

Signature and seal of the Guarantors

[name of bank or financial institution]

[address]

[date]

Advance Payment Security**Demand Guarantee**

Beneficiary: _____

Date: _____

ADVANCE PAYMENT GUARANTEE No.: _____

Guarantor: _____

We have been informed that [Inset name of the Contractor] (hereinafter called "the Contractor") has entered into Contract No. _____ dated _____ with the [insert name of the Procuring agency/Employer] (hereinafter called "the Procuring agency/Employer") for the execution of _____ (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, an advance payment in the sum _____ (_____) is to be made against an advance payment guarantee.

At the request of the Contractor, we as Guarantor, hereby irrevocably undertake to pay the Procuring agency/Employer any sum or sums not exceeding in total an amount of _____ upon receipt by us of the Procuring agency/Employer's complying demand supported by the Procuring agency/Employer's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating either that the Applicant:

(a) has used the advance payment for purposes other than the costs of mobilization in respect of the Works; or

(b) has failed to repay the advance payment in accordance with the Contract conditions, specifying the amount which the Contractor has failed to repay.

A demand under this guarantee may be presented as from the presentation to the Guarantor of a certificate from the Procuring agency/Employer's bank stating that the advance payment referred to above has been credited to the Contractor on its account number _____ at _____.

The maximum amount of this guarantee shall be progressively reduced by the amount of the advance payment repaid by the Contractor as specified in copies of interim statements or payment certificates which shall be presented to us.

The 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.

[signature(s)]

Note: *All italicized text is for use in preparing this form and shall be deleted from the final product.*

Retention Money Security Demand Guarantee

_____ [Guarantor letterhead or SWIFT identifier code]

Beneficiary: _____ [Insert name and Address of Procuring agency/Employer]

Date: _____ [Insert date of issue]

RETENTION MONEY GUARANTEE No.: _____ [Insert guarantee reference number]

Guarantor: _____ [Insert name and address of place of issue, unless indicated in the letterhead]

We have been informed that _____ [insert name of Contractor, which in the case of a joint venture shall be the name of the joint venture] (hereinafter called "the Contractor") has entered into Contract No. _____ [insert reference number of the contract] dated _____ with the Procuring agency/Employer, for the execution of _____ [insert name of contract and brief description of Works] (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, the Procuring agency/Employer retains moneys up to the limit set forth in the Contract ("the Retention Money"), and that when the Taking-Over Certificate has been issued under the Contract and the first half of the Retention Money has been certified for payment, payment of [insert the second half of the Retention Money or if the amount guaranteed under the Performance Guarantee when the Taking-Over Certificate is issued is less than half of the Retention Money, the difference between half of the Retention Money and the amount guaranteed under the Performance Security and, if required, the ES Performance Security] is to be made against a Retention Money guarantee.

At the request of the Applicant, we, as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of _____ [insert amount in figures] (_____) [amount in words] upon receipt by us of the Procuring agency/Employer's complying demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating that the Applicant is in breach of its obligation(s) under the Contract, without your needing to prove or show grounds for your demand or the sum specified therein.

A demand under this guarantee may be presented as from the presentation to the Guarantor of a certificate from the Procuring agency/Employer's bank stating that the second half of the Retention Money as referred to above has been credited to the contractor on its account number _____ at _____ [insert name and address of Contractor's bank].

This guarantee shall expire no later than the day of, 2...., and any demand for payment under it must be received by us at the office indicated above on or before that date.

[signature(s)]

Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.

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 Number: _____
Contract Value: _____
Contract Title: _____

Dated: _____

[Name of Contractor] 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 or any administrative subdivision or agency thereof or any other entity owned or controlled by it (GOP) through any corrupt business practice.

Without limiting the generality of the foregoing [Name of Contractor] represents and warrants that it has fully declared the brokerage, commission, fee 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 consultations 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 Contractor] 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, representative or warranty.

[Name of Contractor] accepts full responsibility and strict liability for making and false declaration, not making full disclosure, misrepresenting fact 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 right 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 Contractor] 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 Contractor] 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.

[Procuring agency/Employer]

[Contractor]

SECTION X - TECHNICAL SPECIFICATIONS & DRAWINGS

TECHNICAL SPECIFICATIONS

Heading	Page No.
Section - 100	
CLEARING AND GRUBBING	1
Section - 101	
REMOVAL OF TREES	2
Section - 102	
DEMOLITION WORKS	3
Section - 103	
EARTHWORKS	6
Section - 104	
DEWATERING	15
Section - 105	
TERMITE CONTROL TREATMENT	18
Section - 106	
CONCRETE FORMWORK	21
Section - 107	
REINFORCEMENT	28
Section - 108	
STRUCTURAL STEEL WORKS	35
Section - 109	
BRICK MASONRY	42
Section – 110	
ALUMINUM WORKS	50
Section - 111	
CEMENT PLASTER	58
Section - 112	
PAINTING	63
Section - 113	
CONTRACTOR'S CAMP	69
Section - 114	
STAKE-OUT SURVEY	70

Section – 115

PLAIN AND REINFORCED CONCRETE	72
--------------------------------------	----

*NOTE: The contents of this Volume II (Technical Specifications) to be read in conjunction with relevant drawings and items as specified in BOQ as well.

Section - 100

CLEARING AND GRUBBING

1. SCOPE

This work shall consist of removal to the specified depth, grubbing and disposal of all surface objects as and where directed in writing by the Engineer, stumps, roots, bushes and trees, vegetation, logs rubbish and other objectionable material except such objects as are designated to remain or to be removed in accordance with other section of specifications.

2. CONSTRUCTION REQUIREMENTS

2.1. CLEARING/ GRUBBING

The stumps, roots, vegetation, bushes, logs, rubbish shall be cleared and / or grubbed as directed by the Engineer. In areas where clearing and grubbing is required, same shall be carried out to the depth of 1 foot below natural surface level.

Operation of clearing and grubbing shall in no way be deemed to effect any level or volume change of the area.

After clearing and grubbing, the compaction of the area will be restored to its original value without any extra payment.

All trees above 4 feet and falling within the construction limits shall be felled & removed by the Contractor. The excavation and removal of trees, roots and stumps including backfilling and compacting of holes and restoring the natural ground to the original condition shall be responsibility of the contractor for which no extra payment shall be made to him. The trees, stumps & roots remain the property of the Contractor, which shall be removed by him.

2.2. PROTECTION AND RESTORATION

The Contractor shall prevent damage to all structure above or below ground. No land monuments, property markers, or official datum points shall be damaged or removed until the Engineer has witnessed or otherwise referenced their locations and approved their removal. The Contractor shall so control his operations as to prevent damage to shrubs, which are to be preserved. Protection may include fences and boards latched to shrubs, to prevent damage from machine operations. Any damage as a result of Contractor's operation shall immediately be rectified by him at his own expense.

3. MEASUREMENT AND PAYMENT

3.1. MEASUREMENT

3.1.1. Clearing and grubbing will be measured for payment only on areas so designated in writing by the Engineer or shown on the drawings. The quantity to be paid for shall be the number of square feet satisfactorily cleared and grubbed.

3.2. PAYMENT

Payment will be made for acceptably measured quantity of cleaning and grubbing on the basis of unit rate per square feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

Section - 101

REMOVAL OF TREES

1. SCOPE

The work done under this section of specifications consist of the removal of trees and stumps to a depth not less than fifty (50) centimeters or as designated by the Engineer to ensure complete removal of roots and stumps and their disposal.

2. CONSTRUCTION REQUIREMENTS

2.1. Such individual trees as the Engineer may designate and mark in white paint shall be left standing uninjured. All other trees to be removed.

2.2. When necessary to prevent injury to other trees or structures or to minimize danger, trees shall be cut in sections from top downwards.

2.3. Hole or loose earth resulting from the removal of trees shall be filled and re-compacted to a degree of compaction of adjoining area. Any extra material required for such purpose shall be at the cost of the contractor.

3. GENERAL REQUIREMENTS

3.1. Contractor shall prevent damage to all under ground utilities, such as pipes cables or conduits etc. For this purpose if so required, removal of trees shall be carried out manually. Any under ground or over ground property damaged by the contractor shall be immediately repaired by the contractor at his own expense.

4. PROPERTY OF MATERIALS

4.1. All the removed trees shall be the property of the contractor and shall be disposed off from the site.

5. MEASUREMENTS AND PAYMENS

5.1. Measurement

Measurement for acceptably completed removal of trees will be made on the basis of number of square feet of area treated as shown on the drawing or as directed by the Engineer.

5.2. Payment

Payment will be made for acceptably measured quantity of removal of trees on the basis of unit rate per square feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

Section - 102

DEMOLITION WORKS

1. SCOPE

The work covered by this section of the specifications consists of furnishing all plant, labour, equipment, appliances and performing all operations as required to dismantle existing structures at the site as directed by the Engineer.

2. SUBMITTALS

2.1. Method Statement and Details

For all Demolition works the Contractor shall submit for the prior approval of the Engineer, the methodology and list of plant and equipment to be employed on the Works. No work shall be commenced until the methodology, plant and equipment to be used in the Works is approved by the Engineer.

3. DISMANTLING PROCEDURES

- 3.1. Demolitions shall be performed in an orderly manner and the Contractor shall take all necessary precautions and expedients to prevent damages to the adjacent structures.
- 3.2. Explosives shall not be used to remove or demolish the Plain and Reinforced Cement Concrete Structures unless otherwise directed by the Engineer.

4. EXECUTION

4.1. Description of Site

The Contractor shall take sufficient steps/ actions/ measures for the safety of the adjoining building and shall be responsible for any damage to the existing superstructures and substructures caused due to demolition.

Where approval has been given to the Contractor for carrying out demolition operations at night or in places where day light is excluded, the Contractor shall provide adequate lighting at all points where demolition and transportation is in progress.

4.2. Notice to Commence Work

The Contractor shall give reasonable notice that he intends to commence any demolition works and he shall submit to the Engineer full details of his proposals. The Engineer may require modifications to be made if he considers the Contractor's proposals to be unsatisfactory and the Contractor shall give effect to such modifications but shall not be relieved of his responsibility with respect to such work.

4.3. Demolitions near Existing Buildings

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 of existing buildings.

4.4. **Shoring, Planking and Strutting**

Shoring, where required during demolition, shall be installed to protect workmen and adjacent paving, structures and utilities. The term shoring shall also be deemed to cover whatever methods the Contractor elects to adopt, with prior approval of the Engineer. Any damage to the property on account of Contractor's fault shall be solely on his account.

4.5. **Utility Lines**

Existing utility lines that are visible or the locations of which are made known to the Contractor prior to demolition and that are to be retained, as well as utility lines constructed during dismantling if damaged, shall be repaired by the Contractor at his own expense. Any existing utility lines which are not known to the Contractor in sufficient time to avoid damage, if inadvertently damaged during demolition, shall be repaired by the Contractor and adjustment in payment will be made as approved by the Engineer. The utility lines, which are to be removed, are encountered within the area of operations the Contractor shall notify the Engineer in ample time for the necessary measures to be taken to prevent interruption of the service.

4.6. **Stockpiling of Demolished Materials**

Demolished material suitable for reusable may be stockpiled as directed by the Engineer.

5. **DISPOSAL**

- 5.1. The demolished/rejected debris materials shall be broken to pieces not larger than 25 to 75mm
- 5.2. All materials resulting from Demolition shall be disposed off out of Municipal limits along the most direct route from the boundary of the project and/or as directed by the Engineer
- 5.3. All carts, trucks or other vehicles used by the Contractor for transportation of the Dismantled/Demolished material shall be suitably constructed or lined so as not to permit any leakage of materials while the vehicles are on the move. These would be so loaded and arranged as not to spill on the Site and public roads. Whenever any vehicle so used is found leaking and unsuitable it shall be immediately withdrawn from the Work.
- 5.4. The disposal of Dismantled/Demolished debris material shall include loading, unloading, transporting, spreading and leveling as directed by the Engineer

6. **PROPERTY OF MATERIAL**

All the materials designated as reusable Except Electrical & Mechanical fixtures at the opening date of tender shall be the property of the Contractor and stacked/stored in an approved manner at a place within the site area as approved by the Engineer.

7. **MEASUREMENT AND PAYMENT**

7.1. **General**

Except otherwise specified herein or elsewhere in the Contract Documents, no measurement and payment will be made for the under-mentioned works related to the relevant BOQ item.

- 7.1.1. Timber shoring, planking, strutting and providing slope for upholding the sides of demolished work.
- 7.1.2. Stacking of reusable materials.
- 7.1.3. Operations and the steps taken for the safety of the existing adjoining structures including danger direction/ diversion sign boards of appropriate size and temporary segregating the area with corrugated sheet steel plates or with brick masonry in mud.

- 7.1.4. Temporary diversion of existing utility lines.
- 7.1.5. Disposal of demolished debris materials out of Municipal limits including loading unloading and spreading.
- 7.1.6. Arrangement of water and power supply for the works, if required.
- 7.1.7. Tools, Plants and equipments used for the demolition.
- 7.1.8. Any damage caused to the structures and installation due to negligence of the Contractors during dismantling operations and their repair/replacement. to the satisfaction of the Engineer.
- 7.1.9. Cleaning and restoring the site to the satisfaction of the Engineer.

7.2. Measurement and payment

No payment will be made to the contractor. It is deemed that price of reusable materials such as bricks, Doors, Windows, etc; are in excess to the price of demolition and other liabilities of the contractor as mentioned above therefore the contractor will credit a lump sum amount to the Employer as quoted in Bill of Quantities.

Section - 103

EARTHWORKS

4. SCOPE

The work to be done under this section of the specifications consists of furnishing all plant, labour, equipment, appliances and materials and in performing all operations in connection with earth works of carrying out excavation in all type of soil for basement, structural foundations underground supplies and services for all structural units, stock piling of suitable excavated material, disposal of unsuitable and surplus excavated material, fill and backfill using suitable excavated material or imported material obtained from approved sources or by blending the excavated material and compaction of fill and backfill in accordance with this section of specifications, the applicable drawings and subject to terms and Conditions of the Contract. The scope of this section of specifications is also covered with detailed specifications as laid down herein.

5. CODES AND STANDARDS

5.1. The following Codes and Standards shall be followed wherever relevant and as directed by the Engineer.

ASTM D-1556-74	Test for density of soil in place by the sand cone method.
ASTM D-1557-78	Test for moisture-density relations of soils and soil aggregate moisture using 4.5 Kg rammer and 457 mm drop.
BS 1377-75	Methods of tests for soils for civil engineering purposes.

GENERAL

1. Class, Nature or Condition of Soil

The Contractor shall acquaint himself with the nature of the ground, existing structures, foundations and subsoil which might be encountered during excavation or earthworks. The Employer does not guarantee or warranty 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 Report, Drawings or in any other Contract Documents or to material obtained from boring or trial holes. 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 an 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. Lines, Levels and Grades

All excavations, cut and fills shall be constructed to the lines, levels and gradients specified with any necessary allowance for consolidation, settlement and drainage so that at the end of the Period of Maintenance the ground shall be at the required lines, levels and gradients. During the course of the Contract and during the Period of Maintenance any damage or defects in cuts and fills, in structures and other works, caused by slips, falls of wash-ins or any other ground movement due to the Contractor's negligence shall be made good by the contractor at his own cost.

3. Setting out and Site Preparation

The Contractor shall set out the works and shall be responsible for true and perfect setting out of the same and for correctness of the positions, levels, dimensions and alignments of all parts thereof. If at any time any error in this respect shall appear during the progress of the works, the Contractor shall at his own expense rectify such error, to the satisfaction of the Engineer.

The Contractor shall construct and maintain accurate bench marks so that the Lines and Levels can be easily checked by the Engineer.

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

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.

4. **Authorized Outlines**

Unless otherwise specified or directed by the Engineer in writing, all earthworks, i.e. excavation of basement trenches and pits for foundations and filling under floors etc. shall be executed to the width, depths, lengths, alignments, grades and levels shown on the Drawings or as directed by the Engineer.

4. **EXCAVATIONS**

- 4.1. Excavation shall include the removal of all material of every name and nature. Excavations shall be carried out in accordance with excavation plans and sections shown on the Drawings and as directed by the Engineer.

The major portion of excavations shall be carried out by mechanical excavators and excavated materials disposed off to stock on spoil as per Drawings or as directed by the Engineer. The excavation which cannot be done by mechanical means shall be done by manual tools. Unless otherwise specified by the Engineer, leveling, trimming and finishing to the required levels and dimensions shall be done manually. The material suitable for fill and backfill if approved by the Engineer shall be stockpiled within the free haulage limit of the project boundary of the works.

- 4.2. The Contractor shall give reasonable notice that he intends to commence any excavation and he shall submit to the Engineer full details of his proposals. The Engineer may require modifications to be made if he considers the Contractor's proposals to be unsatisfactory and the Contractor shall give effect to such modifications but shall not be relieved of his responsibility with respect to such work.
- 4.3. For major excavations, the Contractor shall submit for the prior approval of the Engineer full details and drawings showing the proposed method or procedure, supporting and strutting, etc. The design, provision, construction, maintenance and removal of such temporary works shall be the responsibility of the Contractor and all cost in these respects shall be included in the quoted unit rate for the permanent work.
- 4.4. 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.
- 4.5. The Contractor shall preserve the completed excavation from damage due to slips and earth movements, ingress of water from any source whatsoever and deterioration by exposure to the sun and the effects of the weather.
- 4.6. All excavation of every description, in whatever material encountered shall be performed to the elevations and dimensions shown on the Drawings in such a manner as to avoid interruption to work in other parts of the site. The

Contractor shall be responsible for injury to the permanent works caused by excavation on other parts of the works.

- 4.7. Excavation shall extend to adequate distance from walls and footings to allow for placing and removal of forms, installations of services and for inspection, except where the concrete for walls and footings is authorized to be deposited directly against excavated surfaces. Undercutting will not be permitted. The additional excavation for placing and removal of forms, installation of services, for inspection and generally for working area on slopes for stability shall not be measured for payment and shall be deemed to be included in the rates for excavation as measured net.
- 4.8. All excavations in foundations shall be taken to 6" (150 mm) above the final excavation elevations shown on the drawings and the last 6" (150 mm) shall be trimmed carefully to a smooth and level surface. Immediately after trimming to the final elevation, a layer of blinding concrete shall be placed to the thickness shown on the drawings. All excavations for foundations which have been trimmed and disturbed shall be compacted and covered by lean concrete by the end of the day. It is specifically brought to the notice of the Contractor that any excavation taken down to the trimmed elevation which is left over-night or for any length of time thereafter, uncovered by the blinding concrete, shall be required to be trimmed to such lower elevation as directed by the Engineer and any extra work or any consequent increase in the quantities caused thereby shall not be paid to the Contractor.
- 4.9. No excavation shall be refilled nor any permanent work commenced until the foundation has been inspected by the Engineer and his permission to proceed is given.
- 4.10. If excavation for sub-structures are carried below the required level, as shown on the Drawings or as directed by the Engineer, the surplus depth shall be filled in with concrete of same grade as of blinding concrete at the sole cost of the Contractor.
- 4.11. All excavation shall be performed in the dry. The placing of blinding concrete, placing of reinforcement and casting of the permanent works in the excavation shall be carried out in the dry and the Contractor shall have sufficient dewatering equipment for this purpose. The Contractor shall design, provide and maintain effective dewatering system during excavation and construction of foundations upto plinth level so as to keep the foundation area dry. Adequate precautions shall be taken to prevent any erosion due to undercutting from underneath the previously constructed adjoining foundations.
- 4.12. Shoring, where required during excavation, shall be installed to protect workmen and the bank, adjacent paving, structures and utilities. The term shoring shall also be deemed to cover whatever methods the Contractor elects to adopt, with prior approval of the Engineer, for upholding the sides of excavation and also for planking and strutting to excavation against the side of roadways and adjoining properties in existing hardcore of 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.
- 4.13. Existing utility lines that are shown on the drawings or the locations of which are made known to the Contractor prior to excavation and that are to be retained, as well as utility lines constructed during excavation and backfilling, and if damaged, shall be repaired by the Contractor at his own expense. Any existing utility lines which are not known to the Contractor in sufficient time to avoid damage, if inadvertently damaged during excavation, shall be repaired by the Contractor and adjustment in payment will be made as approved by the Engineer. When utility lines which are to be removed, are encountered within the area of operations the Contractor shall notify the Engineer in ample

time for the necessary measures to be taken to prevent interruption of the service.

- 4.14. Excavated material suitable for use as fill and backfill shall be stockpiled within free haulage limit of the project boundary as directed by the Engineer. This stockpiled material shall be transported back to places requiring fill or backfill.

Excavated material unsuitable for use as fill and backfill shall be disposed off by the Contractor at locations approved by the Engineer within specified free haulage limit.

- 4.15. Where applicable the excavation work shall include the excavation in above water table and excavation below water table. The Contractor shall submit the proposal for dewatering from the areas of excavation for the approval of the Engineer and shall provide all plant, equipment, pumps, sheeting, well points as required to keep the water table 3 feet (1.0 meter) below the deepest foundation as shown on the drawings till the completion of foundation works.
- 4.16. The Contractor shall make independent inquiries and perform and make independent observations to ascertain the water table in the areas of excavations during the period when the construction works are in progress. The Contractor shall take whole risk of any nature for fluctuation of the water table from his own findings. The Employer does not bind himself in any way and shall not be responsible for any information given by him or any information, observations or values obtained from his reports, Drawings, and Documents or anywhere in this Document.
- 4.17. Excavation for pits, cable trenches, equipment- foundations and other structures shall be taken out to the levels and dimensions shown on Drawings or such other levels and dimensions as the Engineer may direct.
- 4.18. Before starting the excavation, the Contractor shall ensure the correct alignment of the pipeline on the ground the depth and width of excavation of the trench, all in accordance with the Drawings and instructions of the Engineer. The Contractor shall make profile with cement concrete pillars.
- 4.19. Excavation shall be carried out true to lines, levels, grades and widths as shown on the drawings or as directed by the Engineer ensuring proper laying of the pipe line, the bedding fill, construction of chambers for appurtenances and any other structures. The trench bottom shall be graded to provide even and substantial bearing over the specified bedding and of the structure.
- 4.20. The Contractor, at his cost shall provide to the satisfaction of the Engineer all timbering, approved supports, shores and bracing to the sides of the excavated trench and foundations in such a manner so as to secure the sides of the trench and excavations from falling or adverse movement. All responsibility connected with such shoring shall rest with the Contractor.
- 4.21. Adequate clearance/working space on both sides of the structure/pipe line shall be provided for which no payment shall be made.
- 4.22. Without the written permission of the Engineer, not more than 200 meter (650 feet) of the trench shall be opened in advance of the completed pipeline.
- 4.23. The bottoms of all excavations shall be carefully leveled. Any pockets of soft or loose material in the bottoms of the pits and trenches shall be removed and the cavities so formed filled with lean concrete at the Contractor's expense.
- 4.24. It is expected that rock and other hard material will be encountered during excavation. The rate of excavation shall include the removal of all sub surface material of every name and nature and no classification of sub-surface material shall be made.

- 4.25. The Engineer may require the Contractor to excavate below the elevations shown on the drawings or he may order him to stop above the elevations shown depending upon the suitable foundation material encountered.
- 4.26. If for any reason, the levels, grades or profiles of the excavations are changed adversely, the Contractor shall, at his own cost, be liable to bring the excavations to the required levels and profiles as shown on the drawings or as directed by the Engineer.

5. **EXCAVATION TOLERANCES**

Excavation shall be performed within the tolerances for excavation limits indicated on the drawings. Where no tolerance limits are indicated excavation shall be performed to tolerances established by the Engineer as acceptable for the design and type of work involved.

6. **FILL AND BACKFILL**

- 6.1. After completion of foundation footing, foundations, walls, and other construction below the elevation of the final grades and prior to filling forms shall be removed and the excavation shall be cleaned of trash and debris.
- 6.2. The backfilling shall include filling under the floors, around the foundation trenches, pipes, conduits, ducts and channels.
- 6.3. The backfilling shall include loading, unloading, transporting, placing, stacking, spreading of earth, watering, rolling, ramming and compacting, etc., complete as specified herein.
- 6.4. Filling shall be approved selected material obtained from outside sources. It shall be predominantly granular material and free from slurry mud, organic or other unsuitable matter and capable of compaction by ordinary means.
- 6.5. The excavated material if found suitable shall be stockpiled within the free haulage limit of the Project Boundary. This material shall be used for filling/back- filling if approved by the Engineer and shall be transported by the Contractor anywhere required for the purpose of filling/back-filling work in this Contract.
- 6.6. The Contractor shall provide the approved quality of backfill and fill material required to complete the fill and backfilling work from the places as designated by the Engineer.
- 6.7. Filling in trenches and foundations shall be placed in 200mm layers and compacted at optimum moisture content by mechanical means or other means as approved by the Engineer.
- 6.8. Filling around pipes and cables shall be carefully placed with fine material to cover the pipe or cable completely before the normal fill is placed.
- 6.9. Material for backfilling shall be as approved by the Engineer and shall be placed in layers not exceeding 150 mm (6 inch) measured as compacted material and saturated with sufficient water and compacted to produce in-situ density not less than 95% of the maximum dry density at optimum moisture content, achieved in Test No.15 of BS 1377 : 1975.
- 6.10. All filled areas shall be left neat, smooth and well compacted, the top surface consisting of the normal site surface soil, unless otherwise directed.
- 6.11. Depending on the depth of fill the Engineer may instruct increased thickness of successive layers to be placed.
- 6.12. Fill shall not be placed against foundation walls prior to the approval by the Engineer. Fill shall be brought up evenly on each side of the walls as far as practicable. Heavy equipment for spreading and compacting the fill shall not be operated closer to the wall than a distance equal to the height of the fill above the top of footing.

- 6.13. In case the Contractor is instructed to arrange for the fill material, the quality of the fill material will be subject to the approval of the Engineer. The Engineer shall require the Contractor to carry out various tests of the fill material. All such tests shall be made at an approved laboratory at the cost of the Contractor. Once a material from a specific source has been approved, the material of the same quality and from the same source only shall be used. Any fill material from borrow pits which has not been approved or the quality of which differs from the approved material shall be rejected without recourse. The Engineer reserves the right to order removal of any such materials brought to the site of the works at his discretion at Contractor's expense. In order to ensure satisfactory compaction, it will be necessary to carry out, depending upon the type of material, particle size distribution tests, liquid limit, plastic limit and determination of organic contents tests, maximum and minimum density tests and determination of optimum moisture content for the fill material.
- 6.14. The method of compaction, namely type of compactor, type of roller, weight of roller and number of passes proposed by the Contractor for any particular fill material shall be subject to the approval of the Engineer after the completion of satisfactory field tests, subsequent to the laboratory analysis using the materials and equipment proposed to be used for the earthwork in conditions similar to those likely to be encountered during construction. The final selection of the soil moisture content, the thickness of layers, the type of compaction equipment and the number of passes shall be decided after these tests, which shall be conducted at Contractor's expense.
- 6.15. Having established the method of compaction to be used, no departure from this approved method shall be permitted without the prior approval of the Engineer. The adequate control of the fill and compacting operations shall be ensured by in-situ density tests and in order to obtain significant results, not less than two tests shall be carried out per one hundred square meters of area compacted. The frequency of tests shall be determined on site and may be varied at the discretion of the Engineer's Representative as the work proceeds. Tests shall be carried out in accordance with British Standard 1377:1975 or to such other standards as approved by the Engineer. The standard of acceptance of the compacting will not be less than 95% in-situ density with respect to the maximum dry density at optimum moisture content achieved in Test No 15 of BS 1377 : 1975 or the standard referred in the drawing.
- 6.16. The exact thickness of layers and the method of placing and compacting the fill shall be determined by the field tests, as stated above, but notwithstanding the results of these trials, fill shall not be placed in loose layers exceeding 200 mm (8 inch) in thickness. In order to maintain control of the thickness of layers, timber profiles shall be used wherever feasible. The profiles of each layer of fill shall be checked by the supervisory staff of the Engineer. The Contractor shall provide adequate supply of water and sufficient capacity of mechanical water carriers to ensure uniform and uninterrupted operation of compaction. The Engineer may forbid the Contractor to proceed with placing and/or compaction of fill and/or order removal and re- compaction of such fill when he finds that the Contractor has insufficient or defective equipment or that the fill has been improperly laid and/or compacted.
- 6.17. Backfilling of trenches/foundations shall be carried out only after the pipe line/ structural works within the excavations have been inspected, tested and approved by the Engineer.
- 6.18. Before the start of fill and backfill, the Contractor shall satisfy himself as to the levels and slopes of the fills and backfill shown on the Drawings, the requirements of compaction, the possibility of settlement and all other particulars whatsoever in connection with the filling works.

- 6.19. Backfilling for pipelines shall proceed as rapidly as practicable. Backfill shall be placed in horizontal layers and shall be compacted as follows:
- 6.20. Layers upto an elevation of 12 inch (300 mm) above the top of the bedding shall not be more than 6 inch (150mm) in loose thickness and the remainder of the layers above that elevation shall not be more than 6 inch (150 mm) of compacted thickness.
- 6.21. If it is found necessary to alter the moisture content of the fill material in any way, then, very strict control shall be exercised over the wetting and/or the drying process and frequent moisture content tests shall be carried out.

7. Sand Filling Under Floors

- 7.1. Unless otherwise specified the base of all ground floors shall be constructed in accordance with the following specification.
- 7.2. Sand filling shall be done in layers not more than 4 inch (100mm.) thick and shall be rammed after saturation to such an extent that 100mm (4 inch.) Layer is reduced to about 75mm (3 inch.) After compaction.
- 7.3. Density achieved should correspond to 95% of the compaction obtained by ASTM 1557 at optimum moisture content.
- 7.4. The base shall be perfectly level. A slope of 1:64 shall be provided in verandahs and bathrooms.
- 7.5. Sand shall conform in all respects to the specifications for fine aggregate except for its grading, i.e. it shall pass through sieve No.16 and not more than 30% shall pass through sieve No. 100.

8. TOLERANCES

The stabilization of compacted backfill/fill surface shall be smooth and even and shall not vary more than 0.5 inch. In 10feet (10 mm in 3 meters) from true profile and shall not be more than ½ inch. (12.5 mm) from true elevation.

9. DISPOSAL OF SURPLUS EXCAVATED MATERIAL

- 9.1. The rejected unsuitable material and surplus excavated material shall be disposed off within 25 kilometer lead measured along the most direct route from boundary of the Project, or as directed by the Engineer.
- 9.2. All carts, trucks or other vehicles used by the Contractor for transportation of the material shall be suitably constructed or lined so as not to permit any leakage of soil while the vehicles are on the move. These would be so loaded and arranged as not to spill on the Site and public roads. Whenever any vehicle so used is found leaking and unsuitable it shall be immediately withdrawn from the Work.
- 9.3. The disposal of surplus/unsuitable excavated material shall include loading, unloading, transporting, stacking, spreading and leveling as directed by the Engineer.

10. MEASUREMENT AND PAYMENT

10.1. General

Except otherwise specified herein or else where in the Contract Documents, no measurement and payment will be made for the under mentioned works related to the relevant BOQ items. The cost thereof shall be deemed to have been included in the quoted unit rate of the respective items of the Bill of Quantities.

- 10.1.1. Timber shoring, planking, strutting and providing slope for upholding the sides of excavations.

- 10.1.2. Any fill with approved material necessitated by over excavation due to fault or convenience of the Contractor.
- 10.1.3. Stockpiling the excavated material at approved location within free haulage limit of the Project Boundary and transporting back suitable material to places requiring backfill.
- 10.1.4. Specified foundation bed preparation.
- 10.1.5. Excavation involved in providing adequate working space around sides of foundation and service line trenches.
- 10.1.6. Rolling, leveling, watering & compacting the fill and backfill to required density.
- 10.1.7. All laboratory and field tests stipulated in these specifications.
- 10.1.8. Disposal of rejected surplus and unsuitable excavated material within 20-kilometer free haulage limit measured along the most direct route from boundary of the Project.

10.2. Excavation

10.2.1. Measurement

Quantities of excavation shall be calculated/measured from the pre-work levels of leveled and graded ground taken jointly by the Contractor and the Engineer before commencement of the work.

The quantities set out for excavation and its subsequent disposal shall be deemed to be the bulk quantity before excavating and no allowance shall be made for any subsequent variations in bulk or for any extra excavation.

Unless otherwise shown on the Drawings quantities of excavation shall be measured of acceptably completed works on the basis of vertical excavations required for the nominal concrete dimensions of the structural members of foundations.

Quantities of excavation for laying service line trenches shall be measured for payment on the basis of vertical excavation faces for the specified width for the trench as shown on the drawings.

Measurement for acceptably completed excavation works shall be made on the basis of number of cubic feet of material excavated for foundation and service trenches as shown on the Drawings or as directed by the Engineer.

10.2.2. Payment

Payment will be made for acceptably measured quantity of excavation on the basis of unit rate per cubic feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

10.3. Filling by Excavated material

10.3.1. Measurement

Measurement for acceptably completed compacted Filling by approved excavated material will be made on the basis of number of Cubic feet of compacted Filling by approved excavated material in position in accordance with the lines, levels, grades and compaction requirements as shown on the drawing or as directed by the Engineer.

10.3.2. Payment

Payment will be made for acceptably measured quantity of Filling by approved excavated material on the basis of unit rate per cubic feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

Section - 104 DEWATERING

1. SCOPE

The work for dewatering shall consist of lowering the ground water to the required predetermined ground elevation and includes:

- a) Dewatering foundations and care of water to maintain all excavations and access free of water as required for the proper construction of the Works including designing of the dewatering system.
- b) Protecting the excavated areas and structures to be constructed from damage by rains, surface run off and infiltration of sub-soil water into the areas of construction during the entire construction period including construction and maintenance of drains ditches and sumps.

2. SUBMITTALS

Prior to commencement of Works, the Contractor shall submit the following to the Engineer for his approval:

- a) Complete plans and sketches for un-watering of surface water if any and dewatering of the required excavations including system for disposal of this water to areas designated by the Engineer.
- b) Detailed design calculations where required.
- c) Proposed plan for protection of Works including the design of the protective works and allied facilities.

3. CONTRACTOR'S RESPONSIBILITY

All plans and works provided for dewatering and removal of impounded water shall be subject to approval of the Engineer but nothing in the Contract shall relieve the Contractor from full responsibility of such operations. The Contractor shall be responsible for and repair at his expense any damage to the Works resulting from failure of his operations. Failure of protection works or similar events, which may occur in the area during the entire construction period, shall be corrected by the Contractor at his expense.

The Contractor shall neither interrupt nor interfere with the natural or normal flow of any channel, watercourse or drain for any reason or purpose without the written approval of the Engineer.

4. PRODUCTS

4.1. GENERAL

The Contractor shall furnish tube wells, well points, pumping equipment, disposal lines, coffer-dams, ditches, drains, sumps, weirs, bunds, or any other work, material or equipment required to protect the Works against water.

4.2. PROTECTIVE WORKS

The Contractor shall construct and provide the protective works as may be required to protect the excavated areas and all other works from rains, surface run-off and infiltration of subsoil water into the areas of constructions.

4.3. **DEWATERING SYSTEMS**

The overall dewatering system shall include the Basic Dewatering System, the Standby Dewatering System, Power Supply Systems, Monitoring devices and all associated equipment as specified herein.

The Basic Dewatering System shall be the minimum required to achieve the specified results.

The Standby Dewatering System shall be that system which may be required to achieve the specified results in case a part or all of the Basic Dewatering System becomes ineffective for any reason.

Power Supply System shall consist of supply of power to various points for running the two dewatering systems and to provide lighting required to perform the work at night.

The Standby Power System shall be that independent generating system which may be required to keep the Dewatering System fully operational in the event of a power failure of the main system.

4.4. **ALARM SYSTEM**

The Contractor shall supply an alarm system, which will alert responsible personnel at the time of power failure and at the same time will automatically activate the Standby Power Units.

5. **EXECUTION**

5.1. **DEWATERING OPERATIONS**

The Contractor shall install, maintain and operate all the systems as required for dewatering the various parts of the Works and for maintaining the foundations free from water. The Contractor's method of removal of water from the foundations shall be as approved by the Engineer. Dewatering shall be accomplished in a manner that will prevent loss of fines from the foundation, will maintain stability of excavated slopes, will result in all construction operations being performed free from standing water and will result in all foundations being sufficiently dry for proper bonding of the backfill material with the foundations and proper compaction of the material placed. The Contractor shall be required to control the seepage along the bottom of the foundations and elsewhere to prevent the accumulation of standing water.

5.2. **PROTECTION OF WORKS**

Particular care shall be taken in all dewatering operations to ensure that the removal or lowering of water impounded in and around structures is at all times controlled and done in a manner that shall not result in sloughing of banks or damage to excavations and structures during the entire construction period.

5.3. **MONITORING**

The Contractor shall constantly keep watch on the sub- surface water levels and likely flooding from surface run off. He shall install piezometers if required and arrange recording of water levels data and correlate this data with dewatering operations on a continuous basis to ensure the dewatering as required.

5.4. **PRECAUTIONS**

The Dewatering System shall be designed in such a manner that all or parts of the Standby System can be directly connected to the Basic System, if during construction it becomes necessary to make this connection.

The Standby Dewatering System shall be operated for a period of at least 3 hours duration each week to demonstrate its complete effectiveness.

5.5. **CLEARANCE**

After having served their purpose, all protective works, dewatering and power supply systems shall be removed or leveled and graded to a slightly appearance so as not to interfere in any way with the operation or functions of the completed Works. Holes left from well points tube wells, pyrometers or other dewatering installations shall be grouted to the satisfaction of the Engineer.

6. MEASUREMENT AND PAYMENT

6.1. GENERAL

Except as otherwise stated the payment for dewatering item shall be made on a lump sum basis. The payment shall include, but not be limited to, all costs incurred in connection with provision, installation, operation, maintenance and removal of the complete Dewatering System consisting of Basic Dewatering System, Standby Dewatering System together with power supply arrangements. The item also includes transportation of all plant, equipment, supplies and personnel to the Site; making all the necessary arrangements for satisfactory performance of the Dewatering System throughout the Contract period; grouting holes as required, cost of provision and maintenance of protective Works and ditches, drains and sumps required for the Work.

- 6.1.1. The cost of providing power supply to run the system and the cost incurred on designing of the Dewatering System shall be deemed to be included in the price for the item.

6.2. - Measurement

No measurement will be made. Execution of the Contractor's plan for the respective item as approved by the Engineer shall be the basis of payment of lump sum amount for the item.

6.3. Payment

- 6.3.1. Interim payments for dewatering shall be made in lump sum in accordance with the following provisions:
- 6.3.2. The first payment equal to 25% of the lump sum amount of dewatering item shall be made after the Contractor has brought on Site all the materials, plant and equipment in accordance with his approved scheme of dewatering.
- 6.3.3. The second payment equal to 25% of the lump sum amount of the dewatering item shall be made after the complete Dewatering System has been installed and the Contractor has demonstrated its performance to the satisfaction of the Engineer.
- 6.3.4. Further payments amounting to 40% of the lump sum amount of dewatering item shall be paid in equal monthly installments starting one month after the second installment and ending at the completion of dewatering operations to the satisfaction of Engineer.
- 6.3.5. Balance 10% of the lump sum amount of dewatering item shall be paid after removal of the system on completion of dewatering operations, grouting of holes, if any and clearance of Site.

Section - 105

TERMITE CONTROL TREATMENT

1. SCOPE

The scope of work for anti termite treatment includes injection of insecticide in sides and bottom of foundation trenches, spraying on stockpiled backfill material and injections of the insecticide in floor sub-grade of the building. The scope also covers treatment of all wood works with insecticides before installation in position.

2. CODES AND STANDARDS

All methods of termite protection used herein shall be in accordance with the standard practice of National Pest Control Association, U.S.A. and the British Wood Preserving Association.

3. SUBMITTALS

- 3.1. Samples of all the materials to be used for termite control for approval of the Engineer and testing in accordance with the specified standards.
- 3.2. Method statement for application of anti-termite chemical.

4. QUALITY ASSURANCE

4.1. Manufacturer's Instructions

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

4.2. Application

A professional operator and also approved by the manufacturer shall be engaged who shall have license in accordance with regulations of governing authorities for application of soil treatment solution.

4.3. Guarantee

The Contractor is to guarantee that the building shall be free from termites (white ants), wood bores and other pests which cause damage to wood or other organic material for one year from the date of acceptance of the building.

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

5. MATERIAL

- 5.1. An emulsible concentrated insecticide shall be used for dilution with water, specially formulated to prevent infestation by termites. Fuel oil will not be permitted as a diluent. Provide a working solution of one of the following chemical with clean portable water in ratio 1:40 unless other wise specified by the manufacturer/ supplier.

5.1.1.1. Termidor

5.1.1.2. Biflex

5.1.1.3. Fiprokill

- 5.2. Insecticide shall be obtained from the Sole distributor, in sealed drums in quantity necessary for the requirement of works.

All mixing shall be done at site and mixing proportion of insecticide with water shall be verified by the Engineer.

- 5.3. Pure turpentine shall be used for dilution of insecticide, in approved proportion for application to woodwork where such application is required.

6. **METHOD AND EXTENT OF APPLICATION**

- 6.1. Insecticide solution shall be applied with approved pressure spraying equipment maintaining a pressure of 150psi to all applications to, on or in earth.
- 6.2. 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. 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 2 meter beyond building line. Solution shall be applied in amounts of not less than 6.00 litter /sq.m of area. If applied over gravel or sand fill, application shall not be less than 7.50litre / sq.metre of area. Insecticide shall penetrate to a depth of 25-mm minimum in porous earth at bottom and 50 mm to 75 mm at sides of excavations.
- 6.3. Sides of foundation excavations, grade beam, and similar areas shall be treated with solution at a rate of 0.37 gallon per square feet upon inner sides of such excavations, and at all locations where concrete slabs for platforms and similar work abut 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.
- 6.4. 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.
- 6.5. 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.
- 6.6. 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.

7. **MEASUREMENT & PAYMENT**

7.1. **General**

Except otherwise specified herein or elsewhere in the Contract Documents, no measurement and payment will be made for the under mentioned specified works related to the relevant items of the Bills of Quantities. The cost there of shall be deemed to have been included in the quoted unit rate of the respective items of the Bills of Quantities.

- 7.1.1. Termite control treatment on wood works.
- 7.1.2. Turpentine & Water required for mixing insecticide solution.
- 7.1.3. Transportation of material and storage at site.
- 7.1.4. Anti-termite treatment on stock piled backfill material.
- 7.1.5. Tool, plant & equipment required for Termite control treatment

7.2. **Termite Control Treatment**

7.2.1. Measurement

Measurement of acceptably completed works of termite control treatment will be made on the basis of number of square feet of area treated by measuring the two dimensions (length & breadth) of treated surface.

7.2.2. Payment

Payment will be made for acceptable measured quantity of termite control treatment on the basis of unit rate per square Feet quoted in the Bills of Quantities & shall constitute full compensation for all the works related to the item.

Section - 106

CONCRETE FORMWORK

1. SCOPE

The work under this section of the Specifications consists of furnishing all plant, labour, equipment, appliances and materials and in performing all operations in connection with the design, supply and installation of formwork for the purpose of shuttering in concrete work, complete in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and conditions of the Contract.

2. GENERAL

It shall be the responsibility of the Contractor to perform the work by engaging well-trained and experienced staff or by the sub contractor who shall have enough number of well-trained and experienced staff to coordinate his activities with the other operations. However the Contractor shall be responsible for the quality of work performed by the sub-contractor as per the requirements of these specifications.

3. MATERIALS

The Contractor shall use the following formwork materials for different purposes as stated below:

3.1. Timber

Form framing, sheathing and shoring.

3.2. Plywood

Form sheathing and panels.

3.3. Steel

- Heavy forms and false work
- Column and joint forms
- Permanent forms
- Welding of permanent forms

3.4. Form Ties Anchors and Hangers

For securing formwork against placing loads and pressures.

3.5. Coatings

Facilitate form removal.

3.6. Steel Joints

For formwork support.

3.7. Steel frame shoring

For formwork support.

4. DELIVERY AND STORAGE

4.1. Delivery

The delivery of formwork materials shall be done in such a manner that damage can be prevented.

4.2. **Storage**

Form work should be stored, after cleaning and preparing for reuse if used before in such a manner that access to all different materials is available.

Material which can be affected by weathering shall be stored in appropriate building or under covers and shade.

5. **WORKMANSHIP**

- 5.1. Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete and shall have sufficient rigidity to maintain specified tolerances.

Where required, details and locations of special forms to be used are set out on the drawings. The Engineer shall refuse any work in any part of the building, which has been constructed with a non-approved formwork. The Engineer shall refuse any concreting which will not be perfect or may not conform to the approved model.

- 5.2. Earth cuts shall not be used as forms for vertical surfaces of reinforced concrete work unless required as such or and permitted by the Engineer.

- 5.3. Mud centering shall not be permitted without the prior approval of the Engineer.

- 5.4. Formwork shall be of wrought timber, steel, plywood, proprietary building boards and such special materials, as may be shown on the drawings or approved by the Engineer, which give the required finish to the surface of concrete. Wooden formwork shall be free from loose knots and shall be well seasoned.

- 5.5. The formwork shall conform to the shape, lines and dimensions as shown on the plans, and be so constructed as to remain sufficiently rigid during the placing and compacting of the concrete, and shall be sufficiently tight to prevent loss of liquid from the concrete.

The design and Engineering of the formwork, as well as its construction, shall be the responsibility of the Contractor. Where necessary, to maintain the specified tolerances, the formwork shall be cambered to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete and due to construction loads.

- 5.6. The Contractor shall establish and maintain in an undisturbed condition and until final completion and acceptance of the project, sufficient control points and bench marks to be used as references for checking upon tolerances.

- 5.7. Requirements for 'facing materials' are given in the Section relevant to 'Finishing of Formed Surfaces'. The maximum deflection of facing material reflected in concrete surfaces exposed to view shall be 1/240 of the span between structural members.

- 5.8. Where natural plywood-form-finish, grout-cleaned-finish, smooth-rubbed-finish, scrubbed-finish, or sand-floated- finish is required, forms shall be smooth (faced with plywood, liner sheets, or pre-fabricated panels) and true to line, in order that the surfaces produced will require little dressing to arrive at true surfaces. Where any as- cast finish is required, no dressing shall be permitted in the finishing operation.

- 5.9. Where as-cast surfaces, including natural plywood-form- finish are specified, the panels of material against which concrete is cast shall be orderly in arrangement, with joints between panels planned in approved relation to openings, building corners, and other architectural features.

- 5.10. Where panels for as-cast surfaces are separated by recessed or otherwise emphasized joints, the structural design of the forms shall provide for locating

form ties, where possible, within the joints so that patches of tie holes will not fall within the panel areas.

- 5.11. Forms shall not be re-used if there is any evidence of surface wear and tear or defect which would impair the quality of the surface finish. Forms shall be thoroughly cleaned and properly coated before re-use.
- 5.12. The formwork shall be designed so that the soffits of slabs and sides of beams, columns, and walls may be removed first, leaving the forms to the soffits of beams and their supports in position.
- 5.13. Forms shall be sufficiently tight to prevent loss of mortar from the concrete. Unless otherwise specified in the Contract Documents chamfer strips shall be placed in the corners of forms to produce beveled edges on permanently exposed surfaces. Interior corners on such surfaces and the edges of formed joints will not require beveling unless required by the Contract Documents.
- 5.14. Positive means such as wedges or jacks for accurate adjustment and for proper removal of shores and struts shall be provided and all settlement shall be monitored during concrete placing operation. Forms shall be securely braced against lateral deflections.
- 5.15. Where concreting of thin members is required to be carried out within formwork of considerable depth, temporary openings in the sides of the formwork shall be provided where necessary to facilitate the placing and consolidation of concrete. Small temporary openings shall also be provided at the bottom of the formwork for columns, walls and deep beams to permit the cleaning out of debris and observation immediately before concrete is deposited.
- 5.16. Form ties shall be constructed so that the ends or end fasteners can be removed without causing appreciable spalling at the faces of the concrete. After the ends or end fasteners of form ties have been removed, the embedded portion of the ties shall terminate not less than 2 diameter or twice the minimum dimension of the tie from the formed faces of concrete to be permanently exposed to view and in no case shall this distance be less than 20 mm. When the formed face of the concrete is not to be permanently exposed to view, form ties may be cut off flush with the formed surfaces.
- 5.17. Through bolts may be permitted, provided that they are greased to allow for easy withdrawal and the holes subsequently made good. Through bolts are not to be used on water-retaining structures.
- 5.18. At construction joints contact surface of the form sheathing for flush surfaces exposed to view shall overlap the hardened concrete in the previous placement by no less than 25 mm. The forms shall be held against the hardened concrete to prevent offsets or loss of mortar at the construction joint so as to maintain a true surface.
- 5.19. Wood forms for wall opening shall be constructed to facilitate loosening, if necessary to counteract swelling of the forms.
- 5.20. Wedges used for final adjustment of the forms prior to concrete placement shall be fastened in position after the final check.
- 5.21. Formwork shall be so anchored to shores or to other supporting surfaces or members that upward or lateral movement of any part of the formwork system during concrete placement will not occur.
- 5.22. Runways or planks for moving labour and equipment shall be provided with struts or legs and shall be supported directly on the formwork or upon the structural member without resting on the reinforcing steel.
- 5.23. All surfaces of forms and embedded materials shall be cleaned of any accumulated mortar or grout from previous concreting and of all other foreign material before placing fresh concrete.

5.24. Forms shall be sufficiently tight to prevent leakage of grout or cement paste. Board forms having joints opened by shrinkage of the wood shall be removed and replaced. Plywood and other wood surfaces not subject to shrinkage shall be sealed against absorption of moisture from the concrete by either (1) a field applied, approved form oil or sealer, or (2) a factory applied non-absorptive liner. When forms are coated to prevent bond with concrete, it shall be done prior to placing of the reinforcing steel. Excess coating material shall not be allowed to stand in puddles in the forms nor allowed to come in contact with the concrete against which fresh concrete will be placed. Care shall be taken that such approved composition is kept out of contact with the reinforcement. Where as-cast finishes are required, materials, which will impart a stain to the concrete, shall not be applied to the form surfaces. Where the finished surface is required to be painted, the material applied to form surfaces shall be compatible with the type of paint to be used.

5.25. For reinforced concrete, in no circumstances shall forms be struck until the concrete attains a strength of at least twice the stress to which the concrete may be exposed at the time of striking.

The strength referred to shall be that of concrete using the same cement and aggregates, with the same proportions, and cured under conditions of temperature and moisture similar to those obtaining in the work. Where possible, the formwork should be left for longer time as it would assist the curing.

I n normal circumstances (generally where temperatures are above 20°C and where ordinary cement is used, forms may be struck after expiry of the following periods.

- Walls, columns and vertical sides of beams : 48 hours or as may be decided by the Engineer.
- .
- Side of slab (shores of props left under). : 6 days
- Beams soffits (shores or props left under). : 12 days.
- Removal of shores or props to slabs.
 - 1. Spanning upto 4 metre 10 days.
 - 2. Spanning over 4 metre 16 days.
- Removal of shores or props to beams.
 - 1. Spanning upto 6 metre. 18 days
 - 2. Spanning over 6 metre 25 days

For rapid hardening cement 3/7 of the above period will be sufficient in all cases except vertical sides of slabs, beams and columns, which should be retained for a minimum of 24 hours.

The number of shores or props, their sizes and disposition shall be such as to be able to safely carry the full dead load of the slab and beams, as the case may be.

Proper allowance shall be made for the decrease in rate of hardening of concrete in cold weather and the above minimum duration must be increased when the mean daily temperature is below 20°C.

26. When repair of surface defects or finishing is required at an early age, forms shall be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations.
27. Top forms on sloping surfaces of concrete shall be removed as soon as the concrete has attained sufficient stiffness to prevent sagging. Any needed repairs or treatment required on such sloping surfaces shall be performed at once and be followed by the specified curing.
28. Wood forms for wall openings shall be loosened as soon as this can be accomplished without damage to the concrete.
29. All formwork shall be removed without such shock or vibration as would damage the reinforced concrete. Before the top plank and struts are removed, the concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened. Proper precautions shall be taken to allow for the decrease in the rate of hardening that occurs with all cement in the cold weather.
30. When reshoring or repropping is permitted or required, the operations shall be planned in advance and shall be subject to approval. While reshoring is underway no live load shall be permitted on the new construction.

In no case during reshoring shall concrete in beam, slab, columns or any other structural member be subjected to combined dead and construction loads in excess of the load permitted by the Engineer for the developed concrete strength at the time of reshoring.

Reshores shall be placed as soon as practicable after stripping operations are complete but in no case later than the end of working day on which stripping occurs.

Reshores shall be tightened to carry their required loads without overstressing the construction. Reshores shall remain in place at least until tests representative of the concrete being supported have reached the strength specified in sub- clause 5.23 hereof.

31. Floors supporting props or shores under newly placed concrete shall have their original supporting props or shores left in place or shall be reshored. The reshoring system shall have a capacity sufficient to resist the anticipated loads and in all cases shall have a capacity equal to at least one half the capacity of the shoring system above. The reshores shall be located directly under a shore position above unless other locations are permitted.
32. The reshoring or re-propping shall extend over a sufficient number of storeys to distribute the weight of newly placed concrete, forms, and construction live loads in such a manner that the design superimposed loads of the floors supporting shores or props are not exceeded.

33. It is generally desirable to give forms for reinforced concrete an upward camber to ensure that the beams or slabs (specially cantilever slabs) do not have a sag when they have taken up their deflection, but this should not be done unless permitted by the Engineer.
34. No loads, other than man and light plant required in connection with the actual work in hand, shall be allowed on suspended floors until 28 days after concreting where ordinary Portland Cement is used and 14 days when rapid hardening Portland Cement is used.
35. The formwork and shuttering for pre-stressed concrete beams shall be well and stoutly constructed from steel clad timber or steel. It shall be fully capable of supporting all the loads due to the fresh concrete and due to construction equipment and operations, including vibration, without deformation or deflection that will affect the dimensions of the concrete member beyond the tolerance stipulated hereinafter.
 - 35.1. It is expressly stipulated that in view of precision and powerful vibration required in casting the pre-stressed concrete girders and pre-cast members particularly in the zones of end blocks or around anchorages, specially designed formwork and supporting systems shall be required.
 - 35.2. All details of formwork of girders and the supporting systems shall be submitted to the Engineer who shall check their safety and approve and/or amend the same, provided however that the approval of the formwork shuttering and supporting system by the Engineer, shall not in any way affect or diminish the Contractor's sole responsibility for fully satisfactory performance of the work.
 - 35.3. All joints between formwork boards and/or panels shall be flush and tight. Internal ties shall be used as few as possible and shall, when unavoidable, be in steel, located at such positions, which will not disturb the reinforcement or pre-stressing steel. The use of spacer blocks for the reinforcement shall be prohibited whenever the same effect can be achieved by properly dimensioned spacer rings mounted directly on the reinforcement. All spacer blocks and rings shall be of the same strength as the concrete in which they are embedded and shall be adequately cured before use.
 - 35.4. Prior to placing concrete, all forms shall be inspected and all debris and extraneous matter removed. The form oil or release agent shall not react with concrete to affect the strength nor shall it give any color. It shall be applied in such a manner as not to contaminate the reinforcement and other fixtures to be embedded in concrete.

MEASUREMENT AND PAYMENT

36. No payment will be made for the works involved within the scope of this section of the specifications unless otherwise specifically stated in the Bills of Quantities or herein.
37. The cost thereof shall be deemed to have been included in the quoted unit rate of relevant items of the Bills of Quantities.

Section - 107

REINFORCEMENT

1. SCOPE

The work under this section of specifications consists of furnishing, cutting, fabricating, bending and placing steel reinforcement and Welded wire fabric in concrete structures or elsewhere as shown on the drawings or as directed by the Engineer. The scope of this section of specification is covered with detailed specifications as laid down herein.

2. APPLICABLE STANDARDS

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

Pakistan Standard

PS 2674	Tensile Testing of Metals.
PS 2031	Bend test for Metallic Materials.
PS 607	General technical delivery requirement for steel.
PS 1612	Cold worked steel deformed bars for reinforcement of Concrete.
PS 1879	Deformed and Plain billet steel bars for concrete reinforcement (Metric)

British Standard

BS 4482	Specifications for cold reinforced steel wire for the reinforcement of concrete.
BS 5135	Specification for arc welding of carbon and carbon manganese steel.
BS 4449	Hot rolled steel bars for reinforcement of concrete
B.S 4461	Cold worked steel bars for reinforcement of concrete.
BS 4466	Bending dimensions, cutting and scheduling of steel reinforcement for concrete.
BS 4483	Steel fabric for the reinforcement of concrete.

ASTM Standard

A 305	Minimum requirement for the deformations of deformed steel bars for concrete reinforcement.
A 615	Deformed billet steel bars for concrete reinforcement.

ACI Standard

ACI 301	Specification for structural concrete for buildings.
ACI 315	Manual of standard practice for detailing reinforced concrete structures.

In addition to the above, the latest editions of other Pakistan Standards, British Standards, American Concrete Institute Standards, American Society for Testing and Materials Standards and other standard as may be specified by the Engineer for Special Material and construction are also relevant.

3. MATERIAL AND SIZE OF BARS

- 3.1. Reinforcement for concrete shall conform to the respective Pakistan, British, ASTM, or other Standards as specified in the Drawings and in the Contract Documents or as may be specified by the Engineer.
- 3.2. Unless otherwise specified, all grade 40 reinforcing bars shall comply with the requirements of ASTM-A 615 Deformed Billet steel bars and shall have a minimum yield strength of 40,000 Psi.
- 3.3. Unless otherwise specified, all grade 60 reinforcing bars shall comply with the requirements of ASTM-A 615M for Deformed steel bars and shall have a minimum yield strength of 60,000 Psi.
- 3.4. Steel wire mesh reinforcement shall conform to requirements of ASTM Designation A 185-64 or BS. 4482 and 4483, Standard Specifications for Welded Steel Wire Fabric for concrete reinforcement. It shall be used where shown on the Drawings.
- 3.5. Binding wire shall be 16 gauge Soft iron wire.
- 3.6. Reinforcement shall be obtained only from manufacturers approved by the Engineer. Each consignment of reinforcement steel shall be accompanied by the manufacturer's certificate or shall refer to a previous certificate, if the consignment is from the same batch, showing that the reinforcement steel complies with the specified requirement. If such certificate is not made available or if the Engineer considers that the manufacturer's tests are inadequate, samples shall be taken for acceptance test from different consignments as the Engineer may direct and shall be tested at the contractor's cost. Should the result of such tests show that the sample does not meet with the specifications the whole consignment shall be rejected and removed from the site at the Contractor's cost.
- 3.7. Reinforcement shall be free from all loose or flaky rust and mill scale, or coating, and any other substance that would reduce or destroy the bend. Reduced section steel reinforcement shall not be used.

4. **DELIVERY & STORAGE**

4.1. **Delivery**

Steel reinforcement bars shall be kept in bundles firmly secured and tagged. Each bar or bundle of bars shall be identified by marks stamped on hot or cold or painted on or by any other means. The identifying marks shall contain the following information:

- Name of the producer or his trade.
- Standard to which the bars have been manufactured.
- The class type and strength .
- The diameter.
- The number of the test certificate.

4.2. **Storage**

The method of storage shall be approved by the Engineer. Reinforcing bars shall be stored and shall be protected from mud, scaling, rusting, oiling, coatings, damage, contamination and structural defects prior to placement in works. Bars of different diameters and grades of steel reinforcement shall be kept separately.

5. **BAR BENDING SCHEDULES**

The Contractor shall prepare bar bending schedules of all the reinforcing steel bars and these bar bending schedules shall be submitted to the Engineer for his approval. The Contractor shall obtain approval of the bar bending schedules before starting actual bar bending works.

6. **CUTTING, BENDING AND PLACING**

- 6.1. The Contractor shall furnish, cut bend and place all reinforcement.
- 6.2. Reinforcement is to be accurately placed as shown in the drawings, and secured against displacement by using 16 gauge G.I wire ties or suitable slips at intersections and supported from the formwork by using concrete, or metal chairs and spacers or hangers of an approved pattern. Where concrete blocks are used for ensuring the cover, they shall be made of mortar not less than 1 part of cement to 2 parts of sand. All reinforcement including dowels, remaining exposed in the work shall be suitable protected against corrosion by a thick coat of cement slurry until embedded in concrete.
- 6.3. Bars used for concrete reinforcement shall be fabricated in accordance with the dimensions shown in the bar bending schedule approved by the Engineer.
- 6.4. The cutting tolerance for all bars shall be ± 1 inch.

- 6.5. Where an overall or an internal dimension of a bent bar is specified in the schedule, the bending tolerance, unless otherwise stated, shall be as in Table-1.

Table-1
Bending Tolerances

Description	Tolerance	
	Plus	Minus
Bars up to 3 ft. long	Inch. $\frac{1}{4}$	Inch. $\frac{1}{4}$
Bars 3 ft. to 6 ft. long	$\frac{1}{4}$	$\frac{1}{2}$
Bars over 6 ft. long	$\frac{1}{4}$	$\frac{1}{4}$

6. - Bars shall be placed to the following tolerances:
- | | | |
|--|---|-----------------------------|
| Concrete cover to formed surfaces | : | $\pm \frac{1}{4}$ inch. |
| Minimum spacing between bars | : | $\pm \frac{1}{4}$ inch |
| - Top bars in slabs and beams | : | <u> </u> + 2 inch. |
| Members 8 inch deep or less | : | <u> </u> +1 inch. |
| Members more than 8 inch but not over 24 inch deep | : | $\pm \frac{1}{4}$ inch. |
| Members more than 24 inch deep. | : | $\pm \frac{1}{4}$ inch. |
7. Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits, or embedded items. If bars are moved more than one bar diameter or enough to exceed the above tolerances, the resulting arrangement of bars shall be subject to approval of the Engineer.
8. Vertical bars in columns shall be offset at least one bar diameter at lapped splices. To ensure proper placement, templates shall be furnished for all column dowels.
9. Reinforcement shall not be bent or straightened in a manner that will injure the material.
10. No bars shall be bent twice in the same place, nor shall they be straightened after bending.
11. Unless permitted by the Engineer, reinforcement shall not be bent after being partially embedded in hardened concrete.
12. No splice of reinforcement shall be made except as shown on the working drawings unless approved by the Engineer.
13. Welding shall be permitted for bars only under suitable conditions and with suitable safeguards in accordance with BS 693, BS 1856, or AWS D12.1, provided the type of reinforcement bar has the required welding properties. Tack welding may be used to fix in position bars that cross each other, only with prior approval of the Engineer.
14. Exposed reinforcement intended for bonding with future extensions is to be effectively protected from corrosion. Protection is also to be provided to reinforcement partly built into concrete where the exposed part is to be built into later concrete.
15. No concreting is to be carried out until the reinforcement has been checked and approved by the Engineer.

16. All detailing shall be done as per American Concrete institute standards ACI-315 and ACI-318.

7. **CONCRETE COVER**

All reinforcing steel shall be held firmly in place before and during the placing of concrete by means of wires and supports adequate to prevent displacement during the course of construction.

8. **SUPPORTS**

All reinforcement shall be secured in place by use of concrete supports. Chairs, spacers, or ties may be of metal or as approved by the Engineer. Such supports shall be of sufficient strength to maintain the reinforcement in place throughout the concreting operations. Concrete supports shall be manufactured of the same concrete strength as used in the structure to be concerted.

9. **EMBEDDED ITEMS**

Before placing concrete, care shall be taken to determine that all embedded items are properly placed as required under the Specifications and are firmly and securely fastened in place as indicated on the Drawings or as directed by the Engineer. Embedded items shall be free from oil and other foreign matter such as loose coatings of rust, paint and scale. The embedding of wood or other perishable materials in concrete is prohibited unless specifically authorized or directed.

10. **MEASUREMENT AND PAYMENT**

10.1. **General**

Except otherwise specified herein or elsewhere in the Contract Documents, no measurement and payment will be made for the under mentioned specified works related to the relevant items of the Bills of Quantities. The cost thereof shall be deemed to have been included in the quoted unit rate of the respective items of the Bills of Quantities.

10.1.1. Providing and installing chairs, supports, hooks, spacers, binding wires, and laps not shown on Drawings including wastage and rolling margin.

10.1.2. Furnishing, delivering, storing, handling bending, cutting and cleaning of reinforcement

10.1.3. Plants, tools, labour and equipment required for the completion of the works at any elevation

10.1.4. Welded splices done by the Contractor for his convenience.

10.2. Furnish and install reinforcing Steel

10.2.1. Measurement

Measurement for acceptably completed works of steel reinforcement shall be made on the basis of number of M.Tonne of reinforcing steel placed on the basis of the lengths of bars installed in accordance with the approved Drawings or bar schedules or as directed by the Engineer. Length of each size of bars shall be converted to weights use of the unit weights per linear metre for each size as stated below. Steel laps indicated on the Drawings and as required by the Engineer will be measured for payment.

Nominal Bar Diameter (Nos.)	Weight Lbs/ft.
#2	0.167
#3	0.376
#4	0.668
#5	1.043
#6	1.502
#7	2.044
#8	2.670
#9	3.400
#10	4.303
#11	5.313

2204.6 lbs = 1.00 M.Tonne (1000 Kg)

10.2.2 Payment

Payment will be made for acceptable measured quantity of reinforcement as provide above on the basis of unit rate per M.Tonne quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the item.

Section - 108

STRUCTURAL STEEL WORKS

1. SCOPE

This Section covers general requirements of steel, steel work fabrication, methods including precautions for erection of steel structures, painting and other general requirements incidental to steel work, for complete job as shown on the design drawings or as directed by the Engineer.

The applicable requirements of this section as determined by the Engineer shall apply to all structural steel works under this contract. The work covered by this section, consists of supply of all material, labour, plant, equipment and appliances including welding, bolts, nuts, washers, anchor bolts, embedded parts etc., fabrication, erection and painting in accordance with the specifications and as per drawings and as directed by the Engineer. The scope of this section of specifications is covered with detailed specifications as laid down herein.

2. CODES AND STANDARDS

The work shall conform to the requirements of the following Codes and Standards, unless otherwise specified.

ASTM A 36-81	Structural steel specifications
ASTM A307-80	Specifications for carbon steel bolts.
BS 729-71	Hot dip galvanized coating on iron and steel articles.
AWS D 12	Recommended Practice for welding steel

3. SUBMITTALS

Prior to execution of work and sufficiently in advance, the Contractor shall submit the following to the Engineer for approval:

3.1. Shop Drawings

Shop Drawings, which shall show full construction details, quantities and locations, with metal gauges, reinforcing, cut- outs, holdfasts and attachment to adjacent construction and materials.

3.2. Samples

Representative samples of a typical metal window and ventilator, hardware, accessories and any other product required.

For metal doors and shutters, cross-sections of typical welded jointed or assembled frame, in specified thickness showing reinforcing, welding and prime paint coat.

3.3. Methodology

Methodology for fabrication, installation, erection and fixing.

4. QUALITY ASSURANCE

4.1. Type and Form of Product

All metal doors, windows, ventilators and shutters shall be the product of reputable manufacturer and shall be of the type indicated on the Drawings, and shall conform to the requirements specified herein.

4.2. Metal Doors and Shutters

All metal door and shutter frames shall be made of good quality cold rolled steel; exterior frames and doors shall be galvanized steel.

All frames shall be secured to the structure with strong wrought iron holdfasts. Holdfast shall be 50 mm wide and 6 mm thick and shall be secured to frames. Attachment shall be concealed.

4.3. **Metal Window and Ventilators**

- Window frame and ventilator sections shall be of mild steel.
- Hinges shall be subject to the approval of the Engineer.
- All operating hardware shall be of bronze lacquered iron.

4.4. **Structural Steel**

All structural steel shall conform to the requirements of ASTM A 36 or equivalent.

4.5. **Welding**

All welding shall be executed and inspected in accordance with the latest provision of the applicable code of the American Welding Society.

4.6. **Bolts**

All bolts, including anchor bolts shall conform to the requirements of ASTM A 307 or equivalent.

5. **DELIVERY AND STORAGE**

- 5.1. Doors shall be packed individually in a manner, which will ensure complete protection of all door surfaces and shall be stored in upright position, under cover, in a manner so as to prevent rust and damage.
- 5.2. Frames shall be supplied with removable angle spreaders securely fastened to the bottom of each joint. The spreaders shall not be removed until frames are secured in place.
- 5.3. Windows shall be delivered in a manner that prevents damages to the units and shall be stored off the ground, under cover, in a manner so as to prevent rust or damage.

6. **PRODUCTS**

6.1. **GENERAL REQUIREMENTS**

- 6.1.1. All contours and arises in metal door shall be true and sharp as can be produced in the thickness of metal required.
- 6.1.2. Construction joint of steelwork welded to full depth and width, or equivalent splice plates shall be welded on unexposed faces of frames. Exposed surfaces of welded joints shall be dressed and ground smooth to produce invisible connections.
- 6.1.3. Reinforcement and stiffeners shall be welded to the inside of the frame surfaces.
- 6.1.4. Window frames and ventilators shall conform to the sections shown on the detailed Drawings and all corners shall be electrically flash welded and finished smooth.
- 6.1.5. Weather baffles shall be integrally rolled and shall provide contact on all the four sides of the operating ventilators.
- 6.1.6. Weep holes and drips shall be provided for drainage in accordance with Drawings or instructions of Engineer.
- 6.1.7. All windows shall be designed for exterior glazing to accommodate glass thickness specified.
- 6.1.8. Ventilators shall show in or out, as indicated on the Drawings and shall be mounted over heavy steel pivots with brass pins.

- 6.1.9. Push bars for out swinging windows shall be a notched device for fixed settings and designed to lock shutters in open/closed position.
- 6.1.10. In-swinging windows shall be provided with a casement for fastener, designed and arranged to close with wedging erection to draw each leaf firmly into contact with window fixed rail.
- 6.1.11. Windows shall be provided with all necessary clips and anchors required for securing the windows to the structure.

7. EXECUTION

7.1. FABRICATION OF DOORS AND WINDOWS

7.1.1. Shape

The steel sections shall be thoroughly straightened in the shape by methods that will not injure it before being laid off or worked in any way.

7.1.2. Cutting and Forming

All members shall be so cut and formed that they can be accurately assembled without being unduly cracked strained or forced into position.

7.1.3. Jointing

The jointing of different parts of the members of mild steel shall be carried out by welding process in conformity with the requirements of American Welding Society for such joints. Welding points shall be made quite smooth by filing them and making smooth.

7.1.4. Galvanizing

If required all exterior doors, frames, anchors, reinforcing and related items shall be fabricated from hot dipped galvanized steel, conforming to BS 729, Part 1. After fabrication, all welds shall be touched up with liquid zinc.

Window frames and ventilators shall be hot dipped galvanized after fabrication conforming to BS 729 Part 1.

8. FABRICATION OF ROLLING SHUTTERS

8.1. Shutters

The shutter shall be fabricated using standard galvanized corrugated segments of the required length according to size of the shutter and of 22-gauge thickness. These segments shall be inter-linked properly to allow rotation for smooth rolling up and down. In order to reduce noise during operation, 2 inch. (50mm) wide wire reinforced canvas belt shall be riveted (using aluminum rivets) to both shutter ends and aluminum rollers shall be installed at top.

8.2. Guide

The guides for the shutter shall be fabricated from mild steel plates and shall be embedded to wall or columns by providing necessary anchors.

8.3. Main Rollers

The main rollers, mounted on the supporting pipe, on which the shutter has to roll up, shall be of mild steel with deep groove ball bearings and provision for greasing.

8.4. Supporting Shaft

The supporting shaft shall be of standard mild steel. Pipe strong enough to support the load of the shutter with minimum deflection. This shaft shall have adequate supports at the ends fabricated from mild steel plates. Each shutter

shall have separate bracket supports. However, due to space limitation for mounting, the same may be made common for adjacent shutter.

8.5. **Coil Spring**

On each end, between the bracket support and the roller coil, a spring shall be provided. The spring shall be of spring steel one end of which shall be fixed to the pipe and the other to the roller. These springs shall be suitable to balance the weight of the shutter to allow smooth operation.

8.6. **Cover**

The cover shall be fabricated from 22 gauge galvanized steel sheet of uniform shape and size without deformations.

9. **INSTALLATION**

9.1. **Doors, Windows and Ventilators**

The Contractor shall be responsible for proper protection and installation of all items furnished. Should the prime coat be damaged, or rust scale appears, he shall at his own expense and at the Engineer's direction, have all exposed surfaces cleaned to bare bright and re-primed with an approved priming coat before finish painting.

All items shall be installed plumb and square and shall be solidly anchored in a good workman-like manner in accordance with the approved Shop Drawings. The Contractor shall be responsible for the protection of installed items from damages 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 final acceptance.

9.2. **Wire Gauze**

Unless otherwise specified or directed by the Engineer, the wire gauze to be fixed with doors, windows and ventilators shall be 22 gauge having 12 x 12 mesh.

9.3. **Shutters**

The installation of all components of the shutter shall be done true to line and level and in perfect plumb. It should be ensured that the shutter should roll up automatically after initial manual lifting upto a desired height. The shutter closing should also be easy smooth and unobstructed. The operation shall be performable by a single person.

10. **PRIMARY COAT AND FINISHING**

10.1. The non-galvanized doors, windows and ventilators shall be painted with primary coat of red oxide and good quality double boiled linseed oil or any approved anti-corrosion paint after proper grinding. Afterwards two coats of synthetic enamel paint of approved make and shade shall be given.

10.2. Two coats of red primer and one coat of synthetic enamel paint shall be applied on all components of shutters except galvanized shutter, after fabrication and before installation. One coat of synthetic enamel paint shall be applied to all exposed surfaces after installation. Before applying paint all surfaces shall be cleaned from rust, burrs, scale, dust or grease.

10.3. The finished work shall be strong and rigid; neat in appearance and free from defects. Plain surfaces shall be smooth and free from warp or buckle. Molded members shall be clean, straight and true. Fastenings shall be concealed where practicable.

11. **MISCELLANEOUS STEEL WORK**

11.1. **General**

The work covered shall include furnishing; fabricating, installing and painting miscellaneous steel work including the following:

11.1.1. Steel handrails.

11.1.2. Steel protection angles and Channels.

11.1.3. Steel doors, windows, and ventilators/louvers.

11.1.4. Steel fencing.

11.1.5. Steel Gate

11.1.6. Embedded plate, anchor bolts and other miscellaneous items.

Drawings, material, fabrication, surface preparation shall conform to the applicable requirements of relevant clauses of these specifications. Any proposed deviation due to field conditions and availability of local material shall be submitted to the Engineer for approval.

11.2. Steel Stairs

11.2.1. General

Structural steel stairs complete with grating treads or checkered plate treads, landings, supporting structures, handrail supports etc. shall be furnished and installed in accordance with working drawings.

11.2.2. Material

Except otherwise indicated in the working drawings, materials shall conform to the requirements of ASTM A36 (specifications for structural steel).

11.2.3. Installation

The stairs shall be installed in a first class workman like manner. Connections to adjacent concrete structures shall be made with anchor bolts or shall be welded to embedded part at site as shown on the drawings.

11.3. Steel Protection Angles

Steel protection angles required for the protection of concrete work shall be erected true to line and level. Steel angles shall be grouted and fixed in position by using anchors as shown on the drawings or as directed by the Engineer.

11.4. Steel Door

Steel doors shall be fabricated in accordance with the Drawings or as directed by the Engineer.

11.4.1. Sample

Sample of materials shall be submitted to the Engineer for approval prior to fabrication.

11.4.2. Frames

Frames shall be fabricated from locally available hot flush hollow pressed sections, 'Z' section angle, tee, channel or pipe sections as specified in the drawings. Material shall however conform to ASTM - A -36.

11.4.3. Shutters

Shutters shall be double skin made of frames of any of the sections noted above with faceplate of at least 18 S.W.G. or as shown in the drawings.

Accessories such as hinges, steel standard track, roller and guides, standard bracket, anchors, bolts, locks, handles, latches, L-drops, stoppers, hydraulic door closure shall be heavy duty and shall conform to the requirements shown on the drawings or as directed by the Engineer.

The internal surfaces of frames and shutter including frame shall be painted with one coat of epoxy primer.

External surfaces in contact with or embedded in concrete shall not be painted, greased or oiled. However, such surfaces shall be given a cement wash after sandblast cleaning. All other external surfaces shall be given two coats of primer and two coats of epoxy enamel paint.

11.5. **Steel Grating on Drains**

Steel grating shall conform to the requirement of Federal specification PR-G-661 b; (except for Naval Vessels) type T all panels shall be banded on the all edges.

11.6. **Steel Hand Rail**

Steel Hand Rail shall be fabricated in accordance with the drawing or as directed by the Engineer and shall conform to the applicable requirement of ASTM A53 for the type and class of pipe indicated.

12. **MEASUREMENT & PAYMENT**

12.1. **General**

Except otherwise specified herein or elsewhere in the Contract Documents, no measurement and payment will be made for the under mentioned specified works related to the relevant items of the Bill of Quantities. The cost there of shall be deemed to have been included in the quoted unit rate of the respective items of the Bill of Quantities.

- Nuts, bolts, screw, rivets, heads, fillets, welds and welding rods.
- Anti-corrosive prime coat.
- Glazing.
- All metal embedded parts, metal fittings and fixtures required for the operational process.
- Cleaning with sand blasting.
- Paint and Painting of Steel works
- Locks, handle, hinges, hold fast, Latches, L-drops stopper, etc.
- Fly screen with open able window panel
- Steel grill with windows
- Sealant, gaskets etc.

12.2. **Steel Hand Rail**

12.2.1. **Measurement**

Measurement of acceptably completed works of Steel Hand Rail will be made on the basis of net actual Running feet fabricated, provided and installed in position as shown on the Drawing or as directed by the Engineer.

12.2.2. **Payment**

Payment will be made for acceptable measured quantity of Steel Hand Railing on the basis of unit rate per Running feet quoted in the Bill of Quantities and shall constitute full compensation for all works related to the item.

12.3. **Steel Louver Door and Rolling Shutter**

12.3.1. **Measurement**

Measurement of acceptably completed works of Steel louver Door and Rolling Shutter will be made on the basis of net actual area in Square

feet fabricated, provided and installed in position as shown on the Drawing or as directed by the Engineer.

12.3.2. Payment

Payment will be made for acceptable measured quantity of Steel louver Door and Rolling Shutter on the basis of unit rate per square feet quoted in the Bill of Quantities and shall constitute full compensation for all works related to the item.

12.4. Steel Louver Ventilator

12.4.1. Measurement

Measurement of acceptably completed works of Steel louver Ventilator will be made on the basis of net actual area in Square feet fabricated, provided and installed in position as shown on the Drawing or as directed by the Engineer.

12.4.2. Payment

Payment will be made for acceptable measured quantity of Steel louver Ventilator on the basis of unit rate per square feet quoted in the Bill of Quantities and shall constitute full compensation for all works related to the item.

12.5. M. Steel grill for Windows

12.5.1. Measurement

Measurement of acceptably completed works of M. Steel grill for Windows will be made on the basis of net actual area in Square feet fabricated provided and installed in position as shown on the Drawing or as directed by the Engineer.

12.5.2. Payment

Payment will be made for acceptable measured quantity of M. Steel grill for Windows on the basis of unit rate per square feet quoted in the Bill of Quantities and shall constitute full compensation for all works related to the item.

Section - 109

BRICK MASONRY

1. SCOPE

The work under this section of the specifications consists of furnishing all plant, labour, equipment, appliances and materials and performing all operations in connection with furnishing and installing plain Brick Masonry and fair face Brick cladding (Gutka) of specified size in position complete in strict accordance with this section of the specifications and applicable drawings and or as established by the Engineer.

2. CODES AND STANDARDS

The work shall conform to the requirements of the following Codes and Standards, unless otherwise specified.

ACI 530-88	Building code requirements for masonry structures
ACI 530.1-88	Specifications for masonry structures
PS 208	Classification, strength and properties of bricks.
ASTM C 67-81	Standard method for sampling and testing brick and structural clay tile.
ASTM C 144-81	Standard specifications of aggregates for masonry mortar.
ASTM C 150-81	Specifications for Portland cement
UBC 2405	Quality control
UBC 2406	Allowable stresses

3. SUBMITTALS

The Contractor shall submit the following to the Engineer for his approval:

- 3.1. Methodology and Sequence of work.
- 3.2. Specimen samples of bricks, aggregates for mortar or grout and Portland cement. Specimens of bricks shall be representative of a complete range of colors, textures and sizes.
- 3.3. Results of all the tests performed upon the materials and masonry units obtained from the site of work as per directions of the Engineer.

4. TOLERANCES

4.1.1. Brick

No overall dimension of brick (width, height and length) shall differ from the specified standard dimension by more than 1/8 inch (3 mm). Standard dimensions of brick is 9" x 4-1/2" x 3" (230 x 115 x 75mm) and fair face brick (gutka) is 9" x 2-1/4" x 2-1/4" (230 x 62 x 62 mm).

4.1.2. Brick Work

All brick work shall be erected true to line, plumb and level and the variation:

- 4.1.2.1. from plumb in any length of wall shall not exceed 1/12" (2mm) in 3 feet (one metre) or 3/8" (10mm) in a storey height or 1 inch (25mm) in the entire height.

5. INSPECTION AND TESTING

Regular inspections shall be carried out to control the quality of the works and to ensure that materials, construction and workmanship are in compliance with the plans and Specifications. Inspection and test records shall be maintained and made available to the Engineer as a routine, on each working day.

5.1. Inspection

Inspection for quality control shall include, but is not limited to the following:

- 5.1.1. the masonry units i.e. bricks, reinforcement if used, cement, lime, surkhi, aggregate, water and all the other materials meet the requirements of the applicable standards of quality
- 5.1.2. materials are properly stored and prepared for use
- 5.1.3. mortar and grout are properly mixed using specified proportions of ingredients,
- 5.1.4. the method of measuring materials for mortar and grout shall be such that the proportions of the constituents are entirely controlled.
- 5.1.5. the bricks pass a visual inspection for soundness, compact structure, reasonably uniform texture and shape; and that the bricks are free from cracks, warpage, large pebbles, balls of clay or particles of lime that would affect the serviceability or strength of the brick.

5.2. Testing

Burnt bricks shall be of uniform color, finish and free from cracks, warpage, exposed stones, pebbles or particles of lime. The size of the bricks shall be in accordance with that shown on the Drawings. The testing of bricks shall comply with ASTM C 67. Physical requirements of the bricks shall be as given in Table 4A-1

TABLE 4A-1

Bricks	Minimum Compressive Strength (brick flat wise)	Maximum water Absorption in 5 hour	Maximum Saturation Co-efficient
Individual	(1,150 psi) 8 MPa	25%	0.90
Average of 5 bricks	(1,430 psi) 10 MPa	22%	0.88

The saturation coefficient is the ratio of absorption by 24 hours submersion in cold water and to that after 5 - hours submersion in boiling water.

In case the bricks do not have the compressive strength as specified then the Engineer shall use his best judgment in permitting incorporation of the best bricks available in the area, taking into consideration the nature and structural stability of the works.

If 10 bricks per thousand are defective or if the average weight of nominal 9" x 4-1/2" x 3" (230 mmx115x75mm) brick is less than 3.5 kg or the bricks are out of dimension the whole lot shall be rejected and the Contractor shall remove the rejected lots from the Site.

13. DELIVERY AND STORAGE

Delivery

The methods and equipment used for transporting the bricks and mortar shall be such as will not damage the bricks nor delay the use of mixed mortar.

Storage

Masonry materials shall be so stored that at the time of use the materials are clean and structurally suitable for use.

MORTAR

Cement

All cement for mortar for brickwork shall conform to the applicable requirements set forth in Section Plain and Reinforced Concrete.

Sand

Sand for mortar used in brickwork shall be furnished by the Contractor, and shall meet the requirements set forth in ASTM C 144. The Fineness Modules of the sand shall range between 1.9 to 2.8 and the grading shall be within the limits given in Table

TABLE 4A-2

Sieve Sizes		Percent Passing (by weight)
4.76mm	No. 4	100
2.38mm	No. 8	95 to 100
1.18mm	No.16	70 to 100
600um	No.30	40 to 75
300um	No.50	10 to 35
149um	No.100	max. 25
74um	No.200	max. 10

Sand shall be stored at the Site in such a manner that it is not mixed with foreign matter. Methods employed by the Contractor for unloading, loading, handling and storage shall be subject to the approval of the Engineer. Sufficient quantity shall be maintained at the Site at all times to assure continuous work.

Water

The water used in the manufacture of bricks and in the preparation of mortar shall be in complete conformity with the applicable requirements set forth for water in Section Plain and Reinforced Concrete.

Surkhi

Surkhi shall be prepared by grinding special bricks into powder form or may be obtained/purchased from approved manufacturers.

Mortar Composition

1. Cement Sand Mortar.

Mortar for all brickwork shall, except as otherwise specified or directed by the Engineer, shall consist of one part Portland Cement to four parts of sand by volume for 4-1/2" (115 mm) thick walls and one part of cement in six parts of sand for 9" (230mm) and over thick walls for building works and one part of cement to 5 parts of sand for other works, and sufficient water to produce the proper consistency for the intended use. Where directed by the Engineer for increased workability, hydrated lime putty, approved by the Engineer, shall be added to the mortar but shall not exceed 25 percent, by volume of the dry cement.

2. Mortar for fair face Brick Cladding (gutka)

The mortar for all fair face brick (gutka) masonry cladding shall consists of cement, surkhi and sufficient water to produce proper consistency in the following composition:

Cement	:	Surkhi
1	:	4

OR

Swan pozzolana in the ratio as recommended by the manufacturer.

3. Mortar Batching

Methods and equipment used for mixing mortar shall be such as will accurately determine and control the amount of each separate ingredient entering into the mortar and shall be subject to the approval of the Engineer. If a mixer is used, it shall be of approved design and the mixing time after all the ingredients are in the mixer, except for the full amount of water, shall not be less than two minutes. Mortar shall be mixed only in sufficient quantities for immediate use and all mortar not used within 30 minutes after addition of the water to the mix shall be wasted. Re-tempering of mortar will not be allowed. Mixing troughs pans shall be thoroughly cleaned and washed at the end of each day's work.

8. BRICKS

1. Brick Materials

Bricks for plain brick masonry shall be first-class bricks made from carefully selected earth which shall be good loam or clay. The earth shall be free from objectionable quantities of lime, gravel, coarse sand and roots and other organic matter. The salt contents shall not exceed 0.3 per cent and calcium carbonate content shall not exceed 2 per cent.

2. **Brick Manufacture**

All bricks shall be manufactured by the Trench Kiln Method or other standard method approved by the Engineer. The moulds to be used in the manufacture of bricks shall be thoroughly sanded before each use and shall be sufficiently larger than the size of the bricks being manufactured to allow for shrinkage in drying and burning. Each finished brick shall be a nominal 230x115x75 mm in size, shall weigh between 3.2 and 4.1 kilograms and shall have a "frog" 6 millimeter deep on the upper face. The bricks shall be thoroughly burnt but without being vitrified. The bricks used shall be well burnt, uniform in shape, size, texture, color and should produce a ringing sound when struck. The bricks shall be free from flaws, cracks, chips, stone nodules of lime or kankar or other blemishes. Bricks over burnt, vitrified, irregular in shape or not having uniform color or under burnt shall not be used. Bricks of uniform size shall be used throughout the work and the source of supply shall not be diversified.

3. **Stacking And Sampling**

The bricks shall be sorted and arranged in stacks of one or two thousands or as directed by the Engineer. Each stack shall be 10 courses high and two bricks thick so that at least 2 feet (0.6 metres) space between the stacks shall be left for the purpose of inspection. Each size or class of brick shall be stacked separately. For purposes of inspection and tests the sample bricks shall be selected by the Engineer or a person authorized by the Engineer for this purpose. These samples shall be furnished by the Contractor without charge. The sampling shall conform to ASTM C 67. For the modulus of rupture, compressive strength and absorption determinations at least 10 bricks shall be selected from each lot of 25,000 bricks or a fraction thereof. For larger lots five additional bricks shall be selected from each 50,000 bricks or a fraction thereof contained in the lot. In no case shall less than 5 bricks be taken.

Additional specimens may be taken at the discretion of the Engineer. Each specimen shall be marked so that it may be identified at any time. Markings shall not cover more than 5 per cent of the superficial area of the specimen.

9. **SCAFFOLDING**

Contractor shall provide safe scaffolding of adequate strength for use of workmen at all levels and heights. Scaffolding which in the opinion of the Engineer is unsafe, shall not be used until it has been strengthened and made safe for use of workmen to the satisfaction of the Engineer.

Damage to masonry from scaffolding or from any other causes shall be repaired by the Contractor.

EXECUTION

1. **PLACING BRICK MASONRY**

The methods and equipment used for transporting the bricks and mortar shall be such as will not damage the brick nor delay the use of mixed mortar. Brick shall not be placed during rains sufficiently heavy or prolonged to wash the mortar from the brick. Mortar already spread which becomes diluted by rain shall be removed and replaced before continuing with the work. All brick to be used in brick masonry shall be moistened with water for three to four hours before they are used by a method which will ensure that each brick is thoroughly and uniformly wetted. All bricks shall be free from water adhering to their surface when they are placed in the brick masonry.

Bricks shall be laid "frog" upward with mortar joints and in English/Flemish bond as shown on the Drawings or as directed by the Engineer. Both bed and vertical joints shall be approximately 6mm and 10mm in thickness completely filled with cement mortar as specified herein, and each brick shall be bedded by firmly tapping with the handle of the trowel. All horizontal joints shall be parallel and all vertical joints in alternate courses shall be directly over one another. Excess mortar at the outer edges shall be removed and joints drawn straight with the edge of a trowel and a straight edge. All anchors and similar work required to be embedded in the brick

masonry shall be installed as the work progresses. At the completion of the work all holes or defective mortar joints shall be cut out and re-pointed.

Where shown on the drawing the exterior faces of the walls shall be finished by striking the joints as the work proceeds. The joints shall be struck by raking the green mortar after the brickwork has been laid and finishing the joint with a pointing tool. Horizontal joints shall be struck to form a weathered joint and vertical joints shall be struck with a V notch. Care shall be taken that the striking tools do not develop a cutting edge, as the object of striking the joint is to compress the mortar into the joints.

The exposed faces of all brick masonry shall be thoroughly cleaned and left bare with struck joints as specified above.

The fair face Brick cladding (gutka) shall be laid in running bond unless otherwise as shown on the drawing or directed by the Engineer.

2. CURING

All brickwork requiring mortar shall be cured by water or other acceptable methods. All methods and operations of the Contractor in curing the different portions of the work shall be subject to the approval of the Engineer. When curing by water, the brickwork shall be kept wet for 7 days unless specified otherwise or covered with water-saturated material or by a system of perforated pipes, mechanical sprinklers, porous hose, ponding or by any other approved method which will keep all surfaces to be cured continuously wet. Water used for curing shall meet the requirements for water used in the manufacture of bricks.

3. Finishing

All bricks shall be skillfully laid frog face up with level courses, uniform joints, square corners, plumb verticals and true surfaces, except when otherwise shown on Drawings or directed by the Engineer. Where the brickwork is required to be covered by mortar coating, the required finish shall be as indicated on the Drawings and shall meet with the requirements of the relevant specifications.

4. Cement Mortar Coating

Brickwork surfaces which are intended to receive paint coatings, shall have an over coating of cement mortar. The mortar shall consist of one part Portland cement to four parts of sand by volume and sufficient water to produce the proper consistency for the intended use. The surface on which mortar is to be applied shall be rough, clean and damp. The first layer of mortar, about 6 mm thick shall be forcibly dashed onto the surface so as to bond more tightly. The full thickness of the cement coating shall be ½" (12mm) except where otherwise shown on the Drawings or directed by the Engineer.

5. Pointing

Brickwork surfaces, which are intended to receive pointing, shall be given V-notch pointing by striking the joints. Tooling shall be done when the mortar is partially set but still sufficiently plastic to bond. All tooling shall be done with a tool, which compacts the mortar. Raked joints shall be ½" (12mm) deep V-notch, 70 degree apex in order to give pressed and compacted surface. All joints shall be given finish with 1:3 cement sand mortar with a pointing tool.

11. REPAIRING BRICKWORK

11.1. If, after the completion of any brickwork, brick is out of alignment or not level, or does not conform to the lines and grades shown on the Drawings, or shows a defective surface, it shall be removed and replaced by the Contractor at his expense, unless the Engineer grants permission in writing to patch the defective area.

11.2. At the completion of the work, all holes and defective mortar joints shall be cut and re-pointed. Exposed masonry shall be protected against staining or other damages and excess mortar shall be cleared off the surfaces as the work progresses. All exposed masonry shall be clean, smooth, plumb and

shall be of acceptable finish. In the event ordinary cleaning is not adequate, special methods such as sand blasting or otherwise as approved by the Engineer, shall be used to clean the surfaces.

12. HORIZONTAL DAMP PROOF COURSE

All Horizontal damp proof courses unless otherwise specified in the drawings shall consists of class 'B' cement concrete (3000 psi) 2" (50mm) thick, mixed with 2.5 kg of pudlo / bag of cement or other approved quality water proofing compound as per manufacturer's specifications and shall be laid at required levels as per drawings and instructions of the Engineer. The D.P.C shall be tamped, consolidated, leveled and edges corners made to the requirements of the relevant drawings including finishing and curing complete. Including two float coat of hot bitumen 10/20 penetration grade shall be applied over the class "B" cement concrete @ 7 kg/100 sft.

13. VERTICAL DAMP PROOF COURSE

All vertical damp proof courses unless otherwise specified in the drawings shall consists of 1/2" thick cement sand plaster in 1:3, mixed with 2.5 kg of pudlo / bag of cement or other approved quality water proofing compound as per manufacturer's specifications and shall be applied at required elevation as per drawings and instructions by the Engineer, including two float of hot bitumen 10/20 penetration grade shall be applied over plaster @ 7kg/100sft.

14. MEASUREMENT AND PAYMENT

14.1. General

14.2. Except otherwise specified herein or elsewhere in the Contract Documents, no measurement and payment will be made for the under mentioned specified works related to the relevant items of the Bills of Quantities. The cost thereof shall be deemed to have been included in the quoted unit rate of the respective items of the Bills of Quantities.

14.2.1. Cutting & chiseling of masonry wherever required.

14.2.2. Cement sand mortar used in laying bricks including wastage.

14.2.3. Curing and repairing the masonry work.

14.2.4. All joint reinforcing bars, reinforcing anchor bars or hoop iron

14.2.5. Horizontal Damp proof course of class "B" concrete (3000 psi) including damp proof materials.

14.2.6. Vertical Damp proof course of 1:3 Plaster including damp proof materials

14.2.7. Scaffolding for Masonry Work.

14.2.8. 2-1/2" long steel nails to be fixed in Brick masonry after every 5th courses at a distance 6" c/c for fair face Brick Cladding.

14.2.9. Cement sand mortar in 1:4 at the back of the fair face brick (Gutka) cladding to make it in plumb if required.

14.3. Brick Masonry

14.3.1. Measurement

In case of different thickness of slab in different areas or room or for any other reason whatsoever, if chiseling of masonry is required, the Contractor shall do so at his own cost where, for any reason whatsoever, the height, of the wall is short of ceiling height, of the actual height shall be made good with 3000 psi nominal mix concrete. This concrete shall neither be measured nor be paid under item of concrete but will be paid for under item of wall masonry. Similarly where the lintel heights are such that the Contractor has to chisel the masonry or provide cast-in-place concrete to make up the height of

the course, no payment will be made for chiseling, but where such cast- in-place concrete is provided, payment for the same will be made at the unit rate for masonry. Measurement of acceptably completed works of brick masonry will be made on the basis of number of cubic feet for 9" (230mm) thick and above and for 4-1/2" (115mm) thick and below in Sq. feet as provided & installed in position as shown on the Drawing or as directed by the Engineer. All opening more than 1 Sq. ft (0.1 Sq. metre) area left in the masonry wall shall be deducted.

14.3.2. **Payment**

Payment will be made for acceptable measured quantity of brick masonry on the basis of unit rate per cubic foot for 9" (230mm) thick and above and 4-1/2" (115mm) thick and below in square foot quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

Section - 110

ALUMINUM WORKS

SCOPE

The work under this section of specification includes furnishing all labour, equipment, appliances and materials and performing all operations in carrying out the work of natural, anodized and powder coated aluminum windows, doors, ventilators and louver with fly proof shutters and aluminum false ceiling of polycarbonate sheet on swimming pool. 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 the applicable drawings and subject to the terms and conditions of the Contract.

APPLICABLE STANDARDS

Latest editions of following ISO and British Standards are relevant to these Specifications wherever applicable.

ISO (International Organization for Standardization)

6612 Windows & Doors - wind resistance tests.

6613 Windows & Door - Air permeability test.

BSI (British Standard Institution)

1227 Hinges

4873 Aluminum alloy windows.

SUBMITTALS

Shop Drawings

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 to permit manufacturer's product delivery and start of site work to suit the building program.

Samples.

Prior to execution of work and sufficiently in advance, the Contractor shall submit representative samples of finished Doors, windows and ventilators, anchoring mechanism, embedded parts, fastenings, glass panes, accessories and other materials for the Engineer's approval.

Manufacturer's Certificate

The 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 specification and the same shall be furnished to the Engineer.

Guarantee

The manufacturer shall furnish his standard written guarantee against leakage of rainwater, excessive infiltration of dust, air and all defects in materials, workman ship covering all the 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 law or by other provision of the Contract Documents.

INSPECTION & TESTING

Contractor shall arrange tests and analysis if directed by the Engineer of scaled models of each Door, window ventilator 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.

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 components 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.

PRODUCT DELIVERY AND STORAGE

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.

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.

MATERIAL

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 B 308 & B221.

Frames

The frames of aluminum doors, windows, ventilator, louvers and fly proof shutters shall be formed from rolled, strip or extruded aluminum and be at least 2mm thick deluxe section. Fastenings bolts and screws shall be made from hardened aluminum.

Fasteners shall be stainless steel of a type selected to prevent galvanic action with the components fastened.

Gaskets shall be vinyl glazing channel gasket to commercial standard CS-230-60.

Hardware as required shall be manufacturer's standard hardware of aluminum, stainless steel or other corrosion resistant materials and shall blend in design with the frame finishes.

Joint sealant shall be approved elastomer.

Fittings and fixtures shall be as per approved samples.

Joint sealant shall be approved elastomer.

Finished Coating

General

The finished coating shall be as stated on the Drawings and applied strictly in accordance with the manufacturer's instructions.

The color of the coating shall be selected from available ranges if not stated in the drawing and or bill of quantities. The Contractor shall offer samples for approval prior to the final selection and the manufacture of these elements.

6.9.2 Anodized coating

The aluminum anodizing shall comply with BS 3987 and be integral color hard coat anodizing 550kp/mm² hardness, minimum 25 microns thick.

The color of anodizing shall be as described on the drawings. Samples of color including limits of color variation shall be submitted to the Engineer for his approval before work commences. The Engineer reserves the right to reject the products of any supplier who cannot guarantee a reasonable limit of color variation, the acceptable limit of variation being at the Engineer's discretion.

6.9.3 Polyester Powder coating

All aluminum sections that are to receive a polyester powder coating shall be given a caustic etch followed by an anodic oxide treatment to obtain an architectural class 1 anodic coating. Anodisation should be not less than 25-micron thickness.

All aluminum works shall be finished in colored electrostatic polyester powder coating as per DIN standard 53151, 53153, 53156 or equal and approved to ____ color subject to the Consultant's approval.

6.9.4 Coating Thickness

As and when instructed by the Consultant, the Contractor shall provide certificates from independent laboratories that the minimum thickness as stated in these Documents has been applied to the aluminum sections. Failure to provide such information shall result in the complete installation being rejected and replaced at the Contractor's expense.

5. Dissimilar Materials

All aluminum surfaces that are to be in contact with cured concrete; mortar, steel and other metals shall have the contact surfaces protected wherever they may entrap moisture or corrosive elements. Metals that are to be in contact with mortar or concrete shall be protected with a two coat bituminous coating.

Prime paint steel parts of anchors, anchor inserts, reinforcement, supports, and all parts after field welding or blotting with zinc chromate. Minimum dry film thickness of 1 mil for zinc chromate.

14. FABRICATION

7.1 General

All nuts, bolts, washers and screws used for assembly and fixing shall be of adequate strength for their purpose within the design and shall be stainless steel grade 18/8.

All sealants used in the assembly of, and in the fixing of cladding and window framing, shall be non-setting to allow thermal movement without detriment to those joint sealants used for peripheral caulking and shall be one part silicone sealant and shall conform to BS 4245. All spliced joints between mullions will be sealed with an approved silicone product, compatible with other sealants and packings used.

All ironmongery which is to have the same finish as the frames and shall be approved by the Engineer.

At all opening of windows and doors and where there are louvered screens and doors, a fly screen shall be provided to the approval of the Engineer, constructed following the principles and specifications as described elsewhere in this specification.

Glazing sections shall be set in special heat resisting PVC and of channel type. Separate glazing sections on each side of the glass will not be permitted.

The following table indicates the basic requirements for window construction. The weights of framing make no allowance for beads, glazing bars, opening light framing, coupling mullions or transoms.

Classifi- cation	Min. Weight Of basic Frame Kg/m run	Max. Superficial Area of window In m2	Max. Dimension Either way Mm	Remarks
Light	0.60	1	1500	
Light	1.00	3	2000	
Medium	1.50	5	2500	
Medium	2.00	9	3000	
Heavy	2.50	12	3500	
Heavy	3.00	12	3500	With door

7.2 Sliding Windows and doors

Weather-stripping - high-density acrylic wool weather pile shall be used. There should be double brushes at every contact between shutter and frame sections for complete insulation. These should be present consistently throughout the unit between the inside and the outside and no portions without it are permitted.

The rollers for sliding shutters for both windows as well as doors shall be of the adjustable type. The adjusting screws must be accessible in the assembled state of the shutters and a vertical adjustment of 7 mm should be possible.

All sections for sliding windows and doors should be hollow section and the cross section dimensions of the sections should not be less than 60 x 40 mm.

The outer frame must be suitable for accommodating sliding flyscreens as required.

The handle-latch set should have all visible surfaces finished as the aluminum sections. The handle must have a proper grip. A small projecting flange or recess in the shutter sections cannot be accepted to serve as handles. The latching mechanism should not be surface mounted but should be concealed within the sections.

Sash rails of vertical sliding windows are to be of tubular box sections with corner joints of outer frames and sashes interlocked, and the balance mechanism is to be an approved proprietary product.

7.3 Side hung windows, doors and ventilators

All windows and doors should be weather-stripped with heat resistant PVC sections. The weather protection should be achieved by a positive compressive action against the PVC section and should not depend on external contact with the PVC section. At every contact between two profiles two weather-stripping section should be provided to complete weather protection.

The bottom sections for hinged doors must be capable of being adjusted vertically if necessary. The gap between the bottom section and the floor should be covered with a pair of special splay-type PVC sections.

The shutter sections for both windows as well as doors shall be hollow section type and shall be overall size 57 x 45 mm and door sections shall be overall size 81 x 45 mm (including flanges).

The shutters of the windows and doors should be assembled with concealed corners of high rigidity. Hinges should be concealed within the sections.

Hinges shall be anodized aluminum with stainless steel pins and nylon washers. Handles shall be anodized aluminum finished to match the aluminum sections and mounted with self-lubricating nylon washers.

A mortice cylinder rim automatic deadlock of high quality with double pin tumbler is to be used.

Windows shall have anodized aluminum handles, color as framing and a latching mechanism securing the shutter to the frame both at the top and bottom.

Fitting where required:

- a. Single action door closer concealed in the head bar of the outer frame and mounted on an adjacent pivot at the threshold and deadlock fitted.
- b. The left hand leaf of double doors with flush bolts at head and sill with deadlock fitted to the right hand leaf.
- c. Escape doors to have panic bolt assembly with vertical elements concealed in the stile and door closer as in (a).

4. Fly screens

Flyscreens shall be fitted to all opening leaves of windows or sliding doors, consisting of a separate metal sub-frame in with aluminum mesh fly wire. The flyscreens shall be adequately secured with suitable clips, setscrews or

turnbuckles and shall be removable for maintenance purposes. Flyscreens doors shall consist of similar section to metal casement doors and shall be fitted with removable panels of fly wire.

The aluminum frame to the flyscreens shall be finished to match the framing of the window or sliding door. Color and type of mesh to Engineer's approval.

7.5 Glazing

The glass shall conform to specification laid down under chapter '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 window members. All the glass shall be best quality of approved manufacture or equivalent standard as approved by the Engineer.

ERECTION AND WORKMANSHIP

Erection

Rawlplugs and anchoring bolts shall be embedded into the concrete or masonry for holding the doors, windows, ventilators and louvers in their correct position.

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 appear on the surface of doors, windows, ventilators and louvers the Contractor shall at his own expense and at the Engineer's direction have all exposed surface cleaned to bare bright metal and made good as required.

All joints between structure and the metal shall be fully caulked and painted. All works shall be installed in strict accordance with the manufacture's instructions.

Workmanship

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 workmanship like manner in accordance with the manufacturer's instructions and as specified herein. All items shall be left in operating, neat and clean condition, free from dirt, finger marks, cement mortar stains 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. Beads and grooves shall be ensured to be clean, dry and un-obstructive at the time of glazing. The complete unit shall be airtight and watertight on completion. No door and window shall be considered complete until the fingerprints and other stains and marks have been removed from the surface of glass and aluminum.

Temporary protection shall be achieved by applying water-soluble protective coating capable of withstanding the action of lime mortar.

Protective coating shall be applied in the manufacturer's plant to the exposed surfaces of all components after removing all fabrication compounds, mixture and dirt accumulations.

FINISHING

All exposed surfaces shall be carefully polished and all alloy defects, die marks, scratches, strokes or other surface blemishes shall be buffed to a

clear surface and given an anodic oxides treatment. The structural shape of aluminum members shall be of uniform quality, color and temper; clean, round, commercially straight and free from injurious defects.

PROTECTION AND CLEANING

- Temporary protection shall be achieved by applying water-soluble protective coating capable of withstanding the action of lime mortar.
- Apply coating in the manufacturer's plant to the exposed surfaces of all components.
- Before application of coating, remove all fabrication compounds, moisture and dirt accumulations.

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.

MEASUREMENT AND PAYMENT

General

Except otherwise specified herein or else where in the Contract Documents, no measurement and payment will be made for the under mentioned specified works related to the relevant items of the Bill of Quantities. The cost thereof shall be deemed to have been included in the quoted unit rate of the respective items of the Bill of Quantities.

- Providing and fixing glazing.
- Rawlplugs, brackets, rubber gasket, sealants, rollers, vetting latches and any other embedded fixture required for fixing the doors, windows, ventilator and louvers.
- Providing and fixing locks, handles and door closers as approved by the Engineer.
- Providing and applying approved joint sealant according to the manufacturers instructions
- Providing and fixing fly proof shutters along with aluminum wire gauze to sliding/ open able windows and ventilators.
- Plant, tool and equipment required to fix aluminum at any height.
- Providing and applying approved joint sealant/ aluminum covering where window mullion touches with the wall poly carbonate sheet (lexan) for Swimming pool false ceiling.

Aluminum Doors, Windows and Ventilators**Measurement**

Measurement of acceptably completed works of aluminum doors, windows and ventilators will be made on the basis of net actual area in square feet provided and installed in position as shown on drawings or as directed by the Engineer.

Payment

Payment will be made for acceptable measured quantity of all finished aluminum doors, windows and ventilators on the basis of unit rate per square feet quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the item.

Aluminum Door Closer**Measurement**

Measurement of acceptably completed works of aluminum door closer will be made on the basis of net actual unit number provided and installed in position as shown on drawings or as directed by the Engineer.

Payment

Payment will be made for acceptable measured quantity of all finished aluminum door closer on the basis of unit number quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the item.

Section - 111

CEMENT PLASTER

1. SCOPE

The work done under this section of the Specifications consists of furnishing all plant, labour, equipment, appliances, and materials and in performing all operations in connection with providing and installing of cement plaster and cement pointing specified external rendering complete in strict accordance with this section of the Specifications and the applicable drawings and subject to the terms and conditions of the Contract. The scope of this section of Specification is covered with detailed Specifications as laid down herein.

2. APPLICABLE STANDARDS

Latest editions of following Pakistan, British & ASTM standards are relevant to these specifications wherever applicable.

Pakistan Standard

P.S 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. 150 Specification for Portland Cement.
 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.
 4027 Specification for sulphate resisting Portland cement.
 5262 External rendered finishes.
 5492 Internal plastering.

3. GENERAL

- 3.1. Except as may be otherwise shown on drawing specified, all plaster work, both internal and external shall be ordinary Portland Cement plaster of the required thickness as shown on the drawings.
- 3.2. 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 all such work is carried out by other contractors before starting of plaster work. Pointing work, chiseling and repairing of cement plaster shall not be permitted without the approval of the Engineer.
- 3.3. Sample of materials shall be submitted to the Engineer for his approval prior to use in the works.

4. MATERIALS

- 4.1. Cement for plaster shall be Ordinary Portland Cement (ASTM C 150 B.S 12 or P.S 232). Sulphate resisting cement (B.S 4027 or P.S. 612) as specified and shall conform to requirements specified in the section "Plain and Reinforced Concrete".
- 4.2. Sand for plaster shall comply with the requirements of BS 1199, BS 1200 or the draft Pakistan Standard "Sand for Plaster" as directed by the Engineer.
- 4.3. Water for plaster shall conform to requirements specified in the section for "plain and reinforced concrete".
- 4.4. Lime putty shall pass 100% through a sieve of 1.4 mm and shall not be retained more than 2% on a sieve of 300 um.
- 4.5. Corner beads shall be fabricated from less than 26 US Standard gauge galvanized steel sheets, shall have 3mm radius corner and shall have expanded wings not less than 65mm width.

Angle beads, stop beads, depth gauge beads, edging profiles, plaster dividing profiles, interior angle profiles, plaster borders and the like shall all be manufactured from sheet steel and galvanized after fabrication, all beads shall be perforated at edges to ensure good adhesion of the plaster work. Thickness and dimensions shall suit particular locations and plaster thickness.
- 4.6. All materials and workmanship for plaster, not explained in these Specifications or, shall comply with the requirements of relevant BS CP 5262 and BS 5492 as directed by the Engineer.

5. PROPORTIONING AND MIXING

- 5.1. 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, in the Bill of Quantities or as directed by the Engineer. Plaster ingredients shall be thoroughly mixed either by hand on a clean cement concrete platform or by a mechanical mixer.
- 5.2. Quick lime shall be slaked by stirring it into excess of water in a tank where it will hydrate and generate heat. Slaking shall be complete in about 12 hours when temperature shall cease to rise. Lime shall then be sieved through 1.4 mm mesh and stored under water and left to mature. Maturing period shall be from one to three weeks as directed by the Engineer. Matured material known as lime putty, shall then be ready for use in plastering.
- 5.3. 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. Retempering shall not be permitted and all mortar which has begun to stiffen shall be discarded.

- 5.4. For cement, lime and sand plaster, normal procedure shall be to prepare a day's supply of coarse materials by mixing one part of lime putty with six parts of sand. Plaster mortar shall be prepared by mixing one part of Portland cement with six parts of coarse material and adjusting the water content to give adequate workability. After adding the Portland cement the plaster shall be used within two hours.

6. **PREPARATION OF SURFACE TO BE PLASTERED**

- 6.1. Concrete surface to be plastered shall be cleaned to remove all grease, form oil and other surface impurities which will otherwise adversely affect the adhesion of plaster to the surface concerned. The surface of all concrete ceilings, beams and columns shall be lightly hacked by approved means to give the required key for plastering.
- 6.2. All masonry surface to be plastered shall be cleaned to remove all matter which will otherwise adversely affect the adhesion of plaster to the surface concerned. The surface shall be washed with clean water and kept damp for 24 hours before further treatment. The surface thus prepared shall be treated uniformly with cement and sand slurry. The slurry to be used shall be one part cement to one part sand by volume with water added to make a stiff creamy mix. The slurry shall be applied with a stiff brush on surface which has previously been well wetted. The surface so treated shall be left to cure for three(3) days.
- 6.3. For pointing all joints shall be raked to make a groove of 20mm deepened surface cleaned with a wire brush.

7. **APPLICATION OF PLASTER**

The plaster of thickness less than the specified thickness shall be rejected. If the plaster is to be more than 15mm thick, it shall be done in two coats. The surface of first coat shall be made rough before the second coat is applied. The plaster shall not have wavy surface and shall be perfectly in plumb. The edges and corners shall represent a straight line. The plaster shall be kept wet continuously for at least ten (10) days. No extra payment shall be allowed for jambs, junctions, corners, edges, round surfaces or for more than one layer of plaster required due to any unevenness in the work done by the Contractor. The plaster work is to cover all conduits, pipes etc. fixed in the walls and ceiling. Wherever specified, metal lath shall be nailed firmly before plastering is commenced. The plaster surface shall be tested frequently with a three (3) metre straight edge and plumb bob.

Plaster containing cracks, blisters, pits, discoloration or any defects shall not be acceptable. Any such plaster or loose plaster shall be removed and replaced with plaster in conformity with these specifications and as additionally directed by the Engineer.

The Contractor shall cut out and patch all defective work at his own cost. All damaged plaster shall be patched as directed by the Engineer. Patching plaster shall match appearance of and shall be finished level with adjoining plaster.

8. **METAL LATH OVER REINFORCED CONCRETE AND MASONRY JOINT**

Metal lath shall be fabricated from sheet steel and shall be of uniform quality and free from flaws broken strands, cracks and corrosive pitting, shall be rectangular and true to shape and shall comply with BS-1369.

All lathing shall be galvanized. Where plastering material depends entirely on the lathing for its key, these shall be not less than two complete mesh openings per 28 mm in one direction and the width of the aperture shall not be less than 5mm.

Sheets shall not be less than 1.6 kg/sq.m when fabricated, using 0.7mm thick steel sheet. Where used on smooth surfaces to form a key it shall be not less than 0.12 kg/sq.m. when fabricated, using 0.5mm thick steel sheet. Tying wire shall be 1.2mm diameter galvanized annealed iron wire.

Before plastering, wherever brick masonry meets with reinforced concrete members a 230mm wide continuous strip of expanded metal lath shall be nailed to the masonry and the reinforced concrete member covering the joint completely to prevent cracking of the joint.

9. **BEADS**

Angle beads, stop beads, depth gauge beads and the like shall be fixed in accordance with the manufacturer's instructions, where shown on the drawings or as directed by the Engineer.

10. **INTERNAL/EXTERNAL PLASTER OVER CONC./BRICK SURFACES.**

10.1. All internal/External plaster on concrete surfaces shall have an average ½" (12mm) thick consisting of 1:3 cement sand mortar in gray cement finished smooth plaster unless otherwise specified on the Drawings and or as directed by the Engineer.

10.2. All internal/ external surface on brick/block masonry shall have an average ¾" (20mm) thick plaster consisting of base coat of 1:5 cement sand mortar in gray cement and finished smooth unless otherwise specified on the Drawings and/or as directed by the Engineer.

11. **MEASUREMENT AND PAYMENT**

11.1. **General**

Except otherwise specified herein or elsewhere in the Contract Documents, no measurement and payment will be made for the under mentioned specified works related to the relevant items of the Bill of Quantities.

The cost thereof shall be deemed to have been included in the quoted unit rate of the respective item of the Bill of Quantities.

11.1.1. Metal lath over reinforced concrete and masonry joint.

11.1.2. Joints, junctions, corners, drip course edge, and roundings.

11.1.3. More than one layer due to any unevenness in the finished works.

11.1.4. Cutting & patching of all defective works.

11.1.5. Surface preparation, cleaning and protection as specified.

11.1.6. Curing of plastered/Pointed surfaces.

11.1.7. Water proofing Admixture in plaster if specified on the Drawings.

11.2. **Cement Sand Plaster,**

11.2.1. **Measurement**

Deductions shall not be made for ends of joints, beam posts, etc., and openings not exceeding 2 square feet each and no addition shall be

made for reveals, jambs, soffits, sills, etc. of these openings non for finishing the plaster around ends of joints, beams posts, etc.

In case of opening of area exceeding 2 square feet each, deduction shall be made for the openings and also no addition shall be made for reveals jambs, soffits, sills, etc., of these openings.

Measurement of acceptably completed works of plaster on R.C.C work or Brick masonry walls on internal or external surfaces of specified thickness will be made on the basis of number of square feet of the surface area plastered as shown on the Drawings or as directed by the Engineer.

11.2.2. Payment

Payment will be made for acceptable measured quantity of plaster on R.C.C or Brick masonry work on internal or external surfaces of specified thickness on the basis of unit rate per square foot quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the item.

SECTION - 112

PAINTING

1. SCOPE

The work under this section of the Specifications consists of furnishing all materials, plant, labour, equipment, appliances and performing all operations in connection with surface preparation, mixing, painting concrete works, Metalworks, wood works, Structural steel, walls, ceilings, pipes ,valves 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.

2. APPLICABLE STANDARDS

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

BSI (British Standards Institution)

245	Specification for mineral solvents (white spirits and related hydrocarbon solvents) for paints and other purposes.
2521	Lead-based priming paint for wood work.
2523	Lead based priming paint for iron and steel.
2569	Sprayed metal coatings.
4800	Paint colors for building purposes.
CP. 231	Painting of building.
CP.3012	Cleaning and preparation of metal surfaces.

3. GENERAL

- 3.1. Except as otherwise specified, all painting shall be applied in conformity with BS CP 231 "Painting of Building" as applicable to the work.
- 3.2. The Contractor shall repair at his own expense all damaged or defective areas of shop-painted metal work and structural steelwork. Metal surfaces against which concrete is to be placed will be furnished shop-painted and shall be cleaned prior to being embedded in concrete.
- 3.3. Except as otherwise specified, all concrete and plastered surfaces are to be painted.
- 3.4. 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.
- 3.5. 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.
- 3.6. 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 300 x 300 x 3 mm tempered hard board panels. Manufacturer's color chart shall be submitted for color specifications and selection.

4. MATERIALS

- 4.1. All materials shall be acceptable, proven, first grade products and shall meet or exceed the minimum standards of reputable manufacturers as approved by the Engineer.
- 4.2. 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.
- 4.3. All synthetic enamel paints and primers for structural steel works, metal work, will be the best available of its type and shall be approved by the Engineer prior to its procurement.
- 4.4. Unless otherwise specified on Drawings approved quality Durocem/snowcem paint or approved equivalent shall be used for painting the exteriors of the structures or other surfaces and/or as directed by the Engineer.
- 4.5. The plastic emulsion/weather shield/ vinyl emulsion paint or similar as approved by the Engineer shall be used for interior surfaces.
- 4.6. Approved quality plasticised Duco Hi Build paint or approved equivalent shall be used for painting the wooden doors or other wood surfaces as shown on the drawings or as directed by the Engineer.
- 4.7. Fire resistant painting shall be proprietary painting material to be applied in conformity with the recommendations and instructions of the manufacturers.
- 4.8. Where ever Multi-color paint coating for interior is specified ZOLA COAT or equivalent as approved by the engineer is to be used. Painting shall be proprietary painting material to be applied in conformity with the recommendations and instructions of the manufacturers.
- 4.9. Where ever Textured roll on paint for interior is specified, ICI, Dulux or equivalent as approved by the Engineer to be used . Painting shall be proprietary painting material to be applied in conformity with the recommendations and instructions of the manufacturers.

- 4.10. 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 manufacturer's recommendations.
- 4.11. All sprit polish or wax polish shall be first grade of reputable manufacturer as approved by the Engineer.

5. **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, 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.

6. **SURFACE PREPARATION**

- 6.1. 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.
- 6.2. In the event the surfaces become otherwise contaminated in the interval between cleaning and painting, recleaning will be done by the Contractor at no additional cost.
- 6.3. Surfaces of stainless steel, aluminum, bronze, and machined surfaces adjacent to metal work being cleaned or painted shall be protected by effective masking or other suitable means, during the cleaning and painting operations.
- 6.4. All the surfaces to be painted with approved quality paint or approved equivalent shall be free from dust, dirt, fungus, lichen, algae etc. Oil paint, varnish and lime wash should always be removed by scraping and washing.
- 6.5. All surfaces to be painted with Duco paint or approved equivalent shall be free from dust, dirt, oil/grease, etc. Wipe over with a rag soaked in thinner or petrol before painting. The Contractor shall apply sufficient under coat to ensure that no dried film is left on all undercoated areas after flattening. Apply 2-3 coats of Duco Primer surfaces after thinning one part with one part Duco thinner. Dry for 5 to 10 minutes between coats. Leave it to hard dry and petrol wipe before applying Duco Hi-Build.
- 6.6. No work in this section shall be allowed until all surfaces or conditions have been inspected and approved by the Engineer.

7. **APPLICATION**

- 7.1. 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.

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.

Two coats of weather shield paint shall be applied in accordance with the manufacturer's instructions or as directed by the Engineer.

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.

- 7.2. Where shown on Drawings all exterior finishes shall be painted with Weather Shield paint in approved colors as per manufacturer's specifications. The number of coats shall be as shown on the drawings or as directed by the Engineer.
- 7.3. All wooden doors shall be painted with approved plasticised Duco Hi-Build paint or approved equivalent as per manufacturer's recommendation and instructions after approval of the Engineer.
- 7.4. Plastic emulsion paint of the approved make and shade shall be applied to surfaces as shown on Drawings as per manufacturer's instructions. The number of coat shall be as indicated on the Drawings or as directed by the Engineer.
- 7.5. Where mentioned on Drawings doors and glazed ventilators shall have fire resistant painting of 90 minute rating and shall be applied as per the manufacturer's recommendation and instructions after the Engineer's approval.

7.6. **POLISHING**

Surfaces to be polished shall be rubbed down with suitable sand paper to smooth surface. Filling shall be done with an approved filler and again rubbed so that the surface is smooth free from raised grains, holes, rough spots and gives a silky feeling. It shall then be finished with wax polish or spirit polish of approved manufacturer.

7.6.1. **WAX POLISH:**

The surfaces shall be dusted off and rubbed over with approved mineral oil. After an interval of at least 48 hours wax polish shall be applied in two coats and buffed to the approved finish.

7.6.2. **SPIRIT POLISH:**

Dana Lakh shall be melted in spirit overnight and clean sediment free spirit polish prepared. With a soft cloth or pad, the polish shall be applied to the surface coat after coat until the surface is shiny, smooth, satin finish to the approval of the Engineer

7.7. **WHITE OR COLOR WASHING**

- 7.7.1. Fresh white lime slaked at site of work should be mixed with sufficient water to make a thin cream. The approximate quantity of water required in making the cream is 5 litre of water to 1 kg of lime. It shall then be screened through a coarse cloth and gum (glue) in the proportion of 1`00 grams of gum to 16 litres (three chattacks of gum to 6 gallon) of wash shall be added. The surface should be dry and thoroughly cleaned from dust and dirt. The wash shall be applied with 'moonj' or jute brush, vertically and horizontally alternatively, and fine wash kept stirred in the container while using. Two or three coats shall be applied as specified and each coat shall be perfectly dry before the succeeding coat is applied over it. After finishing, the surface shall

be of uniform color. The white wash should not splash on the floor and other surfaces. In old surface the surface should be cleaned and repaired with cement mortar where necessary and allowed to dry before white wash is applied. For final coat blue pigment powder should be mixed to the required quantity with the lime water to give a bright white surface.

- 7.7.2. Color wash shall be prepared with fresh slaked white lime mixed with water to make thin cream adding the colored pigment to the required quantity to give the required tint. Gum (glue) in the proportion of 100 gm of gum to 16 litre of wash shall be added. The color wash may be applied one or two coats as specified. The method of application should be same as for white washing. For new work the priming coat shall be of white wash.

8. FINISHES

The finished coating film shall show uniform coverage throughout and shall be reasonably free from brush marks, runs, sags, or noticeable color variations. Edges where coating ends, change color or change thickness shall be clean and straight.

The completed coating shall be compared with sample areas. The completed coating shall be at least as smooth (free from orange peel effect, overspray, embedded or partially embedded particles, craters, pinholes, holes, etc.) as the approved sample areas.

The thickness of the coating shall be checked by the Engineer at random locations by cutting out sections on concrete and plaster surfaces. The cut out sections shall be patched by the Contractor, using the same material and thickness used originally. Porosities shall be marked and patched with the basic primer material, or with a mixture of the basic primer material and finely divided filler, or with a proprietary patching compound compatible with the coating. Any moisture on the surface of the coating shall be allowed to dry thoroughly before patching. In addition, all porosities and imperfections which become evident after applying subsequent coats shall be repaired. This repairing shall be done with the basic coating material or with a proprietary patching compound compatible with the specified coating, except for the top coat, where only basic coating material shall be used. The completed coating shall be free of porosity visible to the naked eye.

9. JOB CONDITIONS

- 9.1. 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.
- 9.2. Place drop cloths to adequately protect all finished work.
- 9.3. Remove and replace all items of finish hardware, device plates, accessories, lighting fixtures or other removable items.
- 9.4. In no case shall any finish hardware or other finished item that is already fitted into place be painted, unless otherwise specified.

10. QUALITY ASSURANCE

All paint for any one surface shall be top quality, of one manufacturer and approved by the Engineer. 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.

11. SCHEDULE OF MEASUREMENT OF PAINT AREA:

- 11.1. Irrespective of prime coats and number of paint coats applied to exposed painting surface area of column, walls, projections; ceilings and other surfaces (Except gates, doors windows and ventilators the cost therefore shall be deemed to have been included in quoted unit rate of the respective items of Bill of Quantities) shall be measured as per actual paint surface area for single time only and paid in accordance with quoted rate of Bill of Quantities.

12. MEASUREMENT AND PAYMENT

12.1. General

Except otherwise specified herein or elsewhere in Contract Documents, no measurement and payment will be made for the under mentioned specified works related to the relevant items of the Bill of Quantities. The cost thereof shall be deemed to have been included in the quoted unit rate of the respective items of Bill of Quantities.

- Preparatory works, including preparatory materials, scraping, scratching, sand blasting, cleaning, priming, protection of finished works etc.

12.2. PAINTING

12.2.1. Measurement

Measurement of acceptably completed respective type of painting works will be made on the basis of net actual areas in square feet of the surface painted as shown on the Drawings or as directed by the Engineer.

12.2.2. Payment

Payment will be made for acceptable measured quantity of respective type of painting on the basis of unit rate per square feet quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the item.

Section - 113

CONTRACTOR'S CAMP

1. SCOPE

The work to be done under this item consists of construction, erection, installation and maintenance of the Contractor's Project Site Offices or main camp and the Contractor's sub-camps or temporary camps, if any, and shall include all offices, shops, warehouses, and other operational buildings; all housing and related facilities including accommodations for the Contractor's personnel.

The location of the Contractor's camps, including all buildings, utilities and facilities therefore, and of the camps or establishments of all persons/parties in the vicinity operating or associated with the Contractor, shall be subject to approval of the Engineer.

The work to be done under this item will terminate upon the actual Completion Date. However, if directed by the Engineer or the Employer, the Contractor shall continue such work to the extent required by the Contractor's personnel during the period of maintenance. No compensation shall be paid for the continued operation and maintenance of the Contractor's Camps during the period of maintenance.

Upon completion of the Works, or at such time within the period of maintenance as directed by the Engineer, the Contractor shall remove all buildings utilities and other facilities from the Site and restore all camp areas to a neat and clean condition.

The construction, operation and maintenance of all camps of the Contractor shall comply with all applicable provisions of current Pakistan Labour Camp Rules.

The Contractor shall furnish, make arrangements for, and carry out proper and adequate maintenance of the Contractor's camp areas at each camp to provide a neat, well-kept camp in all respects with pleasant and healthy surroundings and conditions for all occupants of their camp. The Contractor's camps shall be kept clean, well graded, free from under growth and bushes and adequately drained. Roads and streets shall be kept in good condition. All utilities shall be adequately and properly operated and maintained to provide service and conditions meeting the requirements of these specifications in all respects.

Adequately equipped and properly staffed portable first aid stations or dispensaries shall be provided by the Contractor at camps and other strategic locations to administer first aid treatment at any time required and free of charge to all persons on the Site, including employees of the Engineer and the Employer.

2. PAYMENT OF WORK

No payment shall be made for the works involved within the scope of this section of Specifications unless otherwise specifically stated in the Bills of Quantities or herein.

The cost thereof shall be deemed to have been included in the quoted unit rate of other items of the Bills of Quantities.

Section - 114

STAKE-OUT SURVEY

1. SCOPE

The work to be done under this item consists of making the stake-out survey for construction purposes with competently qualified men, consistent with the current practices. The work shall proceed immediately upon the award of the contract and shall be expeditiously progressed to completion in a manner and at a rate satisfactory to the Engineer. The Contractor shall keep the Engineer fully informed as to the progress of the stake-out survey. The scope of this section of specifications is covered by detailed specifications as laid down herein.

2. MATERIAL AND EQUIPMENT

All instruments, equipment, stakes and other material necessary to perform all work shall be provided by the Contractor. These instruments and equipment shall be available to Engineer at all times for the purpose of checking the work of the Contractor.

All stakes used shall be of a type approved by the Engineer, clearly and permanently marked so as to be legible at all times. It shall be the Contractor's responsibility to maintain these stakes in their proper position and location at all times. Any existing stakes or markers defining property lines and survey monuments which may be disturbed during construction shall be properly tied into fixed reference point before being disturbed and accurately reset in their proper position upon completion of the work.

3. CONSTRUCTION

The Contractor shall trim trees, bushes and other interfering objects, not consistent with the plan, from survey lines in advance of all survey work to permit accurate and unimpeded work by his stake-out survey crews and the Engineer's survey crews. The exact position of all work shall be established from control points which are shown on the plans or modified by the Engineer. Any error, apparent discrepancy in or absence of data shown or required for accurately accomplishing the stake-out survey shall be referred to the Engineer for interpretation or furnishing when such is observed or required.

The Contractor shall be responsible for the accuracy of his work and shall maintain all reference points, stakes, etc. throughout the life of the contract. Damaged, destroyed or inaccessible reference points, bench marks or stakes shall be replaced by the Contractor. Existing or new control points that will be or are destroyed during construction shall be re-established and all reference ties recorded thereon shall be furnished to the Engineer. All stake-out survey work shall be referenced to the centre lines shown on the Plans. All computations necessary to establish the exact position of the work from control points shall be made and preserved by the Contractor. All computations, survey notes and other records necessary to accomplish the work shall be kept neatly and made available to the Engineer upon request and furnished to the Employer upon Contract completion.

The Engineer may check all or any portion of the stake-out survey work or notes made by the Contractor and any necessary correction to the work shall be immediately made. Such checking by the Engineer shall not relieve the Contractor of any of his responsibilities for the accuracy or completeness of his work.

Reference points, base lines, stakes and bench marks for borrow pits shall be established by the Contractor.

All required right-of-way and easement limits shall be established, staked and referenced by the Contractor concurrent with the construction stake-out survey.

The Contractor shall place at least two offset stakes or references at each centre lines station and at such intermediate stations as the Engineer may direct. From computations and measurements made by the Contractor, these stakes shall be clearly marked with the correct centre line, station number, offset and cut or fill so as to permit the establishment of the true centre line location during construction. He shall locate and place all cut, fill, slope, line grade or other stakes and points as the Engineer may direct to be necessary for the proper progress of the work.

4. **PAYMENT OF WORK**

No payment shall be made for the Works involved within the scope of this section of Specifications unless otherwise specifically stated in the Bills of Quantities or herein.

The cost thereof shall be deemed to have been included in the quoted unit rate of other items of the Bills of Quantities.

Section - 115

PLAIN AND REINFORCED CONCRETE

1. SCOPE

The work under this section of the specification consists of furnishing all plant, labour, equipment, appliances and materials and performing all operations in connection with the supply and installation of plain and reinforced concrete work complete, in accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the Contract. The scope of this section of specification is covered with detailed specifications as laid down herein.

2. GENERAL

- 2.1. Full co-operation shall be given to trades like electrical, mechanical and other services.
- 2.2. Suitable templates or instructions or both shall be provided for setting out items not placed in the forms. Embedded items and other materials for mechanical and electrical operations shall have been completed, inspected, tested and approved before concrete is placed.
- 2.3. Shop drawings shall be prepared by the Contractor at his own cost. Approval of shop drawings as well as that of actual samples of concrete finish shall be obtained before work is commenced.

3. CODES AND STANDARDS

The work shall conform to the requirements of the following latest Codes and Standards, unless otherwise specified.

ACI 301-latest	Specifications for structural concrete for buildings.
ACI 304-latest	Guide measuring, mixing, transporting and placing concrete.
ACI 308-latest	Standard practice for curing concrete.
ACI 309-latest	Guide for consolidation of concrete.
ACI 325.9R	Guide for construction of concrete pavements and concrete bases.
ACI 318-latest	Building code requirements for structural concrete.
ASTM C 31-latest	Practice for making and curing concrete test specimens in the field.
ASTM C 33-latest	Standard specifications for concrete aggregates.
ASTM C 39-latest	Standard test methods for compressive strength of cylindrical concrete specimens.
ASTM C 42-latest	Standard test, method for obtaining and testing drilled cores and sawed beams of concrete.
ASTM C 78-latest	Standard test method for flexural strength of concrete (using simple beam with third point loading).
ASTM C 136-latest	Standard test method for sieve analysis of fine and coarse aggregates.
ASTM C 143-latest	Standard test method for slump of Portland cement concrete.
ASTM C 150-latest	Standard specifications for Portland cement.
ASTM C 260-latest	Standard specifications for air-entraining admixtures for concrete.

ASTM C 309-latest	Specification for liquid membrane-forming compounds for curing concrete
ASTM C 404-latest	Standard specifications for aggregate for masonry grout.
ASTM C 494-latest	Standard specifications for chemical admixtures for concrete.
ASTM C 566-latest	Standard test method for total moisture content of aggregate by drying.
ASTM C 869-latest	Standard specifications for foaming agents used in making preformed foam for cellular concrete.
ASTM D 596-latest	Reporting results of water analysis.
ASTM D 1190-latest	Standard specifications for concrete joint sealer, hot-poured elastic type.
ASTM D 1751-latest	Standard specifications for preformed expansion joint filler for concrete paving and structural construction (non-extruding and resilient bituminous types).
ASTM D 1752-latest	Preformed sponge rubber and cork expansion joint fillers for concrete paving and structural construction.
BS 12-latest	Specifications for ordinary and rapid hardening Portland cement.
BS 3148-latest	Methods of tests for water for making concrete.
PS 232-latest	Portland cement (ordinary, rapid hardening and high strength)
PS 243-latest	Concrete coarse and fine aggregates from natural sour.
PS 279-latest	Abrasion of coarse aggregates by the use of Los Angeles machines.
PS 280-latest	Method of test for determination of aggregates crushing value
PS 281-latest	Method of test for organic impurities in sand for concrete aggregates.
PS 283-latest	Method of test for soundness of aggregates by the use of sodium sulphate or magnesium sulphate.
PS 284-latest	Sampling aggregates for concrete
PS 285-latest	Method of test for sieve or screen analysis of fine and coarse aggregates
PS 286-latest	Description and classification of mineral aggregates
PS 421-latest	Sampling of fresh concrete
PS 560-latest	Making and curing concrete compression test specimen in the field
PS 612-latest	Sulphate resisting Portland cement type 'A'
PS 716-latest	Mixing and sampling of fresh concrete in the laboratory
PS 717-latest	Test for concrete compacting factor
PS 849-latest	Making and curing concrete compression test cubes
PS 1638-latest	Fresh concrete, determination of consistency slump test.

4. SUBMITTALS

4.1 Delivery and Storage Record

The Contractor shall submit the following to the Engineer in such form as he may require:

- Accurate records of deliveries of cement and its use in the Works.
- Details of transport, plant, equipment for winning, transporting, manufacturing of aggregate.
- Manufacturer's literature and certification for compliance with the requirements for admixtures and other materials required for concrete work.

4.2 Details of Constructional Plants

Particulars and details of major constructional plants such as mixers, lifts, hoists and cranes, alongwith the general layout plans and flow diagrams for the Engineer's review and prior approval.

15. 4.3 Shop Drawings

Shop drawings including, but not limited to lifts in concrete, formwork, jacking, shoring, architectural concrete works etc., as required by the Engineer.

4.4 Methodology

Methodology for construction alongwith the scheduled program of works and the Contractor's proposed arrangements for batching, mixing, conveying, placing and curing for review and approval by the Engineer.

The method statement shall also include proposals for:

- Construction joints if not shown on the Drawings
- Installation of water stops
- Sequence of concrete placement
- Arrangement for concreting during rain, hot or cold weather and during night
- Transportation, handling and erection and/or installation of precast concrete and/or prefabricated units etc.
- Welding, etc.

4.5 Samples and Specimens

The Contractor shall submit to the Engineer for his approval:

- Samples and specimens of all constructional materials together with the supplier/manufacturer's literature containing his instructions/recommendations. Afterwards the approved samples of aggregate, admixtures and the embedded items shall be submitted properly labeled and identified for future reference.
- Samples of precast concrete units for inspection, testing and for the Engineer's review and approval.
- A minimum of two units or portions of units of each of the architectural and In-situ concrete, of a size as required by the Engineer, shall be submitted. These specimens will be reviewed and approved on the basis of color, texture, dimensional accuracy, surface finish and general appearance.

- Samples/specimens, when accepted, will describe the allowable limits between which variation can be acceptable.
- Approved specimen/samples shall remain at Site, well protected from damage and dilapidation, as required by the Engineer.

4.6 Certificates and Mill-Test-Data

Manufacturer's or supplier's certificate of compliance with relevant standards/specifications shall be submitted for each consignment of the materials and items supplied for use in the Works including but not limited to the following:

Cement, reinforcing steel, admixtures, joint sealing compound, expansion joint material, water-proof membrane, PVC water stop and aggregates etc.

Calibration certificates in respect of scales, gauges, metres and other weighing and dispensing devices to be used on batchers and mixers shall be submitted for the first time immediately before their use in producing concrete and thereafter at every 6 week intervals or earlier if so directed by the Engineer.

4.7 Results of Routine Tests and Daily Reports

The routine shall include submission of the results of all the specified and required tests performed at the job site including, but not limited to, analysis of aggregate, slump test, compressive strength tests, etc., and detailed report of works performed on the preceding day.

4.8 Bar-Bending Schedule

Bar bending schedule shall be submitted for the Engineer's review and approval well in advance of cutting and bending of any reinforcing steel. This shall include corrections for elongations during bending.

4.9 Concreting Record

Daily returns of all concrete placed during the previous day shall be submitted in a format to be agreed with the Engineer.

The returns shall include but shall not be limited, to the following information:

For each specified grade and type of concrete

- Volume of concrete placed per batch and the total concrete.
- Volume of concrete wasted or rejected.
- Quantities of cement, aggregates, water, reinforcing steel, admixtures, embedded items used in the work.
- For each location, structure or part of structure
- The precise position or location of placement, (e.g. reference number, mark identification or element, structure, bay or lift).
- Concrete mixes placed.
- Total volume of each grade and type of concrete placed.
- Records of concrete works, detailing the date, time, humidity, temperature and weather conditions when each part of works was completed.

5. TOLERANCES

The Contractor is to complete all works including formwork, placement, curing, etc, and shall ensure that the concrete surfaces conform to the specified tolerance limits given in ACI 325.9R and 347. Where tolerances are not stated on the Drawings, maximum permissible deviations from established lines, grades and dimensions shall conform to the tolerances given hereinafter.

These tolerances are not cumulative.

Concrete work not meeting the tolerance requirements will be rejected unless an acceptable repair work is allowed by the Engineer.

5.1 Cast in Place Concrete

VARIATION FROM PLUMB: Variation from plumb in vertical lines and surfaces and from the batter in inclined lines and surfaces shall not exceed the limits given in the Table-A

Table-A

Columns, piers, walls and arrises		Exposed corner columns, control joint grooves and other conspicuous lines	
In any 10 ft length or height	¼ inch	In any bay or 20 ft length or height	3/8 inch
In any storey or 20 ft height	3 / 8 inch	Maximum for the entire length or height	½ inch
Maximum for the entire length	1 inch		

VARIATION FROM LEVEL OR GRADES: Variation from the Specified level and grades shall not exceed the limits given in Table-B.

Table-B

Columns, piers, walls and arrises		Exposed corner columns, control joint grooves and other conspicuous lines	
In any 10 ft length or height	¼ inch	In any bay or 20 ft length	¼ inch
In any bay or 20 ft height	½ inch	Maximum for the entire length	½ inch
Maximum for the entire length	¾ inch		

VARIATION FROM POSITION IN PLAN: Variation of the linear building lines from established position in plan and related position of columns, walls and partitions shall not exceed ½ inch any bay of 20 ft nor a maximum of 1 inch in the entire length.

VARIATION IN LOCATION OF OPENINGS: Variation in the sizes and locations of sleeves, floor openings, and wall openings shall not exceed a maximum of ½ inch.

VARIATION IN DIMENSIONS: Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls shall not exceed minus 1 inch nor plus ½ inch

VARIATION IN FOOTINGS: Variation in footings shall not exceed the limits given in Table-C

Table-C

Dimension in Plan	Misplacement or eccentricity	Thickness
Minus ½ inch Plus 2 inch	2% of footing width in the direction of misplacement but not more than 2 inch.	decrease 5% increase No limit

(Tolerances apply to concrete dimensions only, not to positioning of vertical reinforcing steel, dowels, or embedded items.)

VARIATION IN STEPS: Variation in consecutive steps shall not be more than 1/16 inch in rise and 1/8 inch in tread. The maximum variation in the flight of stairs shall not be more than 1/8 inch in rise and ¼ inch in treads.

5.2 Precast Concrete

Forms must be true to size and dimensions of concrete members shown on the plans and shall be so constructed that the variation in the dimensions of the finished products, at the time of placement of these units in the structure, will be within the limits shown in Table-D unless otherwise noted on structural/ architectural Drawings:

Table-D

–	Variation in Overall dimensions of members	3 ft	per 1/16 inch
–	Variation in Cross-sectional dimensions:		
	* sections less than 3 inches		1/16 inch
	* sections over 3 inches and less than 18 inches		1/8 inch
	* sections over 18 inches		¼ inch
–	Deviations from straight line in long sections	Not more than per 10 ft.	1/8 inch
–	Deviation from specified camber	10 ft of span	1/16 inch
–	Maximum differential between adjacent units in erected position		¼ inch

5.3 Pavements

Departure from specified lines, levels and grades shall not exceed the following limits:

–	Established alignment	¼ inch
–	Established longitudinal grade on any line	½ inch
–	Transverse template contour except at transverse joints	1/8 inch
–	Transverse template contour at transverse joints in width of one traffic lane	¼ inch

6. QUALITY ASSURANCE

6.1 Cement

Cement shall be stored and sampled at Site and tested from time to time at the discretion of the Engineer in accordance with ASTM C-150 or its equivalent British or Pakistan Standards at the expense of the Contractor. If the tests prove that the cement has become unsatisfactory, it shall be removed from the Site immediately. Cement which has been in storage at the Site longer than three months, shall not be used until retesting proves it to be satisfactory.

6.2 Aggregate - Requirements

Aggregates shall conform to ASTM C-33. Following tests shall be carried out by the Contractor at his own cost to establish suitability of the material for the intended use.

- Mechanical properties
- Porosity
- Organic impurities
- Clay and Silt Contents
- Abrasion and Soundness tests
- Alkali Re-activity Potential
- Water soluble chloride contents

6.3 Sampling and Testing of Aggregate

During construction, aggregates shall be sampled and tested once for every 100 tonnes or part thereof as delivered to the mixer to determine compliance with the Specifications. The Contractor shall provide samples and test such samples in the presence and supervision of the Engineer using appropriate standard test methods selected by the Engineer. Testing of concrete aggregates by the Engineer shall not relieve the Contractor of his responsibility to maintain control and to ensure the production, stockpiling and handling of both fine and coarse aggregates in accordance with these Specifications. Tests shall be carried out only in laboratories approved by the Engineer.

6.4 Deleterious Substances

FINE AGGREGATE: The maximum percentages of deleterious substances in the fine aggregate as delivered to the mixer shall not exceed the values given in Table-E

Table-E

Item	Max.percent (by weight)
Material finer than 75 um (No. 200) sieve	3
Shale	1
Total of other deleterious substances (such as mica, chlorides, coated grains and soft flaky particles)	3

The sum of the percentages of all deleterious substances shall not exceed 5 per cent by weight.

COARSE AGGREGATE: The maximum percentages of deleterious substances in any size of coarse aggregate, as delivered to the mixer, shall not exceed the values given in Table-F

Table-F

Substances	Maximum percent by weight
Material passing 75 um (No.200) sieve	1
Shale	1
Clay lumps	1/2
Other deleterious substances	1

The sum of the percentages of all deleterious substances in any size, as delivered to the mixer, shall not exceed 3 per cent by weight.

6.5 Moisture Control

All fine aggregate and smallest size group of the coarse aggregate shall remain dry during storage at the Site for at least 72 hours immediately prior to use. The free moisture content of the fine aggregate and of the smallest size group of coarse aggregate, as delivered to the mixer, shall be controlled so as not to exceed 4% and 1% respectively, by weight of the saturated surface dry aggregates unless higher limits are allowed by the Engineer. The moisture content of the other size of the coarse aggregates shall be controlled so that the aggregates are delivered to the mixers with the least amount of free moisture and the least variation in free moisture practicable under the job conditions. The moisture content of the aggregate shall be determined in accordance with ASTM C-566. In addition to the limits on the maximum amounts of free moisture in aggregates, the moisture content shall be controlled so that for each size the variation in the percent of free moisture will not be more than 0.5 percent during any one hour of mixing plant operation and not more than 2.0 percent during any 8 hour period of mixing plant operation. Under no conditions shall the aggregate be delivered to the mixing plant dripping wet.

The Contractor may accomplish the required moisture control by use of freely-drained storage, covered transportation and storage, mechanical dewatering devices or any other means or combination of means acceptable to the Engineer.

6.6 Admixtures

No admixtures shall be used without the approval of the Engineer for which the following procedure shall be followed:

- Intention to use admixtures shall be submitted with reasons justifying its use supported by manufacturer's literature, past experience and applicable standards.
- If approved, trial mixes shall be prepared to arrive at a control mix design with admixtures and with suitable characteristics for the job.
- Control mix shall be used on the job only if and where approved by the Engineer.

The admixtures shall be sampled at the source of supply and tested by an approved laboratory. An admixture which has been in storage at the Site for longer than 6 months or which has been subjected to freezing shall not be used until retest proves it to be satisfactory. Additional tests shall be made by the Contractor under the supervision of the Engineer.

6.7 Testing Facilities

The Contractor shall make arrangement for testing of cylinders to be fixed by the Engineer from time to time shall be tested from an approved laboratory.

Concrete strength shall be determined on the basis of test cylinders, however with the approval of the Engineer compressive strength may also be controlled on the basis of test cubes. The cube strength in such case shall be multiplied by a relevant factor shown in Table-M or as agreed by the Engineer to arrive at the cylinder strength.

7. CONCRETE MIX DESIGN

Concrete shall be composed of Portland cement, fine and coarse aggregate, water and any admixtures as specified.

The concrete mixes for each grade of concrete shall be designed by the Contractor under the supervision of the Engineer. The proportions of concrete components for each grade of concrete once agreed by the Engineer would be changed only with the approval of the Engineer or as directed by him during progress of the Work.

8. INSPECTION AND TESTING

8.1 Inspection

Concrete batching, mixing, delivery and all other construction work shall be inspected at intervals decided by the Engineer to ensure compliance of all operations with Specifications and other provisions of the Contract.

No concrete shall be placed until all forms and all items to be embedded in concrete are inspected and approved by the Engineer in writing.

Completed concrete work which fails to meet one or more of the requirements of the Specifications and/or other Contract documents shall either be rejected or repaired to the Engineer's satisfaction.

8.2 Testing of Concrete

All tests shall be carried out at laboratories approved by the Engineer. The Engineer's Representative shall be present during testing if so required by the Engineer.

STRENGTH TESTS DURING THE WORK: Strength tests of the concrete placed during the course of the work shall be made by the Contractor. The Contractor shall test, for control purposes, such number of cylinders as the Engineer may direct. In general three set of three cylinders shall be taken from each 250 cubic feet or fraction thereof or from each day's pour, whichever is less, of each class of concrete placed. Test specimens shall be made and cured in accordance with the applicable requirements of ASTM C-31. Specimens shall be cured in the manner and environments as the pertinent structure.

Cylinder shall be tested in accordance with the applicable requirements of ASTM C-39 and ASTM C-78. The test result shall be based on the average of the strength of the test specimens except that if one specimen in a set of three shows manifest evidence of improper sampling, moulding or testing, the test result shall be based on the average of the remaining two specimens. If two specimens in a set of three show such defects, the results of the set will be discarded and average strength determined from test results of the other two sets.

The standard age of test shall be 28 days, but 7-day tests may be used at the discretion of the Engineer, based on the relation between the 7-day and 28-day strengths of the concrete as established by tests for the materials and proportions used. If the average of the strength tests of the 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 Contractor may change the proportions of the constituents of the concrete, as necessary to secure the required strength for the remaining portions of the work.

TESTS OF HARDENED CONCRETE IN OR REMOVED FROM THE STRUCTURE: Where the results of the strength tests of the control specimens indicate that the concrete as placed does not meet Specification requirements, or where there is other evidence that the quality of the concrete is below Specification requirements, core-

boring tests will be made by the Engineer in accordance with the applicable requirements of ASTM C-42. If the concrete in the structure will be more than superficially wet under service conditions, the cores shall be immersed in water for at least 48 hours and tested wet. In the event that the core-boring test indicates that the concrete placed does not conform to the Drawings and Specifications, measures as prescribed by the Engineer shall be taken to correct the deficiency. However, the Engineer shall have the authority to prescribe such corrective measures, and the Contractor shall take such measures if in the Engineer's opinion the results of the test specimens, without coring, warrant such action. If a strength deficiency is found and is in the opinion of the Engineer due to the Contractor's fault or negligence, the entire cost of replacing faulty concrete or carrying out prescribed corrective measures shall be borne by the Contractor who shall also reimburse the Employer for the cost of making tests. Otherwise, payment for removing and replacing faulty concrete or carrying out prescribed corrective measures will be made under applicable Items of the Bill of Quantities as determined by the Engineer.

RELATION BETWEEN ALLOWABLE STRENGTH AND CONTROL TEST CYLINDER STRENGTH: Where cylinders are made by wet screening of concrete with aggregate greater than 1-1/2 inch size, such as 3 inch aggregate concrete, the cylinders will be required to have a compressive test strength greater than the allowable strength shown on the Drawings, to indicate that the respective concrete in place in the work has the allowable strength shown. The mix design shall be such that the average strength of the specimens tested is greater than the allowable strength shown on the Drawings for the (3 inch aggregate) concrete. Such increments over the allowable strength shown will be established by the Engineer after the mix design has been done and prior to mixing of concrete, and shall be approximately ten per cent.

9. DELIVERY AND STORAGE

9.1 Transportation of Cement

Transportation of the cement from the factory to the Site stores and to the point of use shall be accomplished in such a manner that the cement is completely protected from exposure to moisture. Cement, which has been adversely affected by moisture, as determined by the Engineer, shall be rejected. Cement in sacks shall be delivered in strong, well-made sacks, each plainly marked with the manufacturer's name, brand, type of cement and the weight of cement contained therein. Packages varying from the standard weight marked thereon may be rejected and if the average weight of packages in any consignment as shown by weighing fifty packages taken at random, is less than that marked on the packages, the entire consignment may be rejected. Packages received in broken or damaged condition shall be rejected or may be accepted only as fractional packages as determined by the Engineer.

9.2 Storage of Cement

Cement shall be stored at Site in dry, weather tight and properly ventilated stores. All storage facilities shall be subject to approval and shall be such as to permit easy access for inspection and identification of each consignment. Adequate storage capacity shall be furnished to provide sufficient cement to meet the peak needs of the project.

The Contractor shall use cement in the approximate chronological order in which it is received at the Site.

Cement storage facilities shall be emptied and cleaned by the Contractor when so directed.

Suitable, accurate scales shall be provided by the Contractor to weight the cement in stores and elsewhere on the Site, if required, and he shall also furnish all necessary test weights.

9.3 Storage of Aggregates

Aggregate shall be stored at the Site in such a manner as to prevent its contamination. Aggregate which has deteriorated or which has been contaminated shall not be used for concrete. All methods employed by the Contractor for loading, unloading, handling and stockpiling aggregates shall be subject to the approval of the Engineer. Sufficient quantities of aggregate shall be maintained at the Site at all times to assure continuous placement and completion of any lift of concrete started.

10. MATERIALS

10.1 CEMENT

10.1.1 General

Cement shall be fresh, furnished in sacks as approved by the Engineer. Unless otherwise permitted, cement from not more than two plants shall be used and in general, the product of only one plant shall be used in any particular section of the work. Cement recovered through cleaning of sacks shall not be used.

10.1.2 Portland Cement

Portland cement shall be of Pakistan origin and manufacture unless otherwise approved by the Engineer. Portland cement shall conform to Pakistan Standard PS-232 or to British Standard BS-12 or to ASTM C 150 type-I. Portland cement conforming to ASTM C-150, Rapid hardening type-III or sulphate resistant type-V may also be used in certain parts of the Works as directed by the Engineer.

10.2 AGGREGATES

10.2.1 Requirements

The nominal maximum size of the aggregates shall not be larger than one fifth of the narrowest dimension of the finished wall or slab, or larger than three fourth of the minimum clear spacing between the reinforcing steel and embedments. These limitations may be waived if, in the judgment of the Engineer, workability and method of consolidation be such that the concrete can be placed without honey-combs or voids.

16. 10.2.2 Composition

The use of natural sand or a combination of natural and manufactured sand may be permitted, provided that the fine aggregate meets the applicable requirements of the Specifications for the particular use intended. Coarse aggregate shall consist of gravel, crushed stone or a combination thereof.

10.2.3 Source

The Contractor shall obtain concrete aggregate from deposits of natural sand and gravel or shall procure crushed aggregate from approved quarries which produce aggregates meeting with the Specifications contained herein.

10.2.4 Processed Aggregates

The Contractor in procuring the processed aggregates or in planning his aggregate processing operations shall ensure that the aggregates, as delivered to the mixer, consist of clean, hard and uncoated particles; light weight elements (chalk, clay, coal) are separated by segregation under water by vibration where required and the fines are

removed from the coarse aggregate by adequate washing. The coarse aggregate shall be rescreened just prior to delivery to the concrete mixer bins. The moisture content shall conform to the provisions of sub-section 6.5 "Moisture Control". Compliance with the aggregate grading and uniformity requirements shall be determined before the material is delivered at the mixer. All aggregates shall be sieved and washed with clean water. The aggregates shall conform to the specific requirements given hereinafter.

10.2.5 Fine Aggregate

The grading of fine aggregate as delivered to the mixers shall conform to the requirements given in Table-G

Table-G

<i>Sieve size Standard square mesh</i>	<i>Percentage passing (by weight)</i>
3/8 inch	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No.100	2 to 10

Te Fineness Modulus shall range between 2.31 and 2.51

10.2.6 Coarse Aggregate

The grading of the coarse aggregate as delivered to the mixer shall conform to the requirements given in Table-H

TABLE-H Grading Requirements for Coarse Aggregate

		Amounts Finer than Each Laboratory Sieve (Square openings) Weight Percentage												
	Nominal S i z e (Sieves w i t h S q u a r e O p e n i n g s)	4"	3½"	3"	2½"	2"	1½"	1"	¾"	½"	3/8"	No.4	No.8	No.1 00
	3 ½ " to 1½"	100	9 0 t o 100	----- -	2 5 t o 60	----- -	0 to 15	----- -	0 to 5	-----	-----	-----	-----	-----
	2 ½ " to 1½"	-----	----- -	100	9 0 t o 100	3 5 t o 70	0 to 15	----- -	0 to 5	-----	-----	-----	-----	-----
	2" to 1"	-----	----- -	----- -	100	9 0 t o 100	35 to 70	0 to 15	----- -	0 to 5	-----	-----	-----	-----
	2" to No.4.	-----	----- -	----- -	100	9 5 t o 100	-----	3 5 t o 70	----- -	10 to 30	-----	0 to 5	-----	-----
	1½" to ¾"	-----	----- -	----- -	-----	100	90 to 100	2 0 t o 55	0 to 15	-----	0 to 5	-----	-----	-----

1½" to ¾"	-----	-----	-----	-----	100	95 to 100	-----	3 5 t o 70	-----	1 0 t o 30	0 to 5	-----	-----
1" to ½"	-----	-----	-----	-----	-----	100	9 0 t o 100	2 0 t o 55	0 to 10	0 to 5	-----	-----	-----
1" to ¾"	-----	-----	-----	-----	-----	100	9 0 t o 100	4 0 t o 85	10 to 40	0 to 15	0 to 5	-----	-----
1" to No.4.	-----	-----	-----	-----	-----	100	9 5 t o 100	-----	25 to 60	-----	0 to 10	0 to 5	-----
¾" to ⅜"	-----	-----	-----	-----	-----	-----	100	9 0 t o 100	20 to 55	0 to 15	0 to 5	-----	-----
¾" to No.4.	-----	-----	-----	-----	-----	-----	100	9 0 t o 100	-----	2 0 t o 55	0 to 10	0 to 5	-----
½" to No.4.	-----	-----	-----	-----	-----	-----	-----	100	90 to 100	4 0 t o 70	0 to 15	0 to 5	-----
⅜" to No.8.	-----	-----	-----	-----	-----	-----	-----	-----	100	8 5 t o 100	0 to 30	0 to 10	0 to 5

7. Particle Shape

The shape of the particles in fine and coarse aggregate shall generally be spherical or cubical. The quantity of flat and elongated particles in the separated size groups of coarse aggregate, as defined and determined by standard tests approved by the Engineer, shall not exceed 15 per cent by weight in any size group. A flat particle is one having a ratio of width to thickness greater than three. An elongated particle is one having a ratio of length to width greater than three.

8. Soft Particles

The Contractor in procuring processed aggregates or in planning his aggregate processing operations shall make whatever provisions are necessary, as regards methods and equipment, to ensure effective elimination of soft particles from all aggregates to the degree that the percentage of soft particles present in the processed coarse aggregate does not exceed 3 per cent by weight when determined in accordance with the applicable requirements of ASTM C-851, or other standard test methods selected by the Engineer. Test samples shall be representative of each size group of processed aggregate specified in Table-H, obtained according to ASTM C-851. Weight of samples for each size group shall be as given in Table-I

Table-I

Size No.	Nominal Size	Weight of Sample in Kilograms
8.	3/8" to No.8	0.6
7.	1/2" to No.4	1.0
6.	3/4" to 3/8"	1.5
5.	1" to 1/2"	3.0
4.	1-1/2" to 1"	4.5
3.	2" to 1"	7.0
2.	2-1/2" to 1-1/2"	16.0

10.3 WATER

Water for washing aggregates and for mixing and curing concrete shall be fresh, clean and free from injurious amounts of oil, acid, alkali, salt, organic matter, or other deleterious substances as determined by ASTM D-596.

The water for curing concrete should have a pH value between 6 to 8 and shall not contain impurities, which cause discoloration of concrete.

10.4 ADMIXTURES

10.4.1 Approval Required

Admixtures, including air-entraining admixtures, foaming chemicals and water-reducing admixtures, shall not be used, except with the prior approval of the Engineer. All tests for the evaluation and approval of an admixture shall be made by the Contractor as specified in sub-section 6.6 of these Specifications.

10.4.2 Air-Entraining Admixtures

The source and brand of air-entraining admixture, if required, shall be proposed by the Contractor and approved by the Engineer. The air-entraining admixture will be an approved substance or compound conforming to the requirements of ASTM C-260, which will produce entrained air in the concrete as hereinafter specified. The air-entraining admixture shall be added to the batch in solution in a portion of the mixing water. This solution shall be batched by means of a mechanical batcher capable of accurate measurement and in such a manner as to ensure uniform distribution of the admixture throughout the batch during the specified mixing period.

10.4.3 Water-Reducing Admixtures

The source, brand, types of suitable water reducing cement dispersing admixtures, if required, shall be proposed by the Contractor and approved by the Engineer. The water-entraining admixture will be compatible with the air-entraining admixture specified above and shall be batched and added to the concrete in the manner specified for the adding of air-entraining admixture but separate from the portion of the mixing water containing the air-entraining admixture. The quantities of water-reducing, cement-dispersing admixture to be used shall be in accordance with the instructions of the manufacturers as approved by the Engineer. Water reducing admixture shall conform to the requirements of ASTM C-494.

10.5 WATERSTOPS

10.5.1 PVC Waterstops

PVC (Polyvinylchloride) waterstops shall be extruded from an elastomeric plastic compound, the basic resin of which shall be polyvinylchloride. 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 and tested it shall have the physical characteristics when tested by the U.S Corps. Of Engineer test method as shown in Table-J.

Table-J

Corps of Engrs. Tests Method No.	No. of Specimens Tested	Physical characteristics	Requirement
1	2	3	4
568	5	Tensile strength using die III, not less than	1750 psi
573	5	U l t i m a t e e l o n g a t i o n using die III, not less than	350%
570	3	L o w temperature brittleness, no sign of failure such as cracking or chipping at	-37° C

571	3	Stiffness in flexure 1/2 inch span, not less than	400 psi
-----	---	--	---------

10.6 JOINT SEALING COMPOUND

Sealing compound shall be either of the cold application type conforming to ASTM D-1850 or of the single or multiple component type or of the hot poured type conforming to the requirements of ASTM D-1190 or their equivalents.

10.7 EXPANSION JOINT FILLER

Expansion Joint filler material shall be premoulded asphalt impregnated fiber board, to be applied over the full joint-width, except as otherwise indicated on the Drawings, and shall conform to ASTM D-1751 where non-extruding and resilient bituminous type is indicated but where non-extruding and resilient non-bituminous is required the expansion joint filler shall consist of sponge rubber, self-expanding cork or any other material and type as directed by the Engineer, meeting the requirements of ASTM D-1752.

10.8 NON-SHRINK GROUT

Non-shrink grout of a thickness less than one inch shall consist of one part cement, one part clean sharp sand and 1:22000 to 1:15000 part of grained aluminum powder containing non-polishing agent. Non-shrink grout one inch or more in thickness shall be proportioned as above except that 1.5 parts of 3/8 inch to 1/4 inch (pea-size) gravel shall be added to the mix. The above composition may be varied if so required by the Engineer. In each case, however, the Contractor shall, at his own cost, prepare optimum mix design and conduct testing of the grout composition for strength and non-shrink performance. Pre-mix non-shrink grout from approved manufacturers may also be used as required by the Engineer.

10.9 EPOXY CONCRETE AND MORTAR

10.9.1 General

Epoxy concrete for installation adjacent to embedded metal and epoxy concrete and/or mortar for the replacement of faulty concrete or for other special purposes as ordered or approved by the Engineer shall conform to the requirements specified hereunder. Epoxy concrete and epoxy mortar shall be mixed in the proportions by such methods and with such equipment as are recommended by the manufacturer of the epoxy resin and approved by the Engineer. The proportions of epoxy mortar and epoxy concrete and the methods of mixing and placing will be subject to change to meet field requirements. The individual batch size of epoxy concrete and mortar which may be prepared at one time shall not exceed the amount that may be mixed, placed and finished in accordance with the manufacturer's instructions as approved by the Engineer.

10.9.2 Materials

EPOXY RESIN: Epoxy resin shall be subject to approval by the Engineer.

AGGREGATES FOR EPOXY CONCRETE: The aggregates used for epoxy concrete shall be clean, dry, crushed river cobble gravel 3/4 inch maximum size. Except for gradation, fine and coarse aggregates shall meet the requirements of ASTM C-33. Gradation of fine aggregate

shall be the same as specified in sub-section 10.2.5, except that the percentage passing a No. 100 sieve shall be held to the lower limit specified to the greatest extent practicable. The fine and coarse aggregates used in preparation of epoxy resin concrete shall be oven dry and shall be conditioned to a temperature of 15°C to 21°C prior to mixing the epoxy resin binder. Gradation of the coarse aggregate shall conform to the requirements of Table-K when tested in accordance with ASTM C-136.

Table-K

Sieve Size Standard Sq. Mesh	Per cent passing (by weight)
3/4 inch	100
1/2 inch	90 - 100
3/8 inch	40 - 70
No.4	0 - 15
No.8	0 - 5

The aggregates shall be well graded from coarse to fine.

AGGREGATES FOR EPOXY MORTAR: Except for gradation, fine aggregates for use in epoxy mortar shall conform to the requirements of ASTM C-404. The aggregate used in the preparation of the epoxy resin mortar shall be oven dry and shall be conditioned to a temperature of 15°C to 21°C prior to mixing the epoxy resin binder. Gradation of the fine aggregate shall conform approximately to the requirements of Table-L when tested in accordance with ASTM C-136.

Table L

Sieve Size Standard Sq.mesh	Percentage Passing (by weight)
No. 4	100
No. 8	95 - 100
No. 16	60 - 100
No. 30	35 - 70
No. 50	15 - 35
No. 100	2 - 5
No. 200	0 - 2

The aggregates shall be well graded from coarse to fine and the material passing the No. 100 sieve shall be held to a minimum.

10.10 VAPOR BARRIER

Vapor barrier shall be polyethylene building film, visqueen standard or approved equal. The film shall be 100 gauge thick. The quality of material shall be approved by the Engineer prior to use in the works.

Vapor barrier shall be laid in position wherever shown on the Drawings.

The material shall be supplied in rolls and laid by rolling over the prepared surface at the levels and position in the areas shown on the Drawings. Where joint is necessary at the side or end of a 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 concreting. The Contractor shall protect the film sheets from damages during laying and subsequent operations and shall replace at his own cost all damaged film sheets to the satisfaction of the Engineer.

Manufacturer's recommendations and instructions alongwith the sample of material shall be submitted to the Engineer for his approval.

17. 11. EXECUTION

11.1 PROPORTIONING OF CONCRETE

11.1.1 General

Trial mixes and tests shall be made by the Contractor for the purpose of designing the mixes and for quality control with regard to the required strength, density and durability. The proportions shall be changed whenever such change is necessary to maintain the standard of quality required for the structures and to meet the varying conditions encountered during construction.

All materials composing the concrete shall invariably be measured by weight or if approved by the Engineer as an exception by volume.

11.1.2 Cement Content

The cement content of concrete for various grades shall be established by trial mixes and shall depend on the size, type and gradation of aggregate used, water cement ratio required for the structure and on the requirements of concrete strength, durability and workability.

11.1.3 Aggregate Content

The maximum size of aggregate (MSA) to be used in the various parts of the structure shall be as shown on the Drawings and where not shown, shall be as directed by the Engineer. Concrete mixes shall be designed to use the largest size and maximum amount of coarse aggregate practicable keeping in view the requirements of sub-section 10.2.1

11.1.4 Water Content

The amount of water to be used shall be governed by the following considerations:

WATER CEMENT RATIO: In general, the mix design shall provide for water cement ratios by weight with aggregate at saturated surface dry condition, which will be determined on the basis of producing concrete having suitable workability, density, impermeability, durability and the required strength without the use of excessive amount of cement.

It is expected that water cement ratio by weight will vary from 0.45 for concrete in thin sections to 0.65 for mass concrete in severe weather conditions. Maximum permissible water cement ratio will also vary from 0.67 for low strength concrete to 0.38 for concrete for higher strength concrete.

CONSISTENCY: The amount of water used in the concrete shall be regulated as required to produce concrete of proper consistency taking into account the effect of any variation in either or both the moisture contents or grading of the aggregates as they enter the mixer. Addition of water to compensate for stiffening of concrete before placing shall not be permitted. Uniformity in concrete consistency from batch to batch shall be ensured.

11.1.5 Concrete Strength

Various classes of concrete shall have 28 day compressive strength of 6 inch x 12 inch test cylinders at least equal to the values given in Table-M except as otherwise indicated on the Drawings or directed by the Engineer.

Table -M

Class	Cylinder Stgrength Psi
A	4000
B	3000
C	1000

11.1.6 Slump

In general, the slump of the concrete, after concrete has been deposited but before it has been consolidated, shall not exceed the values specified below for the structures and/or parts thereof unless otherwise directed by the Engineer. Check slumps shall be taken at the mixer and at locations of placement and or as directed by the Engineer. The Engineer may order the placement of concrete having lesser slump, wherever concrete of such lesser slumps can be consolidated readily into place by means of the specified vibrations. The use of buckets, chutes, hoppers, or other equipment of types that will not readily handle and place concrete of such lesser slumps will not be permitted. The slump will be determined in accordance with ASTM C-143.

The minimum slump shall be $\frac{3}{4}$ inch in all cases, except when plasticisers are used with the Engineer's approval. The maximum slump shall not exceed the under mentioned limits:

Mass concrete	2 inch
Slabs, floors and foundations	2 inch
Columns, beams, walls, parapets etc.	4 inch
Other parts	3 inch

11.2 BATCHING AND MIXING

11.2.1 Type and Capacity

All concrete shall be produced in a batching and mixing plant or by means of a mechanical mixer as approved by the Engineer.

The capacity of the plant shall be such that the proposed arrangement will produce adequate quantity of concrete to meet with all the other requirements of these Specifications and the construction schedule. The batched materials shall be thoroughly combined into a uniform mixture before the addition of water and admixtures. The water shall be added gradually and the mixer operated for specified duration of time so as to obtain a thoroughly mixed concrete of uniform color and quality.

11.2.2 Mixers

Hand mixed concrete shall not be used; however, the Engineer may allow concrete to be mixed in small mixers. The mixers provided by the Contractor shall be capable of combining the materials into a uniform mixture and of discharging without segregation. Mixers shall not be charged in excess of the capacity recommended by the manufacturer and shall not be recharged before completely discharging the previous batches. Overmixing requiring additions of water will not be permitted. The mixers shall be operated at a drum speed designated by the manufacturer. The mixers shall be cleaned frequently and maintained in satisfactory operating condition, and mixer drums shall be replaced when worn down more than 10 per cent of their length and or thickness.

11.2.3 Water Batcher

A suitable water measuring device shall be provided by the Contractor which shall be capable of measuring water within the specified requirements for each batch. The mechanism for delivering water to the mixer shall be such that no leakage will occur when the valves are closed.

11.2.4 Locations

The concrete plant/mixer shall be installed at the Site at locations selected by the Contractor and approved by the Engineer.

11.2.5 Arrangement

Separate bins and compartments shall be provided for each size or type of aggregate and Portland cement. The compartments shall be of adequate size and so constructed that the materials will be maintained separated under all conditions. Batching equipment/ arrangement shall be capable of delivering concrete within the following limits of accuracy as shown in Table-N

Table-N

Material	Per cent by weight
Cement	+1%
Water +1%	
Aggregate smaller than $\frac{3}{4}$ inch	+2%
Aggregate larger than $\frac{3}{4}$ inch	+3%

11.2.6 Cooling

Adequate cooling facilities shall be provided to ensure that the temperature of concrete when discharged from the mixers is sufficiently low to meet the temperature requirements as specified in sub-section 11.4.2. Cool mixing water, ice, precooled aggregate, shading the stockpiles with roofing or any other arrangements may be used to ensure the pre-cooling of the concrete, subject to the approval of the Engineer, but approval shall not in any way relieve the Contractor of his responsibility of placing concrete at temperatures at or below the specified limits.

11.2.7 Scales

Adequate weight and volume batching facilities, as approved by the Engineer, shall be provided by the Contractor for the accurate measurement and control of each of the materials entering each batch of concrete. The accuracy of the weighing equipment shall conform to the requirements of applicable standards. The weighing equipment shall be arranged so that the concrete plant operator and Engineer can observe the dials or indicators. Volumetric measurements, if approved by the Engineer, shall be made by means of accurate measuring boxes.

11.2.8 Mixing Time

The mixing periods specified in Table-O are based on proper control of the speed of rotation of the mixer and of the proper introduction of the materials into the mixer. The mixing time will be increased when such increase is necessary to secure the required uniformity and consistency of the concrete. The mixing time for each batch after solid materials are in the mixer drum, provided that all the mixing water is introduced before one fourth of the mixing time has elapsed, shall be as follows:

Table -O

Capacity of	Mixer Mixing Time
upto 2.0 cubic yards	2.0 minutes
from 2.0 to 3.25 cubic yards	2.5 minutes

11.3 CONVEYING

Concrete shall be conveyed from mixer to the place of final deposit as rapidly as practicable, by methods which will prevent segregation or loss of ingredients and in accordance with ACI-304. Any wet batch hopper through which the concrete passes shall be conical in shape. There shall be no vertical drop greater than three feet except where the use of such equipment is approved in writing by the Engineer, in advance of any use. Each type or class of concrete shall be visually identified by placing a colored tag or marker on the bucket as it leaves the mixing plant so that the concrete may be positively identified and placed in the structure forms in the desired position.

11.4 PLACING

11.4.1 General

No concrete is to be placed until all the preparatory works have been satisfactorily completed and the reinforcement and embedded items have been checked and approved by the Engineer. Concrete placing shall follow the practice given in ACI-304.

No concrete shall be placed until all formwork, reinforcement, installation of parts to be embedded, bracing of forms and preparation of surfaces involved in the placing and the method of placement have been approved by the Engineer. Approval of the method of placement proposed will not relieve the Contractor of his responsibility for its adequacy and he shall remain solely responsible for the satisfactory construction of all work under the Contract. Before concrete is placed, all surface upon or against which concrete is to be placed shall be free from standing water, mud, debris or any loose material. All surfaces of forms and embedded material that have become encrusted with dried mortar or grout from concrete previously placed shall be cleaned of all such mortar or grout before the surrounding or adjacent concrete is placed. The surfaces of absorptive materials against or upon which concrete is to be placed shall be moistened thoroughly so that the moisture will not be drawn from the freshly placed concrete. Concrete shall be worked into the corners and angles of the forms and around all reinforcement and embedded items without permitting the material to segregate. Concrete shall be deposited as close as possible to its final position in the forms. The depositing of concrete shall be regulated so that the concrete may be effectively compacted with a minimum of lateral movement into horizontal layers approximately 18 inches in thickness. No concrete that has partially hardened or been contaminated by foreign materials shall be deposited in the structure, nor shall retamped concrete be used unless approved by the Engineer. The surfaces of construction joints shall be kept continuously wet for at least eighteen hours during the twenty-four hour period prior to placing concrete except as otherwise directed by the Engineer. All free water shall be removed and the construction joint shall be completely surface dry prior to placement of concrete. All concrete placing equipment and methods shall be subject to approval of the Engineer. Concrete placement will not be permitted, if in the opinion of the Engineer, weather conditions prevent proper placement and consolidation.

11.4.2 Time Interval Between Mixing and Placing

Concrete mixed in stationary mixers and transported by non-agitating equipment shall be placed within thirty minutes after it has been mixed, unless otherwise authorized. In any case, concrete shall be placed and compacted well within the initial setting time.

11.4.3 Placing Temperature

Placing temperature shall conform to the requirements herein specified for thin and moderate sections. The Engineer's determination as to the type of section and applicable placing temperatures shall govern. Concrete shall be placed at temperatures as follows:

THIN SECTIONS: Concrete for thin sections shall be delivered to the forms at the coolest temperature which is practicable to produce under current conditions but in no case at a temperature in excess of 30°C. Except as otherwise determined by the Engineer, sections to which this provision shall apply shall be less than 18 inches in thickness.

MODERATE SECTIONS: Concrete for moderate sections shall have a temperature of not more than 21°C when placed. A moderate section will be one that is greater than 18 inches but less than 36 inches in thickness.

Where concrete is to be placed on a flat excavated surface or on an excavated surface inclined at not more than 1V: 1.75 H, a 3 inch layer

of blinding concrete, if not otherwise shown on the Drawings, shall be placed immediately after completion of excavation and cleaning. The upper surface of the blinding concrete shall not be higher than the required cover below the lowest layer of the reinforcing steel. The final excavated level shall be calculated to allow for the 3 inch thickness of the blinding layer.

11.4.5 Lifts In Concrete

Concrete shall be placed in lifts or depths as directed by the Engineer. The placement of concrete shall be carried on at such a rate and in such a manner that formation of cold joints is prevented. Slabs shall be placed in one lift, unless otherwise authorized or directed. In walls, lifts shall terminate at such levels as shall conform to structural details. Where slabs and beams are placed continuously with walls and columns, the concrete in walls and columns shall have been in place for at least two hours, or for a longer period when directed by the Engineer, before placing concrete in the slabs and beams. The top surface of vertically formed lifts shall be generally leveled. The concrete in columns shall be placed in one continuous operation, unless otherwise authorized. In general, the construction joints in beams and slabs shall be located as shown on the Drawings and concrete shall be placed in the sequence indicated on the Drawings or as authorized by the Engineer. The maximum differential in height between the various pours of the structure shall be as shown on the Drawings or as directed by the Engineer.

11.4.6 Elapsed Time between Placement of Lifts

Except as otherwise approved on the basis of lift drawings submitted by the Contractor, a minimum of 72 hours shall elapse between the placing of successive lifts of walls and thin sections and 120 hours shall elapse between placing lifts of moderate sections. Thin and moderate sections are defined in sub-section 11.4.3.

11.4.7 Time between Adjacent Pours

The time between adjacent pours shall be defined as the time elapsing from the end of the striking off of one pour to the start of placing the next pour. The minimum time elapsing between adjacent pours shall be five days for thin and moderate sections and fourteen days for mass section.

11.4.8 Concrete for Blockouts

Blockouts for equipment and fittings and for such other work as indicated or directed shall be provided as indicated on the Drawings. After the said equipment and fitting have been installed and adjusted in their final location, the blockout recesses shall be filled with concrete. Before installing the components to be embedded in blockout concrete and before depositing any blockout concrete, the concrete surfaces of the blockout shall be cleaned in the manner specified for cleaning construction joints.

11.4.9 Placing Concrete through Reinforcement

In placing concrete through reinforcement, care shall be taken that no segregation of the coarse aggregate occurs.

In certain cases, like the bottom of beams and slabs, the congestion of steel near the forms may make placing difficult. In such cases, as decided by the Engineer, a layer of mortar of a composition compatible with the required concrete strength shall be first deposited to cover the surface to a depth of 5/8 inch.

11.4.10 Vibration of Concrete

Recommended Practice given in ACI-309 shall be followed for concrete consolidation. Concrete shall be compacted with mechanical vibrating equipment supplemented by hand spading and tamping. In no case shall vibrators be used to transport concrete inside the forms. The vibrating equipment shall be of internal type and shall at all times be adequate in number of units and power of each unit to properly consolidate all the concrete. Form or surface vibrators shall not be used unless specifically approved. The intensity (amplitude) of vibration shall be sufficient (frequency not less than 6,000 impulses per minute) to produce satisfactory consolidation. The duration of vibrations shall be limited to that necessary to produce satisfactory consolidation. Excessive surface working will not be permitted.

11.4.11 Precast Cement Concrete

The work to be done under this item consists of manufacturing, storing, handling, transporting and laying precast concrete members as may be required. Materials and methods for precast concrete work shall conform to the applicable requirements of these Specifications - Plain and Reinforced Concrete. Except as otherwise shown or specified, maximum size of coarse aggregate shall be $\frac{3}{4}$ inch. Concrete shall be mechanically vibrated in placing. Slump shall be limited to 1-1/2 inch. Precast concrete shall be water cured for 14 days. Precast units shall not be removed until they have attained at least 75% of their required 28 days strength and shall be picked up only by their lifting hooks. The precast members which are subjected to overstress or otherwise injured during curing or handling shall be removed from the Site by the Contractor.

11.5 EXPANSION, CONTRACTION AND CONSTRUCTION JOINTS

11.5.1 Construction Joints

GENERAL: As soon as a lift is completed, the top surface of concrete and reinforcing dowels shall be immediately and carefully protected from any condition that may damage the concrete surface and the dowels. The construction joints shall be prepared as per satisfaction of the Engineer.

CLEANING: Horizontal construction joints on lifts with relatively open and accessible surfaces shall be prepared for receiving the next lift by cleaning with either wet sandblasting or by air- water cutting. Approved wet sandblasting equipment shall be provided. If the surface of a lift is congested with reinforcing steel and is relatively inaccessible or if for any other reason it is considered undesirable to disturb the surface of a lift before it has hardened, surface cutting by means of air-water jets will not be permitted and the use of wet sandblasting will be required.

AIR WATER CUTTING: Air-water cutting of a construction joint shall be performed when approved by the Engineer. The surface shall be cut with a high-pressure air-water jet to remove all laitance and to expose clean, sound aggregate, but not so as to undercut the edges of the larger particles of the aggregate. The air pressure used in the jet shall be 0.7 MPa plus or minus 10% (100 psi) and the water pressure shall be just sufficient to bring the water into effective influence of the air pressure. After cutting, the surface shall be washed and rinsed as long as there is any trace of cloudiness of the wash water. The surface shall again be washed with an air-water jet while the concrete is still green, say well within 6 hours of concreting, (depending upon the atmospheric conditions of humidity and temperature) prior to placing the succeeding lift. Where necessary to remove accumulated laitance, coatings, stains, debris and other foreign material, wet sandblasting will be required immediately before

placing the next lift to supplement air-water cutting. When approved by the Engineer, a retarder may be applied to the surface of the lift in order to prolong the period of time during which air-water cutting is effective. Prior to receiving approval, the Contractor shall furnish technical data and samples of the retarder to be used and shall demonstrate the method to be used in its application.

WET SANDBLASTING: When employed in the preparation of construction joints, wet sandblasting shall be performed immediately before placing the following lift. The operation shall be continued until all laitance, coating, stains, debris and other foreign materials are removed. The surface of the concrete shall then be washed thoroughly to remove all loose material.

JOINTS: Vertical construction joints shall be prepared similar to the horizontal construction joints. Where allowed by the Engineer, the inner surface of the formwork may be coated with an approved set-retarder to facilitate the preparation of the vertical construction joint.

WATER DISPOSAL: The method used in disposing of water employed in cutting, washing and rinsing of concrete surfaces shall be such that the waste water does not stain, discolor, or effect exposed surfaces of the structure. Methods of disposal shall be subject to approval by the Engineer.

11.6 INSTALLATION OF WATER STOPS

11.6.1 General

Except as otherwise shown on the Drawings, waterstops shall be installed with an approximately equal width of material embedded in concrete on each side of the joint. Water stops shall be sealed to other cut off systems as shown on the Drawings or as directed by the Engineer. All waterstops shall be installed and carefully positioned so as to form a continuous water tight diaphragm in each joint. All splices shall be neat with the ends of the joined materials in true alignment.

Concrete shall be carefully placed and vibrated around water stops to ensure maximum concrete imperviousness and density, the complete filling of the forms in the vicinity of the waterstop and complete contact between the concrete and all surfaces of water stop.

11.6.2 PVC Waterstops

Splices in the continuity or at the intersections of run of PVC waterstops shall be performed by heat sealing the adjacent surfaces in accordance with the manufacturer's recommendations or as directed by the Engineer. 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 waterstop shall be used to reform the ribs at the splices. The continuity of the characteristic components of the cross-section of the waterstop design (ribs, tubular center axis, protrusions, and the like) shall be maintained across the splice. The splice joints shall be tested in accordance with the applicable standards and as directed by the Engineer.

11.7 CURING

11.7.1 General

All concrete including concrete repair work shall be cured by an approved method or combination of methods in accordance with ACI-308. The Contractor shall have all equipment and materials needed for adequate curing and protection of the concrete on hand

and ready to use before actual concrete placement begins. Means shall be provided for the protection of concrete from the sun, drying winds and traffic until the specified curing has been completed.

The curing medium shall be applied so as to prevent loss of moisture from the concrete. Concrete shall be protected from heavy rains for 24 hours. All concrete shall be adequately protected from damage. No fire or excessive heat, including the heat resulting from welding, shall be permitted near or in direct contact with the concrete at any time. All galleries, conduits and other formed openings through the concrete shall be closed during the curing period.

If during the specified minimum period of curing, the surface temperature of the concrete falls below 10°C, the period of curing shall be extended to allow the concrete to reach sufficient maturity. The period of extension shall be as approved by the Engineer.

11.7.2 Moist Curing

Concrete shall be moist-cured maintaining all surfaces continuously (not periodically) wet for 14 days immediately following the placing or until covered with fresh concrete. Precast elements shall also be water-cured for 14 days. Curing water shall be removed without allowing stagnant pools of water to form on the exposed lift surface. Water for curing shall comply with the applicable requirements of sub-section 10.3 "Water". Where forms of tongue-and groove or shiplap sheathing are used and are left in place during curing, the sheathing shall be kept wet at all times. When in contact with concrete, steel forms shall be kept wet. Horizontal construction joints and finished horizontal surfaces cured with sand shall be covered with a minimum uniform thickness of 2 inch of sand and kept continuously saturated with water.

11.7.3 Liquid Curing Membrane

An approved curing compound conforming to ASTM C 309 shall be applied in accordance with the manufacturer's recommendations immediately after any water sheen which may develop after finishing has disappeared from the concrete surface. It shall not be used on any surface against which additional concrete or other material is to be bonded unless it is proven that the curing compound will not prevent bond or unless positive measures are taken to remove it completely from such areas.

11.8 REPAIR OF CONCRETE

11.8.1 General

Concrete that is damaged from any cause; concrete that is honeycombed, fractured, or otherwise defective; and concrete which, because of excessive surface depressions, must be excavated and built up to bring the surface to the prescribed lines; shall be removed and replaced with dry pack mortar, or concrete, as hereinafter specified. Repair of concrete shall be performed only by skilled workmen and within 24 hours of removal of forms. The Contractor shall keep the Engineer advised as to when repair of concrete will be performed. Unless an inspection is waived in each specific case, repair of concrete shall be performed only in the presence of the Engineer. Repairs shall be made in accordance with the procedures approved by the Engineer.

11.8.2 Materials

All materials used in the repair of concrete shall conform to the applicable requirements of the Specifications.

11.8.3 Protrusions

Where bulges and abrupt irregularities protrude outside the specified limits on formed surfaces not to be concealed permanently, the protrusions shall be reduced by bush-hammering and grinding so that the surface irregularities are within the specified limits.

11.8.4 Depressions

GENERAL: All fillings for depressions shall be bonded tightly to the surfaces of holes and shall be sound and free from shrinkage cracks and drummy areas after the fillings have been cured and have dried. All fillings in surfaces of structures prominently exposed to public view shall contain sufficient white Portland cement to produce the same color as that of the adjoining concrete. Repairs shall be made with non-shrink grout, guniting or drypack filling except where repairs with epoxy concrete and/or epoxy mortar are directed to be made by the Engineer. Concrete, mortar, grouting, guniting or drypack mortar filling as the case may be shall each be mixed in proportions approved by the Engineer to produce a repair at least equivalent in strength density and durability to the concrete in which the repair is required and shall match with the adjacent surfaces in texture, color and shade.

CONCRETE FILLING: Concrete filling shall be used for holes extending entirely through concrete sections; for holes in which no reinforcement is encountered and which are greater in area than 1.0 square feet and deeper than 4 inch; and for holes in reinforced concrete which are greater than 0.5 square feet in area and which extend beyond the reinforcement.

MORTAR FILLING: Mortar filling, placed under impact by use of a mortar gun, may be used for repairing defects on surfaces, not exposed to public view where the defects are too wide for drypack filling and too shallow for concrete filling and no deeper than the far side of the reinforcement that is nearest to the surface.

DRYPACK MORTAR FILLING: Drypack mortar fillings shall be used for filling holes having a depth nearly equal to, or greater than, the least surface dimension; for narrow slots cut for repair of cracks; for grout pipes recesses; and for tie rod fastener recesses as specified. Drypack mortar shall not be used for filling behind reinforcement or for filling holes that extend completely through a concrete section. If removal of the ends of form ties results in recesses, the recesses shall be filled with drypack mortar provided that filling of recesses in surfaces upon or against which fill material or concrete is to be placed will be required only where the recesses are deeper than 1 inch in walls less than 12 inch thick.

SURFACE FINISHES OF REPAIRED AREAS: The Contractor shall correct all imperfections on the concrete surface as necessary to produce surfaces that conform to the requirements specified for the adjacent area. Fins and encrustations shall be neatly removed from the surfaces.

11.9 EPOXY CONCRETE AND MORTAR

11.9.1 Mixing and Batching

EPOXY BINDER: Prior to mixing, the two components of the epoxy resin binder shall be conditioned to 15°C to 21°C. The two components shall be combined with constant stirring, and the stirring shall be continued until a uniform mixture is obtained. The rate of mixing should be such that entrained air is held to a minimum. A power-driven (air or spark proof) mixer with propeller-type blade operating at a maximum of 500 rpm shall be used for mixing the two components of the epoxy resin binder and a hemispherical bottomed polyethylene or metal container shall be used for the mixing.

EPOXY CONCRETE: Epoxy binder shall be prepared as specified above, and after the two components have been thoroughly mixed, shall be transferred to large metal pans and the aggregates added in recommended and approved proportion as specified in sub-section 10.2.6.

The fine aggregate shall be added to the epoxy resin binder and the material shall be mixed until a rich mortar consistency is attained. The coarse aggregate shall then be added and the epoxy concrete thoroughly mixed.

MORTAR: Epoxy binder shall be prepared as specified above in para - Epoxy Binder. After the two components have been thoroughly mixed, the binder shall be transferred to large metal pans and the fine aggregate added in recommended and approved proportions as specified in sub-section 10.2.5. The fine aggregate shall be added to the binder gradually and mixing continued until all particles are coated.

11.9.2 Temperature, Moisture and Protection for Epoxy Mortars and Concrete

Epoxy concrete and mortar shall be placed and repairs shall be made when the atmospheric and concrete temperature are above 5°C and less than 38°C and remain in this range for a period of at least 24 hours. If the work is required to be done at temperatures lower or higher than those specified; approved means as recommended by the manufacturer of the epoxy binder and approved by Engineer shall be provided to raise or lower the ambient and concrete temperatures as required for satisfactory work. Such means will include heating or cooling equipment and necessary shelters. If temperatures below 5°C are anticipated during the cure-out or hardening period of the epoxy concrete or mortar, heated enclosures shall be maintained over the repair area with care taken to avoid localized heating or hot-spots. Circulating air shall be used to ensure that surface temperatures do not exceed 35°C during curing. Epoxy resin concrete and mortar shall be placed only on sound, clean and dry surfaces. Suitable methods shall be used to dry and to maintain dry the contact surfaces of the concrete to which the epoxy concrete or mortar is to be applied. All repairs shall be protected from rain or seepage water for at least 24 hours and from all types of traffic for a period of 72 hours.

11.9.3 Preparation and Placing

EPOXY CONCRETE: All fines, dust, and other loose material on the contact surface shall be removed by scrubbing with a stiff bristle brush followed by washing. The dry, cleaned surfaces shall receive a prime coat of epoxy resin. The prime coat shall be applied in a thin coat and briskly scrubbed into the dry concrete surface with a stiff bristle brush. Placement of the epoxy resin concrete shall be delayed until the prime coat becomes tacky. The epoxy resin concrete shall be placed in layers not over 4 inch in thickness. The thickness of courses and time interval between courses, shall be such that the temperature of the epoxy concrete does not exceed 60°C at any time during hardening. Mechanical plate, screed or float vibrators or hand tampers shall be used to consolidate the epoxy concrete. Excess epoxy concrete which becomes spread on the adjacent surfaces of hardened concrete shall be removed before it hardens.

EPOXY MORTAR: Defective concrete in areas as determined by the Engineer, shall be repaired with the aid of a saw cut at least 1 inch outside the faulty area. The concrete between the saw cut and the

edge of the faulty area and the concrete throughout the area shall be chipped out to solid concrete. The cavity thus formed shall be thoroughly cleaned with compressed air, sand blasting or other method to remove all loose material. The dry, cleaned surfaces of the cavity shall receive a prime coat of epoxy resin binder of composition as recommended by the manufacturer of the epoxy. The prime coat shall be applied in a thin coating and scrubbed into the surface with a stiff bristle brush. Placement of epoxy resin mortar shall be delayed until the prime coat becomes tacky. The epoxy mortar shall then be placed in the cavity in layers not exceeding 1 inch in thickness. The time interval between placement of additional layers shall be such that the temperature of the epoxy resin mortar does not exceed 60°C at any time during hardening. Mechanical plate, screed or float vibrators or hand tampers shall be used to consolidate the epoxy resin mortar. Excess epoxy resin mortar, which becomes spread on the adjacent surfaces of the hardened concrete, shall be removed before it hardens.

11.10 Health and Safety Precautions

- Full face shields shall be used during all mixing and blending operations and for placing operations as required.
- Protective skin creams of a suitable nature for the operations shall be used.
- Portable eye washing facilities shall be maintained at mixing, batching and placing operations.
- Adequate fire protection shall be maintained at all mixing and placing operations.
- Smoking or the use of spark or flame producing devices is prohibited within 50 feet of mixing and placing operations.
- The mixing, placing, or storage of solvent is prohibited within 15 feet of any vehicle, equipment or machinery which could be damaged from fire or could ignite vapors from the material.
- Contaminated clothing which cannot be decontaminated shall be burned at an approved burning area at the end of each working day.
- Facilities shall be provided for decontamination of clothing and equipment at the job site.
- Care should be taken in handling solvent for cleaning equipment to avoid problems of toxicity, fires and possible explosions.
- Adequate ventilations shall be provided.

11.11 FINISHES AND FINISHING

11.11.1 General

Allowable deviations from plumb or level and from the alignment, profile grades and dimensions shown on the Drawings or specified in sub-section 5 "Tolerances" are defined as tolerances and are to be distinguished from irregularities in finish as described herein. The classes of finish and the requirements for finishing of concrete surfaces shall generally be as specified herein or as indicated on the Drawings. Finishing of concrete surfaces shall be performed only by workmen who are skilled concrete finishers.

The Contractor shall keep the Engineer informed as to when finishing of concrete will be performed. Unless inspection is waived in each specific case, finishing of concrete shall be performed only in the presence of the Engineer. Concrete surfaces will be tested by the Engineer where necessary to determine whether surface irregularities are within the limits hereinafter specified. Surface irregularities are classified as abrupt or gradual. Offsets caused by displaced or misplaced form sheathing or lining or form sections or otherwise defective form lumber will be considered as abrupt irregularities, and will be tested by direct measurements. All other irregularities will be considered as gradual irregularities and will be tested by the use of a template, consisting of a straight edge or the equivalent thereof for curved surfaces. The length of the template will be 4 feet 6 inch.

The classes of finish for concrete surfaces shall be as shown on the Drawings or as directed by the Engineer. No grinding will be required on formed surfaces other than that necessary for repair of surface imperfections as specified herein.

11.11.2 Ordinary Finish (OF)

Ordinary finish (OF) applies to surfaces upon or against which fill material or concrete is to be placed. If unformed, the finishing operation shall consist of sufficient leveling and screeding to produce even uniform surfaces. When formed, the surfaces require no treatment after form removal except for repair of defective concrete and filling of holes left by the removal of fasteners from the end of the tie rods as required under sub-section 11.8 –“Repair of Concrete”. Correction of surface irregularities shall be required for depressions only and only for those which exceed 1 inch when measured as described in sub-section 11.11.1.

11.11.3 Rough Concrete Finish (RC)

Rough concrete finish (RC) applies to surfaces which are intended to receive tiles, metallic lining or other applications as indicated on the Drawings. After consolidation and leveling of the concrete to the specified tolerances, the surface shall be roughened with stiff brushes or rakes before final set. Where rough concrete finish is specified for wall surfaces, the same shall be obtained by use of formwork suitable to produce the required finish. Surface irregularities measured as described in sub-section 11.11.1 General, shall not exceed ¼ inch for floors and 1/8 inch for walls.

11.11.4 Ordinary Slab Finish (OS)

Ordinary slab finish (OS) applies to floor surfaces which are not intended to receive any floor coverings. After the concrete has been placed, consolidated, struck-off and levelled, and its surface has stiffened sufficiently, floating shall be performed by use of hand or power driven equipment, and shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture. Floating shall be continued until a small amount of mortar without excess water is brought to the surface so as to permit effective trowelling. Steel trowelling shall be started when the surface has hardened sufficiently to prevent excess of fine material from being drawn to the surface. Steel trowelling shall be performed with firm pressure such as will flatten the sandy texture of the floated surface and produce a dense uniform surface, free from blemishes and trowel marks. Surface irregularities measured as described in sub-section 11.11.1 General, shall not exceed ¼ inch for abrupt irregularities and ½ inch for gradual irregularities and ½ inch for gradual irregularities.

11.11.5 Fair Faced Finish (FF)

Fair Finish (FF) shall be applied to all exposed surfaces of walls and ceilings which are not to be covered by any other finish. Surface irregularities shall not exceed 1/8 inch for abrupt irregularities and 1/4 inch for gradual irregularities, when measured as described in subsection 11.11.1 All abrupt irregularities and all gradual irregularities in excess of 6 mm shall be reduced by grinding to conform to the specified limit for gradual irregularities.

12. MEASUREMENT AND PAYMENT

12.1 General

- 12.1.1 Except as otherwise specified hereunder, measurement of concrete shall be made on the basis of the actual volume of concrete in place within the neat lines of the structure, as indicated on the Drawings. Measurement for payment shall not be made of concrete, nor any ingredients including cement in concrete, which is placed outside of the pavelines shown on the Drawings. Measurement of concrete placed against the sides of any excavation without the use of intervening forms shall be made only within the pay lines of the structure. Unless otherwise specified, payment for concrete shall be made at the respective contract unit price per cubic feet for the various items of the Bill of Quantities, which price shall include the cost of all labour, materials and the use of all equipment and tools required to complete the batching, mixing, transporting, placing, protecting, curing and other concrete work; except the reinforcement, waterproofing and embedded parts which are specified to be paid for separately. The Contract unit prices per cubic metre for concrete will include the cost of formworks, form oils, aggregates, water, preparation of all type of joints, bond breaking and curing compounds, handling and incorporating the cement admixture into the work, mixing, cooling, specified cleaning and other preparation of surface to receive concrete, placing, finishing, curing and all other work required to complete the concrete structures. No measurement or payment shall be made for removal and replacement of rejected concrete with Portland cement mortar, epoxy concrete, epoxy mortar or by any other method.
- 12.1.2 No measurement and payment shall be made for testing of cement; sampling and testing of aggregates; providing and testing concrete for slump and compressive strengths on the basis of test cylinders as specified or cubes if approved by the Engineer; providing and designing the trial mixes and testing for each grade of concrete as required by the Engineer and other tests as specified to be made in the laboratory at Site and/or in a laboratory approved by the Engineer.
- 12.1.3 No measurement and payment shall be made for providing samples and testing precast concrete units manufactured outside the Site;
- 12.1.4 No. measurement and payment shall be made for providing any type of admixtures; waterstops; embedded items; expansion/contraction joint, expansion joint/ contraction joint filler materials, Aluminum , G.I, Copper, stainless steel strip cover (any size) etc. cost of which shall be deemed to be included in the cost of respective item.

12.2 Measurement

- 12.2.1 Concrete shall be measured as per approved execution, and no deduction shall be made for the following:
- Volume of any reinforcing steel embedded in the concrete.

- Volume occupied by water pipes and conduits etc, not exceeding 4 sq. inch each in cross-sectional area.
 - Voids not exceeding 1.0 sq. ft. If any void exceeds 1.0 sq. ft total area of void shall be deducted.
- 12.2.2 Voids, which are not to be deducted as specified above, refer only to openings or vents which are wholly within the boundaries of measured areas. Openings or vents which are at the boundaries of measured areas shall always be subject to deduction irrespective of their size.
- 12.2.3 Concrete work shall be classified and measured separately as listed under the Items of BOQ.
- 12.2.4 Junction between straight and curved works shall in all cases be deemed to be included with the work in which they occur.
- 12.2.5 Measurement of walls shall be taken between attached columns, piers or pillar. The thickness of attached columns, piers or pillar shall be taken as the combined thickness of the wall and columns, pier or pillar. Attached or isolated columns, piers, pillar and the like (except where caused by openings) having a length on plan not exceeding four times the thickness shall be classified as columns. Those having a length over four times the thickness and caused by openings in wall shall be classified as walls.
- 12.2.6 Columns shall be measured from the top of footing/footing beams or floor surfaces to the underside of beams or slabs as the case may be. Where the width of beams is less than the width of columns, the extra width at the junction shall be included in the beams.
- 12.2.7 The depth of the beams shall be measured from bottom of the slab to the bottom of the beams except in case of inverted beams where it shall be measured from top of slab to the top of beam. The cross-section of the beam shall be the actual cross- section below or above the slab.
- 12.2.8 Measurement of acceptably completed works of plain and reinforced cement concrete shall be made on the basis of the number of cubic feet of concrete placed and compacted in position within the neat lines of the structure as shown on the Drawings or as directed by the Engineer.
- 12.2.9 Measurement of non-shrink cement grout shall be made on the basis of number of cubic feet of grout acceptably placed in positions as shown on the Drawings or as directed by the Engineer.

12.2.11 **Payment**

Payment will be made for the acceptable measured quantity of plain and reinforced cement concrete on the basis of unit rate per cubic feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

DRAWINGS

EXISTING PLANT ROOM STATE BANK OF PAKISTAN KARACHI.

STRUCTURAL DRAWINGS

LIST OF DRAWINGS		
SR. NO.	DRAWING NO.	DRAWING TITLE
1	G-01	GENERAL NOTES & SPECIFICATIONS GUIDLINES
2	G-02	STANDARD HOOK DETAILS
3	S-01	EXISTING COLUMN LAYOUT PLAN
4	S-02	PROPOSED COLUMNS FOOTING PLAN
5	S-03	FOOTING SECTIONS REINFORCEMENT DETAILS
6	S-04	PROPOSED CLUMNS AT GROUND FLOOR
7	S-05	GROUND FLOOR SLAB BEAM FRAMING
8	S-06	MISLLENIOUS DETAILS-1
9	S-07	MISLLENIOUS DETAILS-1
10	S-08	PROPOSED CLUMNS AT FIRST FLOOR
11	S-09	FIRST FLOOR SLAB BEAM FRAMING
12	S-10	MISLLENIOUS DETAILS-3

GENERAL NOTES

1. Design is in accordance with ACI-318 Code, 1995 Specifications.
2. All work shall be carried out in accordance with the job specifications.
- 3a. All Reinforced concrete in columns & RCC Walls is 4000 psi cylinder strength with min cement content 425Kg/m3 .
- 3a. All Reinforced concrete except columns & RCC Walls is 3000 psi cylinder strength with min cement content 325Kg/m3 .
4. Design of specified concrete mix shall be submitted by the Contractor and shall be got approved from the Engineer well before concreting of relevant structures alongwith result of test cylinders tested as per ASTM C 39. Test specimens shall be made and cured in accordance with ASTM C 31.
5. All reinforcing steel is Deformed 60,Grade 60000 psi min. yield strength and min. ultimate strength of 90000 psi as per ASTM A-615 specifications.
6. Ordinary Portland cement, conforming to BS-12 / PS-232 shall be used in all R.C.C. work except where it is specifically mentioned in the geotechnical report.
7. Cement from different sources shall not be mixed for the structure.
8. Coarse sand from approved quarries / sources shall be used.
9. Well graded crushed stone from approved quarries / sources shall be used as coarse aggregate. Maximum nominal size of the coarse aggregate shall be 20 mm for all R.C.C. work.
10. Potable water shall be used for concrete and shall be free of organic and other impurities.
11. 60 x 60 mm Precast concrete blocks having compressive strength of 6000 psi. and spaced not more than 1 m c/c shall be used for provision of required cover to main reinforcement. Thickness of these blocks shall be equal to the required cover.
12. All dimensions are given in feet. Written dimensions are to be followed.
13. Unless otherwise shown on the plans, Concrete cover provided for reinforcement shall be as follows;

Footings on 1:4:8

Bottom

2"

Sides

2"

Slabs

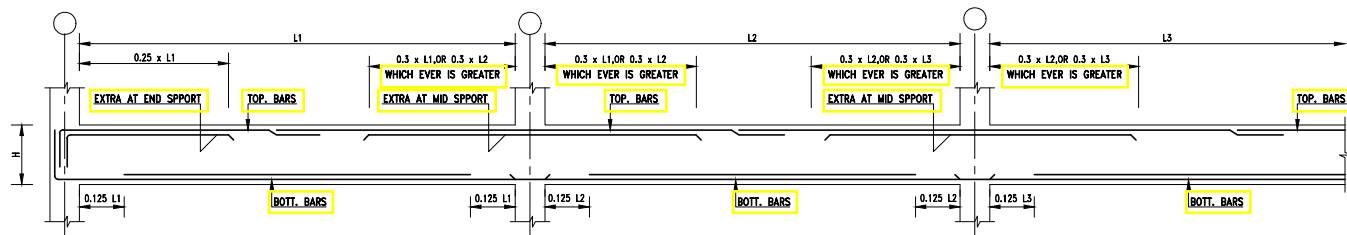
3/4"

Beams & Columns

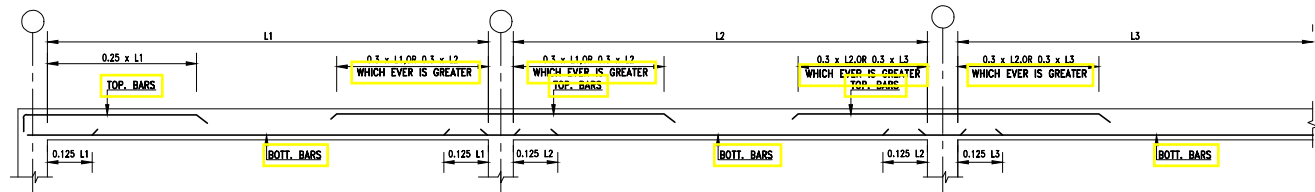
1½"
14. Construction drawings along with bar bending schedule shall be submitted by the contractor for Engineer's approval well before proceeding any work.
15. All layout, configuration, dimensions and levels shall be verified before proceeding with the work.
16. All reinforcing bars shall be held firmly in place before and during the pouring of concrete by means of adequate number of wires and supports to prevent dislocation during the course of construction.
17. Construction joint not shown on the drawing shall be properly planed and so made and located as to least impair the strength of structure and shall need prior approval of the Engineer. In general they shall be located near the middle of the span of slab and beams. Joints shall be perpendicular to main reinforcement. All reinforcing steel shall be continued properly across the joints.

18. During construction, safety and stability of the structure and all temporary works shall be given prime importance. Utmost care and precaution shall be exercised by the contractor during the work against any mishap or accident.
19. Bars in beams shall be joggled in vertical plane for laps and shall be staggered.
20. All Laps are 60 times bar diameter.
21. Bars in column shall be joggled for laps with starter bars.
22. Position of bars in beams shall be adjusted keeping in view the position of vertical bars of the columns.
23. Stirrups shall be placed in such a way that their hooks shall be staggered and located in compression face.
24. Concrete test cylinder shall be cured with the same method and under same conditions as those for the concrete work they represent.
25. No concrete shall be poured until its form work and reinforcement has been inspected and approved by the Engineer.
26. Sequence of removal of form work shall be as approved by the Engineer.
27. All structural Drawings shall be read & checked in conjunction with the Architectural Drawings for layout and levels of different members.
28. Existing underground services if any, required to be left in position, shall be carefully protected during excavation.
29. Excavation adjacent to existing structures and/or under-ground services shall be made by hand.
30. Adequate shoring and support to the sides of all excavation shall be supplied and erected where required to safe guard workmen and protect any adjacent structures.
31. Foundations have been designed for bearing capacity as per geo technical report. In case of any adverse variety of soil or bearing capacity found during construction, it shall be immediately brought to the notice of Engineer in charge for further instructions.
32. While back filling of excavation for footings compaction shall be done in layers.
33. All conduits and pipes to be laid in concrete shall be located above main reinforcement of slabs and beams and with the approval of the Engineer.
34. Preformed expansion joint filler (non extruding and resilient type) where used shall conform to ASTM 1751 (AASHTO M 213) specification.
35. Excavation including dewatering, bracing of excavation to safeguard the adjoining property and life and dewatering pits in case of rain is contractor's responsibility. For that matter, a qualified Geo-Technical engineer can be appointed on his role.

NO.	REVISIONS:	DATE	SIGN.
PROJECT:			
EXISTING PLANT ROOM STATE BANK OF PAKISTAN KARACHI.			
TITLE:			
GENERAL NOTES & SPECIFICATIONS GUIDELINES			
SCALE:	N.T.S	DRAWING NO.	
DATE:	05-11-2025	G-01	
		Tech N Blocks Office #06, Building #12J, Block 06, PECHS, Karachi.	



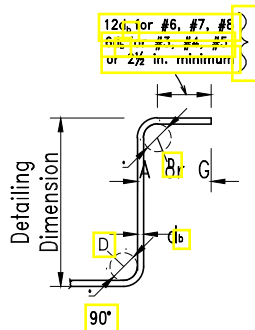
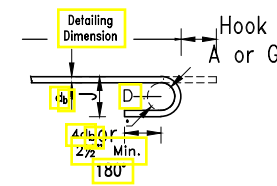
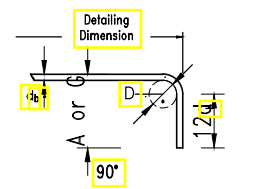
TYP BARS CUTOFF DETAILS FOR BEAM



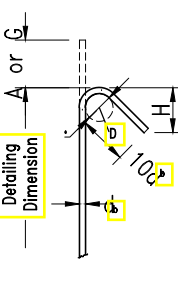
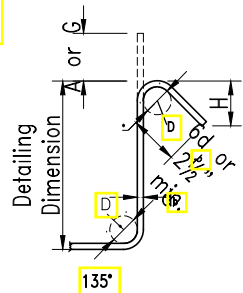
TYP BARS CUTOFF DETAILS FOR SLAB

RECOMENDED END HOOKS, ALL GRADES

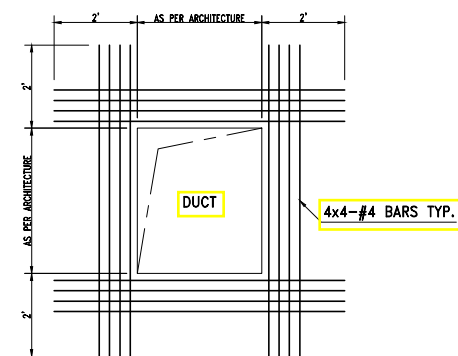
Bar Size	Finished bend diameter D, in.	180-deg hooks		90-deg hooks	
		A or G, in.	J, in.	A or G, in.	
#3	2 1/4	5	3	6	
#4	3	6	4	8	
#5	3 3/4	7	5	10	
#6	4 1/2	8	6	12	
#7	5 1/2	10	7	14	
#8	6	11	8	16	
#9	9 1/2	15	11 1/4	19	
#10	10 1/4	17	13 1/4	20	
#11	12	19	14 3/4	24	
#14	18 1/4	27	21 1/4	31	
#18	24	36	28 1/2	41	



STIRRUP AND TIE HOOKS

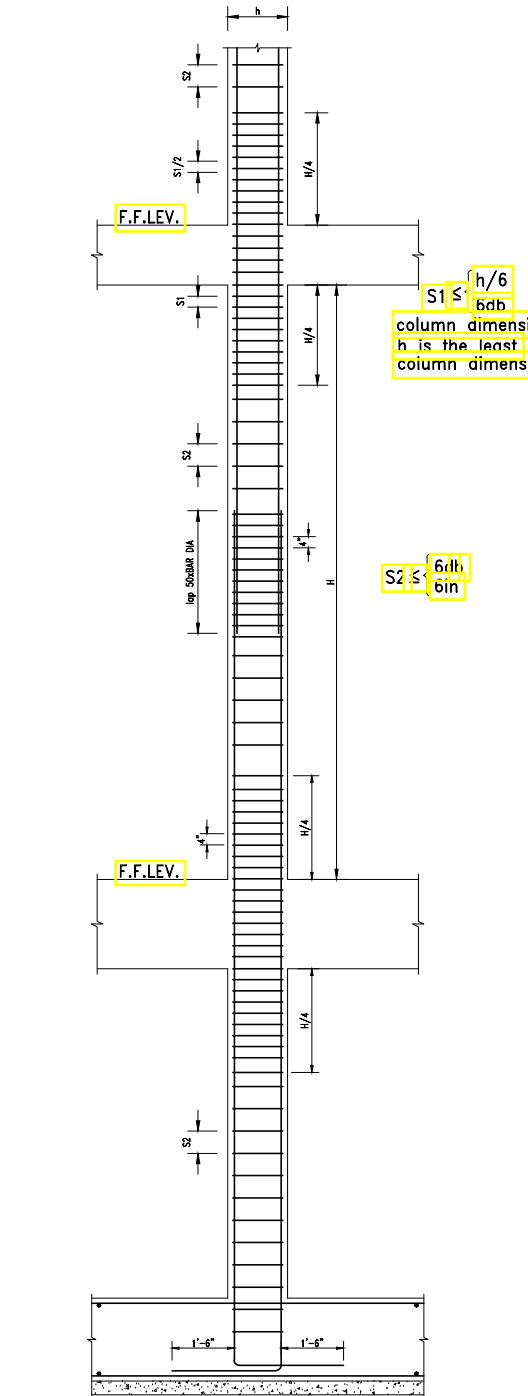


135-DEG SEISMIC STIRRUP/TIE HOOKS

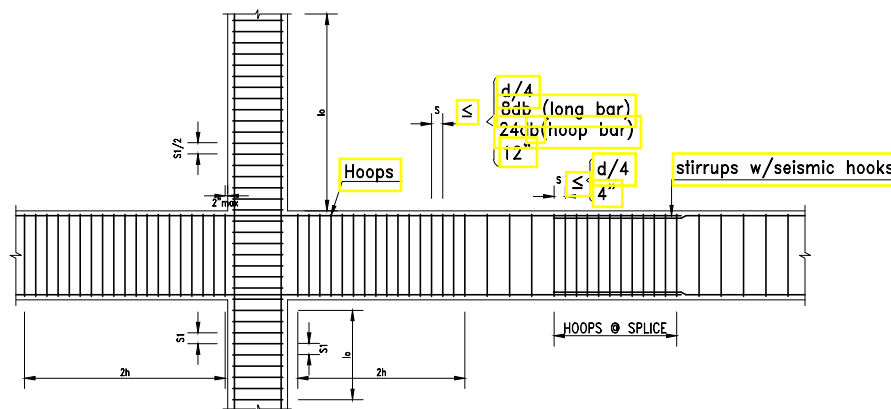


TYP. REINFORCEMENT AROUND DUCTS

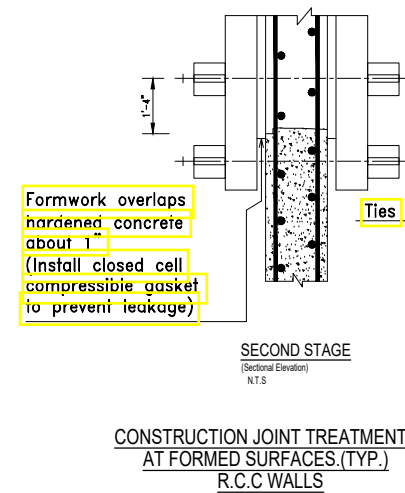
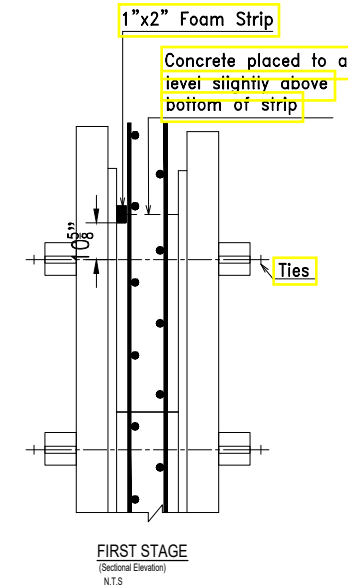
Bar Size	n (in.)	Stirrups and tie hook dimensions, in.		135 deg Stirrup-tie hook dimensions, in.	
		90-deg hooks	135-deg hooks	135-deg hooks	
		A or G,	A or G,	A or G, in.	H approx
#3	1 1/2	4	4	5	3 1/2
#4	2	4 1/2	4 1/2	6 1/2	4 1/2
#6	4 1/2	12	7 1/4	10 1/4	6 1/2



COLUMN TRANSVERSE REINFORCEMENT SPACING REQUIREMENTS



HOOP AND STIRRUP LOCATION AND SPACING REQUIREMENTS FOR BEAM AND BEAM-COLUMN JOINT

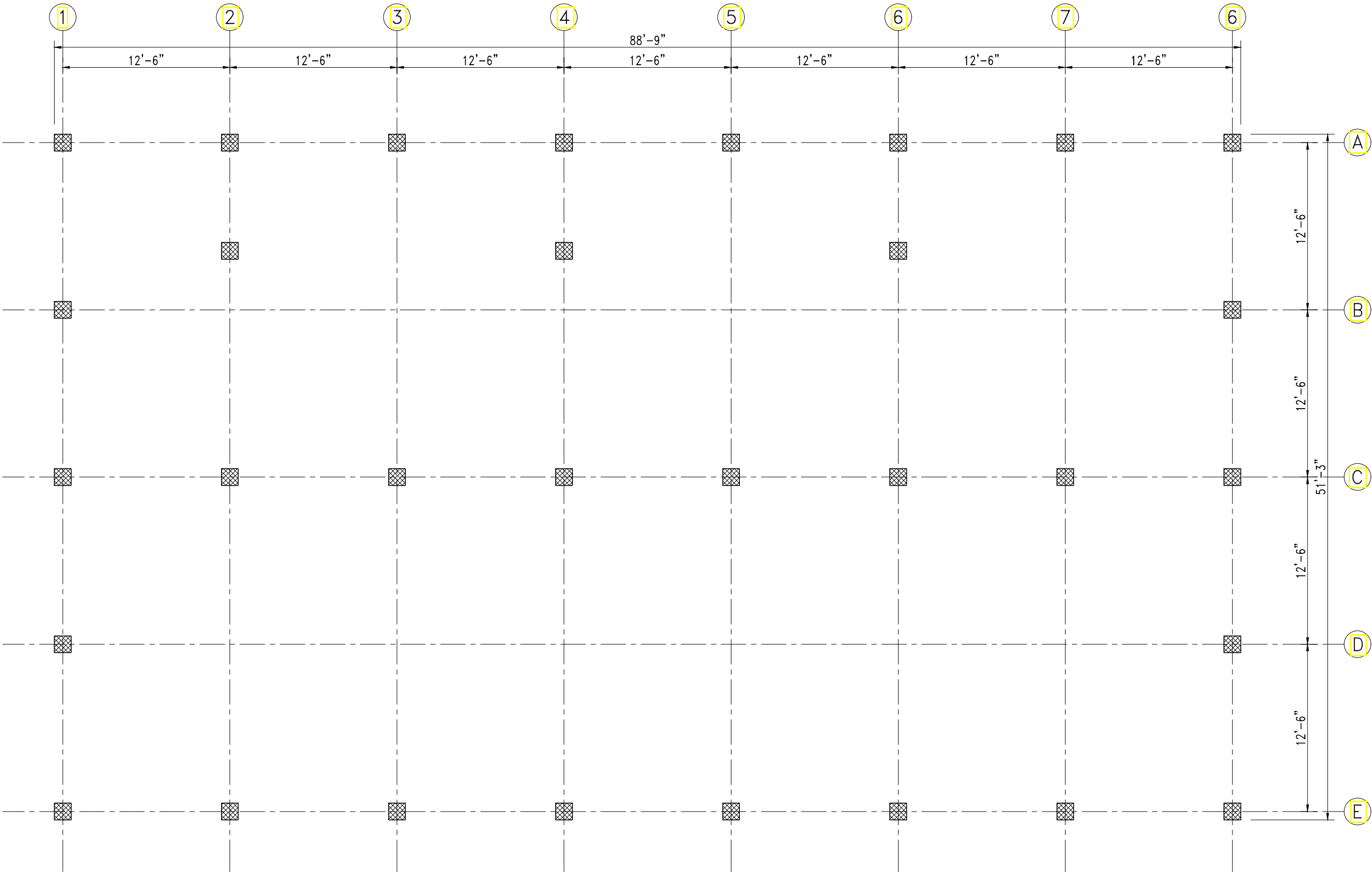


CONSTRUCTION JOINT TREATMENT AT FORMED SURFACES (TYP.) R.C.C WALLS

NO.	REVISIONS:	DATE	SIGN.
PROJECT: EXISTING PLANT ROOM STATE BANK OF PAKISTAN KARACHI.			
TITLE: STANDARD HOOK DETAILS			
SCALE: N.T.S.		DRAWING NO. G-02	
DATE: 05-11-2025			



NOTES:-
* FOR GENERAL NOTES SEE DWG.NO. G-01
* FOR STANDARD HOOK DETAILS SEE DWG.NO. G-02



EXISTING COLUMN LAYOUT PLAN
DIMENSIONS AS PER PROVIDED DATA

NO.	REVISIONS:	DATE	SIGN.
PROJECT: EXISTING PLANT ROOM STATE BANK OF PAKISTAN KARACHI.			
TITLE: EXISTING FOOTING LAYOUT PLAN			
SCALE: N.T.S	DRAWING NO. S-01		
DATE: 05-11-2025			

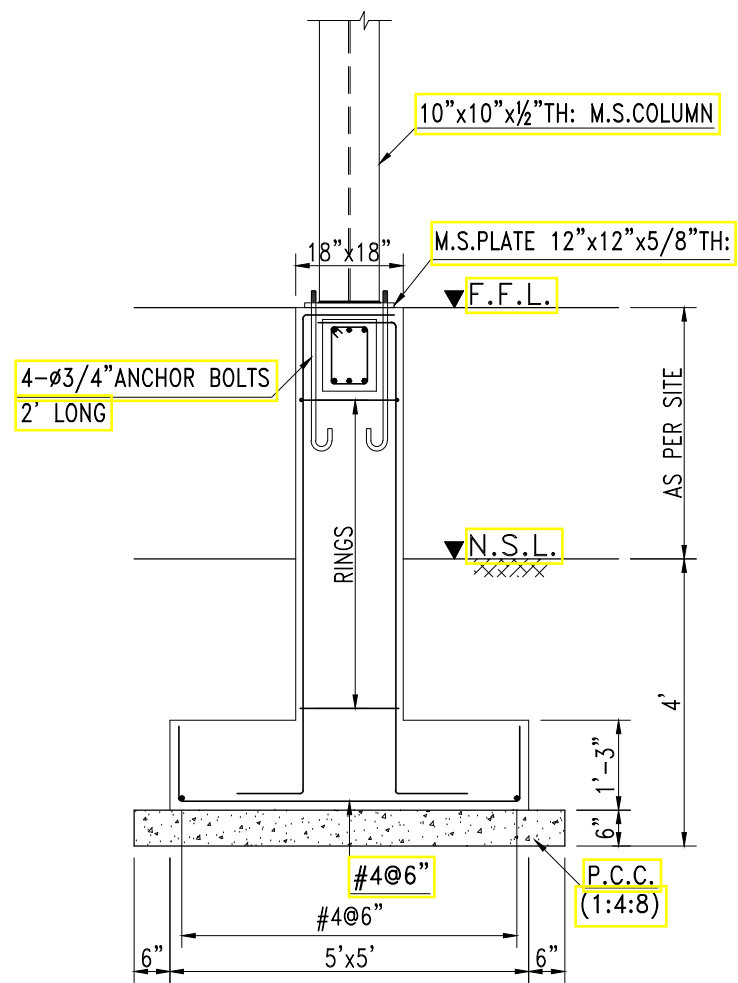


* FOR GENERAL NOTES SEE DWG.NO. G-01
* FOR STANDARD HOOK DETAILS SEE DWG.NO. G-02

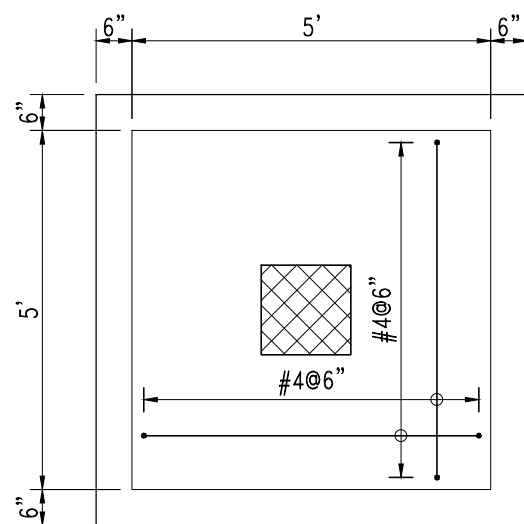


NO.	REVISIONS:	DATE	SIGN.
PROJECT:			
EXISTING PLANT ROOM STATE BANK OF PAKISTAN KARACHI.			
TITLE:			
PROPOSED COLUMNS FOOTING LAYOUT PLAN			
SCALE:	N.T.S	DRAWING NO.	
DATE:	05-11-2025	S-02	

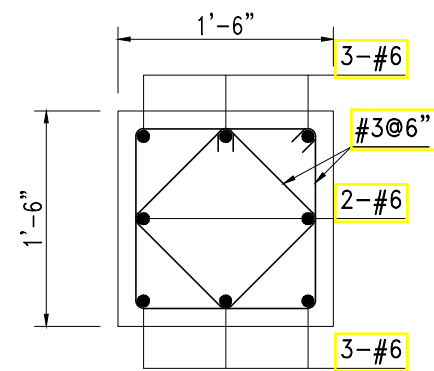
NOTES:-
* FOR GENERAL NOTES SEE DWG.NO. G-01
* FOR STANDARD HOOK DETAILS SEE DWG.NO. G-02



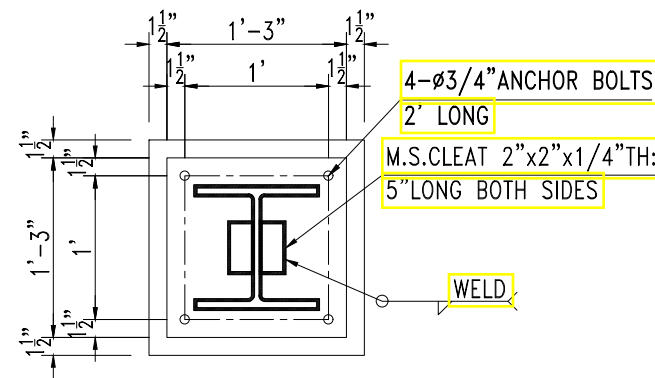
SECTION 1-1



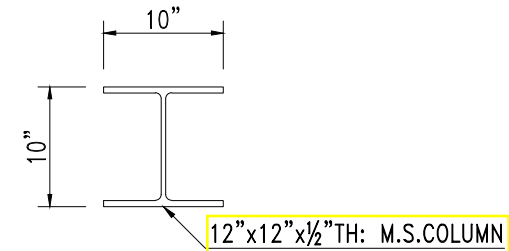
FOOTING F-1



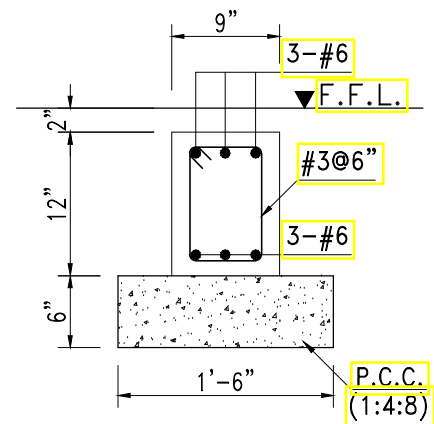
PEDESTAL P-1



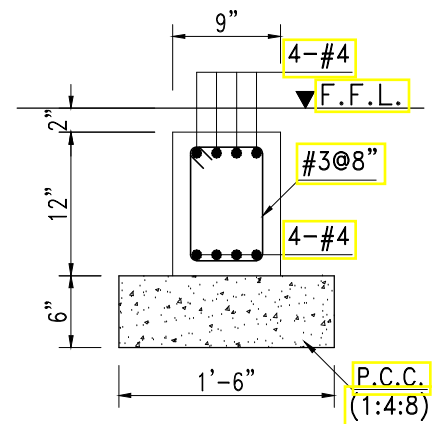
PADESTAL TOP VIEW



M.S.COLUMN



PLINTH BEAM PB-1



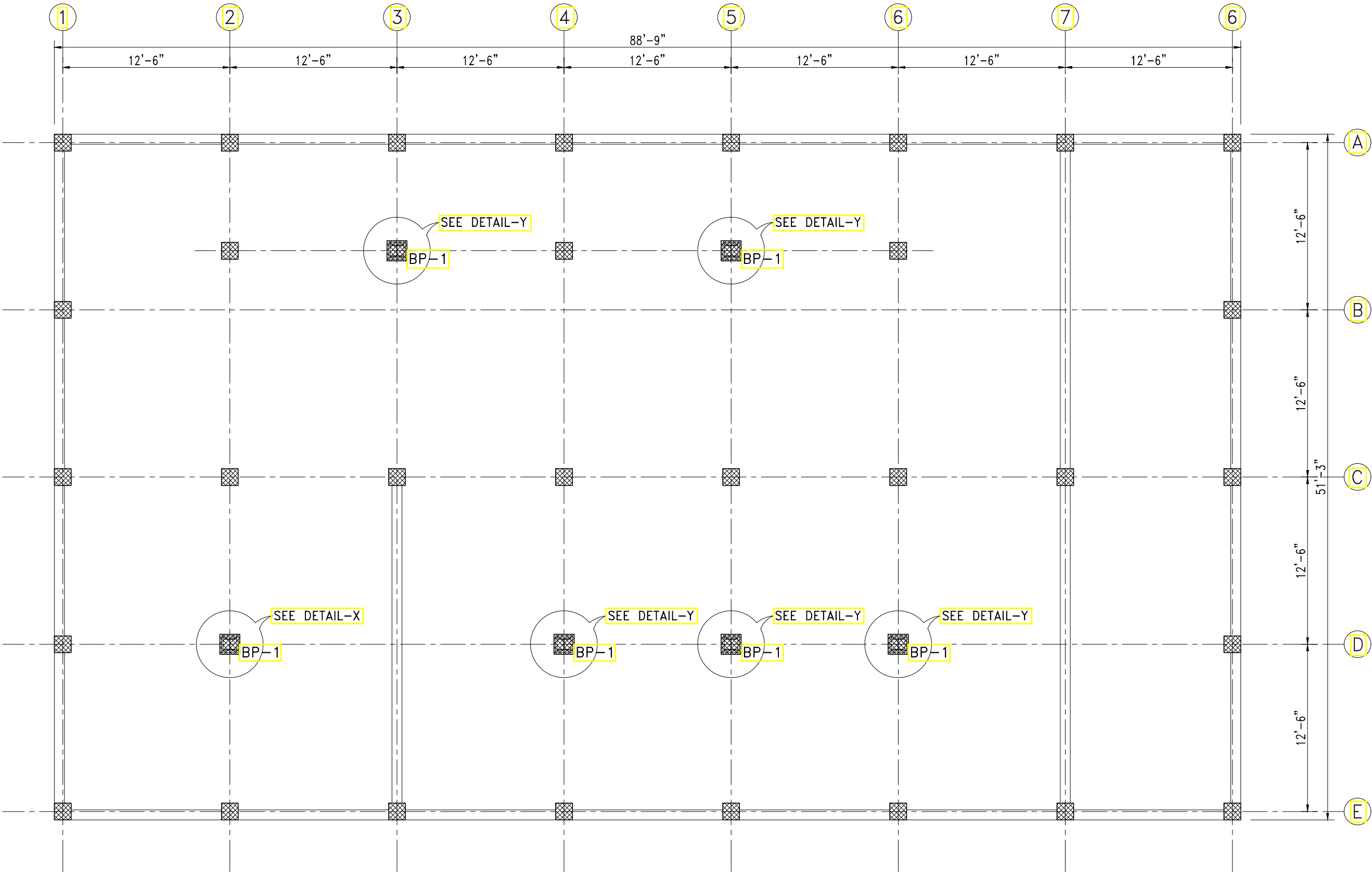
PLINTH BEAM PB-2

NO.	REVISIONS:	DATE	SIGN.
PROJECT:	EXISTING PLANT ROOM STATE BANK OF PAKISTAN KARACHI.		
TITLE:	FOOTING SECTIONS REINFORCEMENT DETAILS		
SCALE:	N.T.S	DRAWING NO.	S-03
DATE:	05-11-2025		



Tech N Blocks
Office #06, Building #12J, Block 06,
PECHS, Karachi.

NOTES:-
* FOR GENERAL NOTES SEE DWG.NO. G-01
* FOR STANDARD HOOK DETAILS SEE DWG.NO. G-02



PROPOSED CLUMNS AT GROUND FLOOR

NO.	REVISIONS:	DATE	SIGN.
-----	------------	------	-------

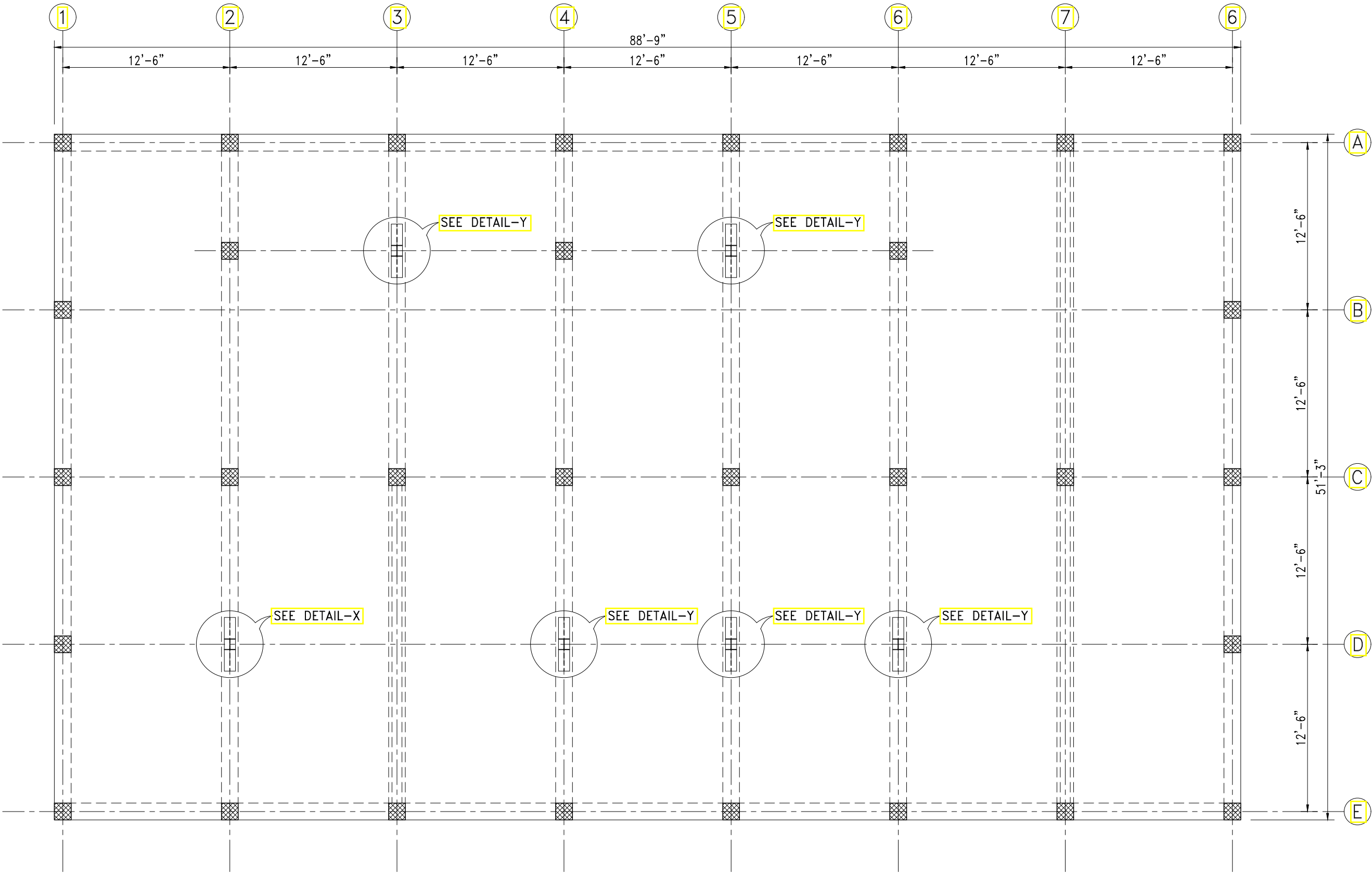
PROJECT:	EXISTING PLANT ROOM STATE BANK OF PAKISTAN KARACHI.		
----------	---	--	--

TITLE:	PROPOSED COLUMNS AT GROUND FLOOR		
--------	-------------------------------------	--	--

SCALE:	N.T.S.	DRAWING NO.
--------	--------	-------------

DATE:	05-11-2025	S-04
-------	------------	------

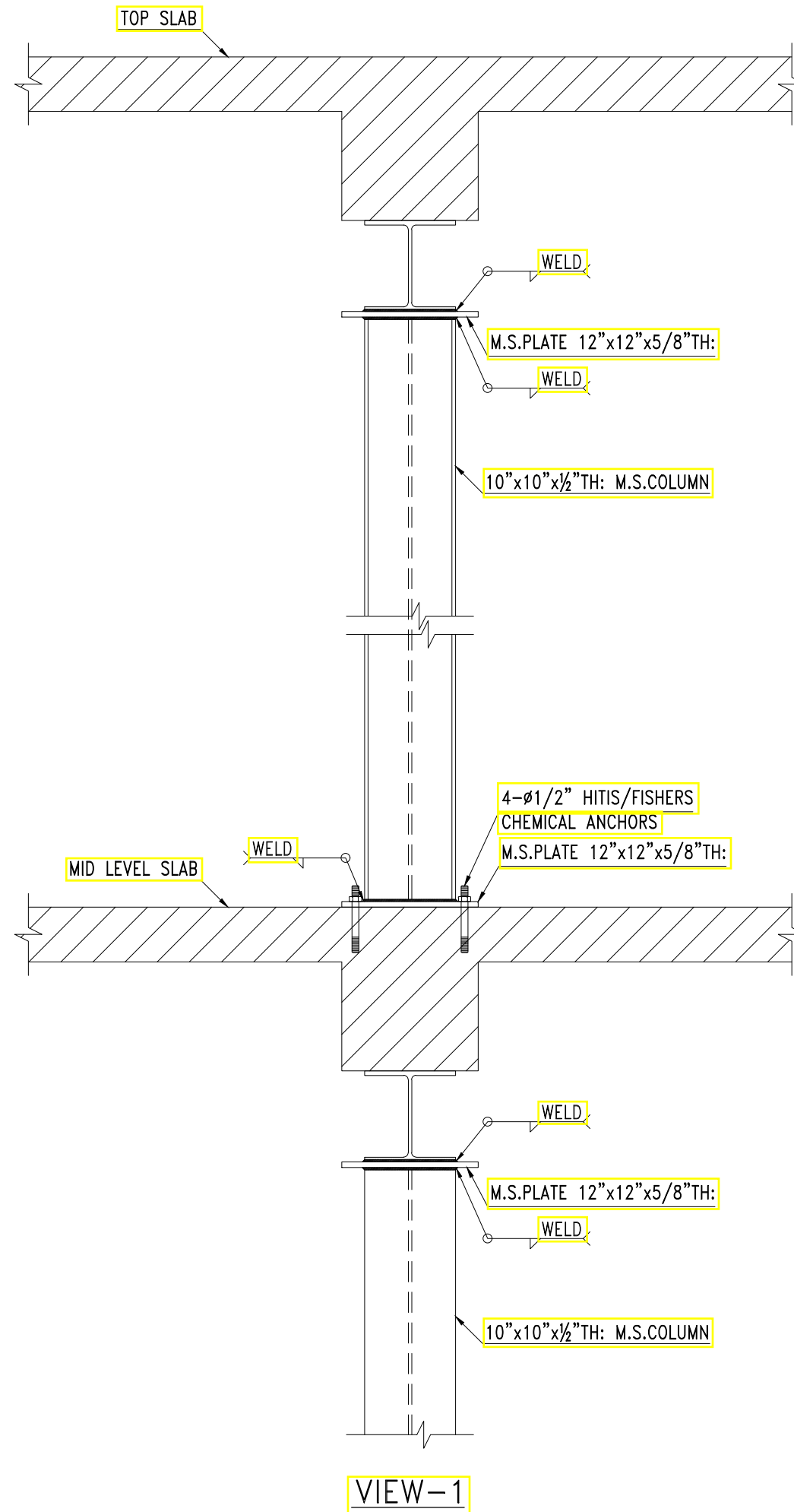
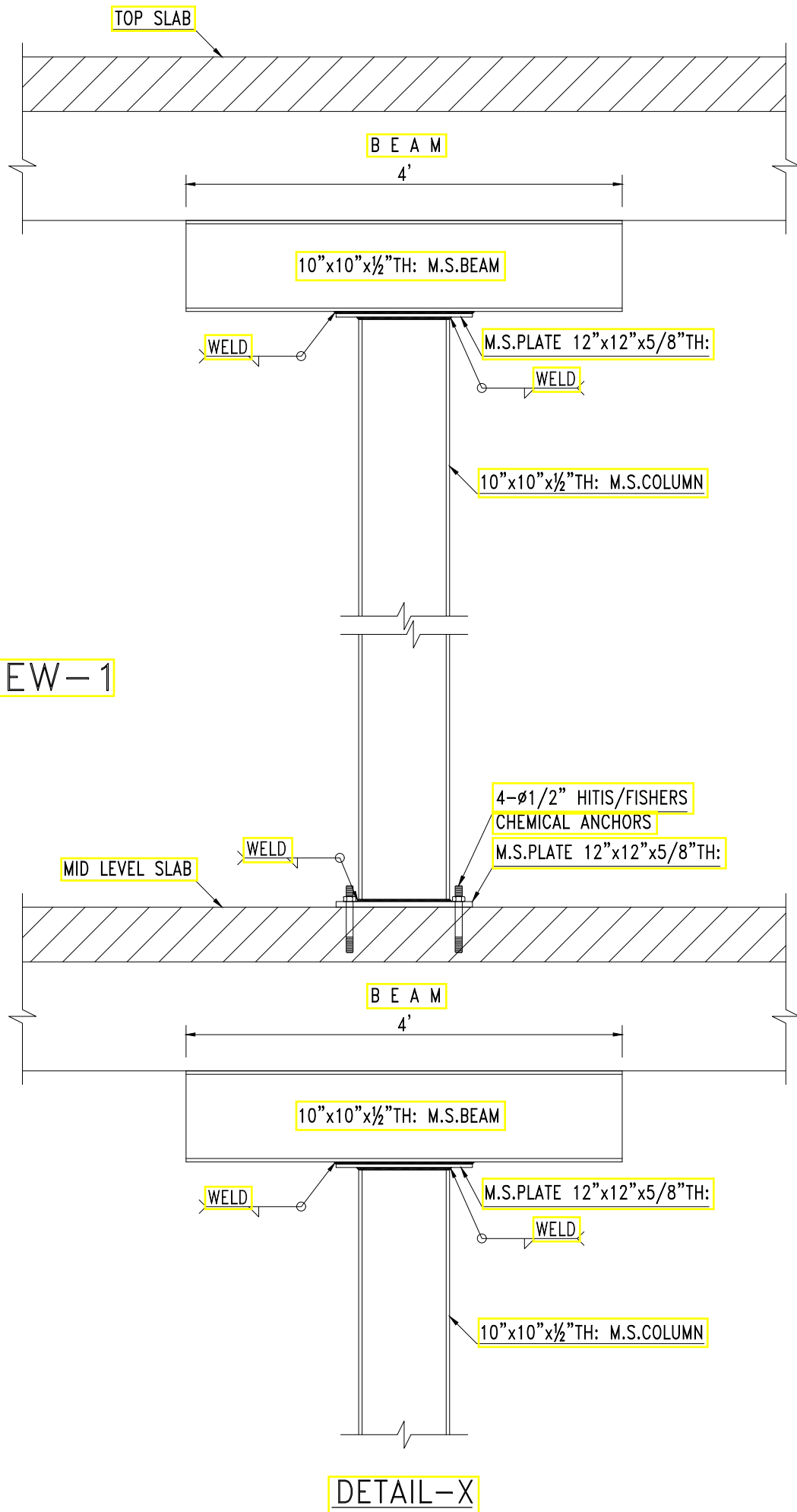
NOTES:-
* FOR GENERAL NOTES SEE DWG.NO. G-01
* FOR STANDARD HOOK DETAILS SEE DWG.NO. G-02



GROUND FLOOR SLAB BEAM FRAMING

NO.	REVISIONS:	DATE	SIGN.
PROJECT:			
EXISTING PLANT ROOM STATE BANK OF PAKISTAN KARACHI.			
TITLE:			
GROUND FLOOR SLAB BEAM FRAMING			
SCALE:		DRAWING NO.	
DATE:		S-05	
05-11-2025			

VIEW-1



NOTES:-

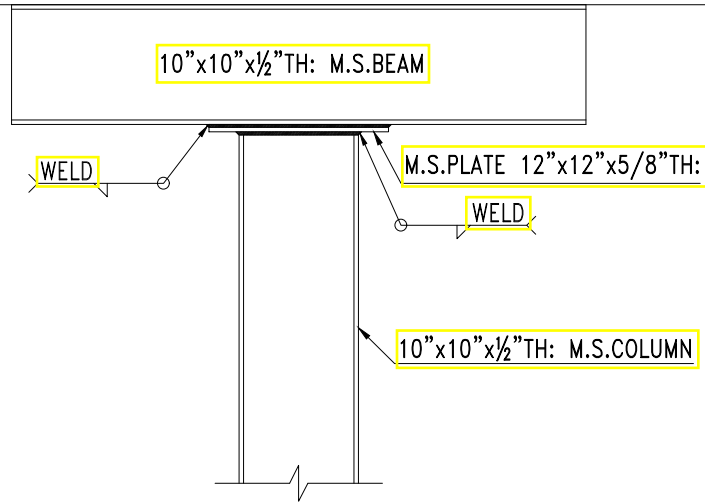
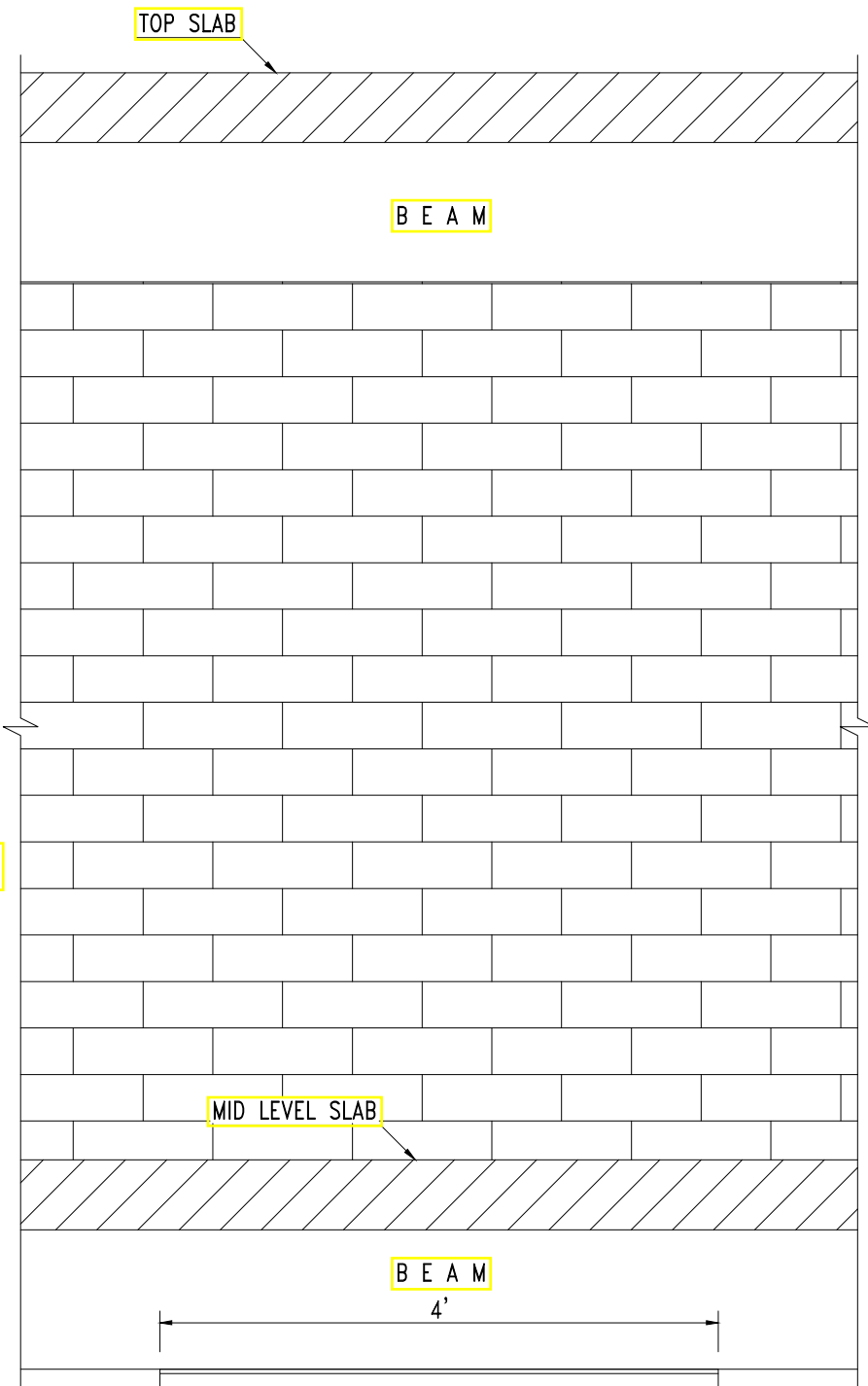
- * FOR GENERAL NOTES SEE DWG.NO. G-01
- * FOR STANDARD HOOK DETAILS SEE DWG.NO. G-02

NO.	REVISIONS:	DATE	SIGN.
PROJECT:			
EXISTING PLANT ROOM STATE BANK OF PAKISTAN KARACHI.			
TITLE:			
MISLENIOUS DETAILS-1			
SCALE:		DRAWING NO.	
N.T.S		S-06	
DATE:		05-11-2025	

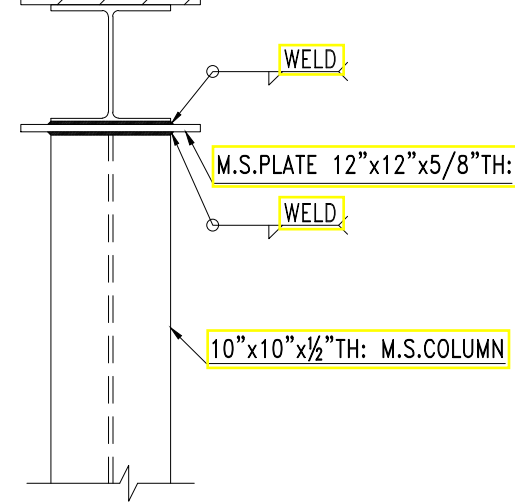
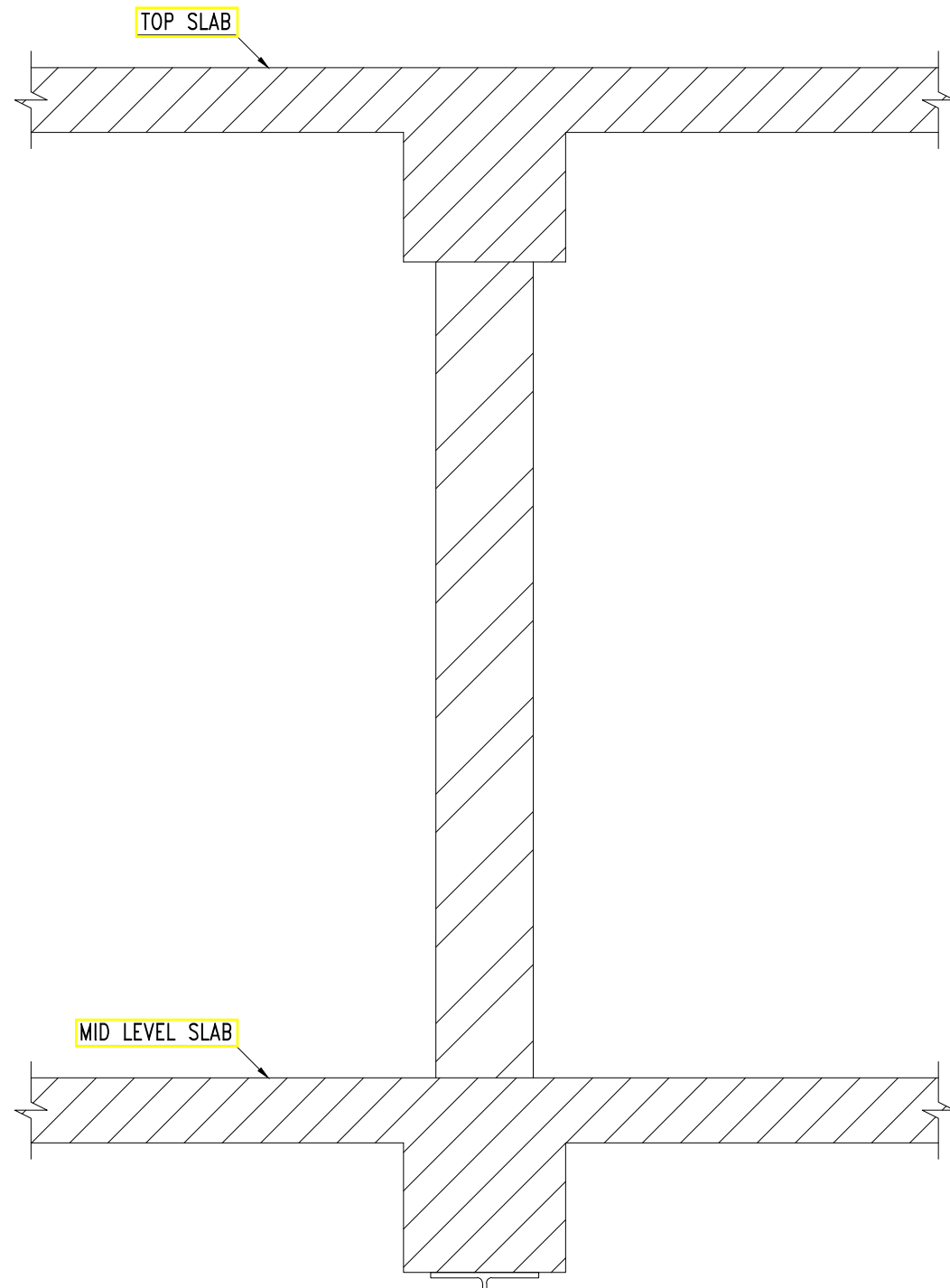


Tech N Blocks
Office #06, Building #12J, Block 06,
PECHS, Karachi.

VIEW-2



DETAIL-Y



VIEW-2

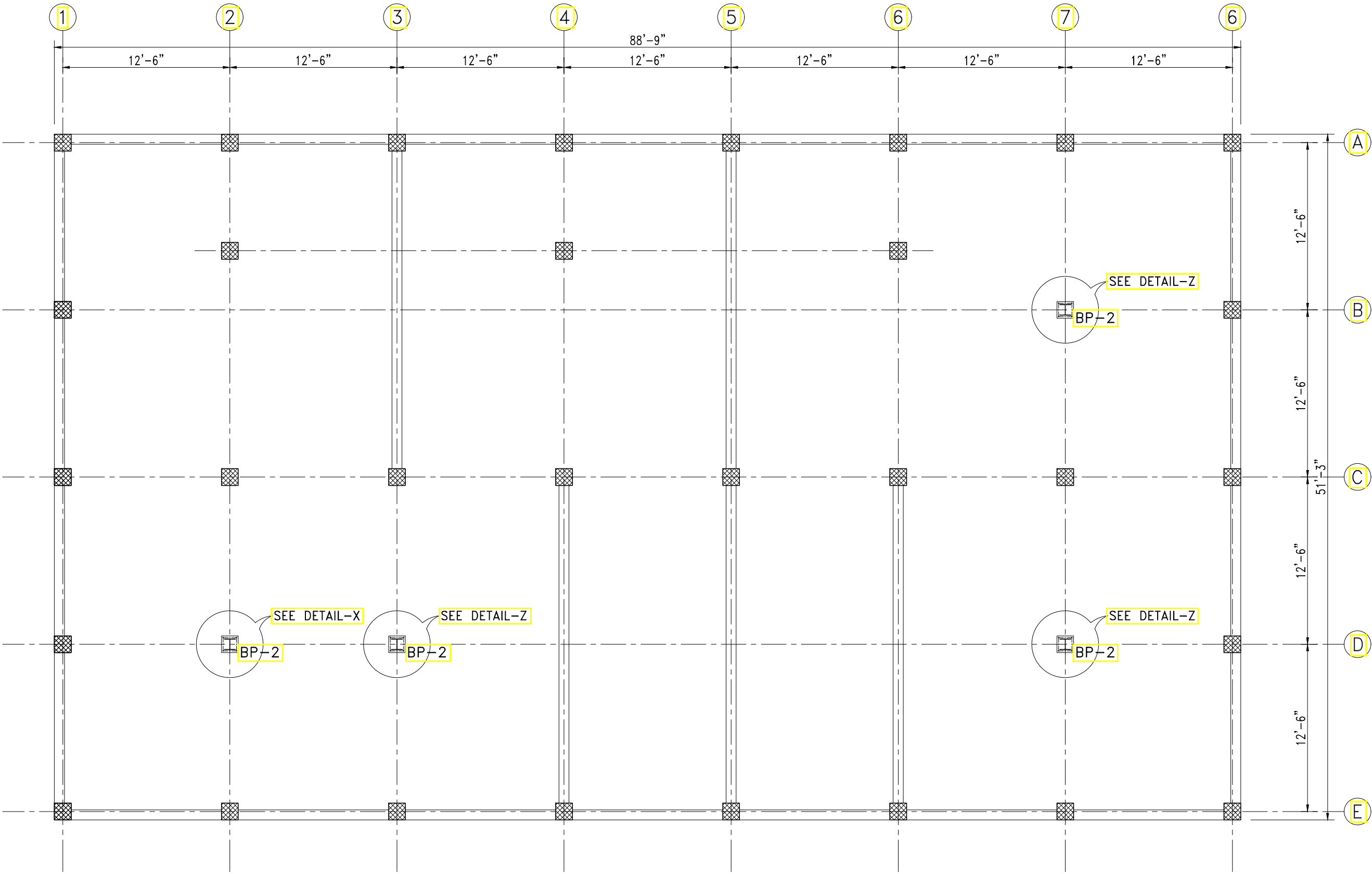
NOTES:-
* FOR GENERAL NOTES SEE DWG.NO. G-01
* FOR STANDARD HOOK DETAILS SEE DWG.NO. G-02

NO.	REVISIONS:	DATE	SIGN.
PROJECT:			
EXISTING PLANT ROOM STATE BANK OF PAKISTAN KARACHI.			
TITLE:			
MISLLENIOUS DETAILS-2			
SCALE:		DRAWING NO.	
N.T.S		S-07	
DATE:		05-11-2025	



Tech N Blocks
Office #06, Building #12J, Block 06,
PECHS, Karachi.

NOTES:-
* FOR GENERAL NOTES SEE DWG.NO. G-01
* FOR STANDARD HOOK DETAILS SEE DWG.NO. G-02



PROPOSED COLUMNS AT FIRST FLOOR

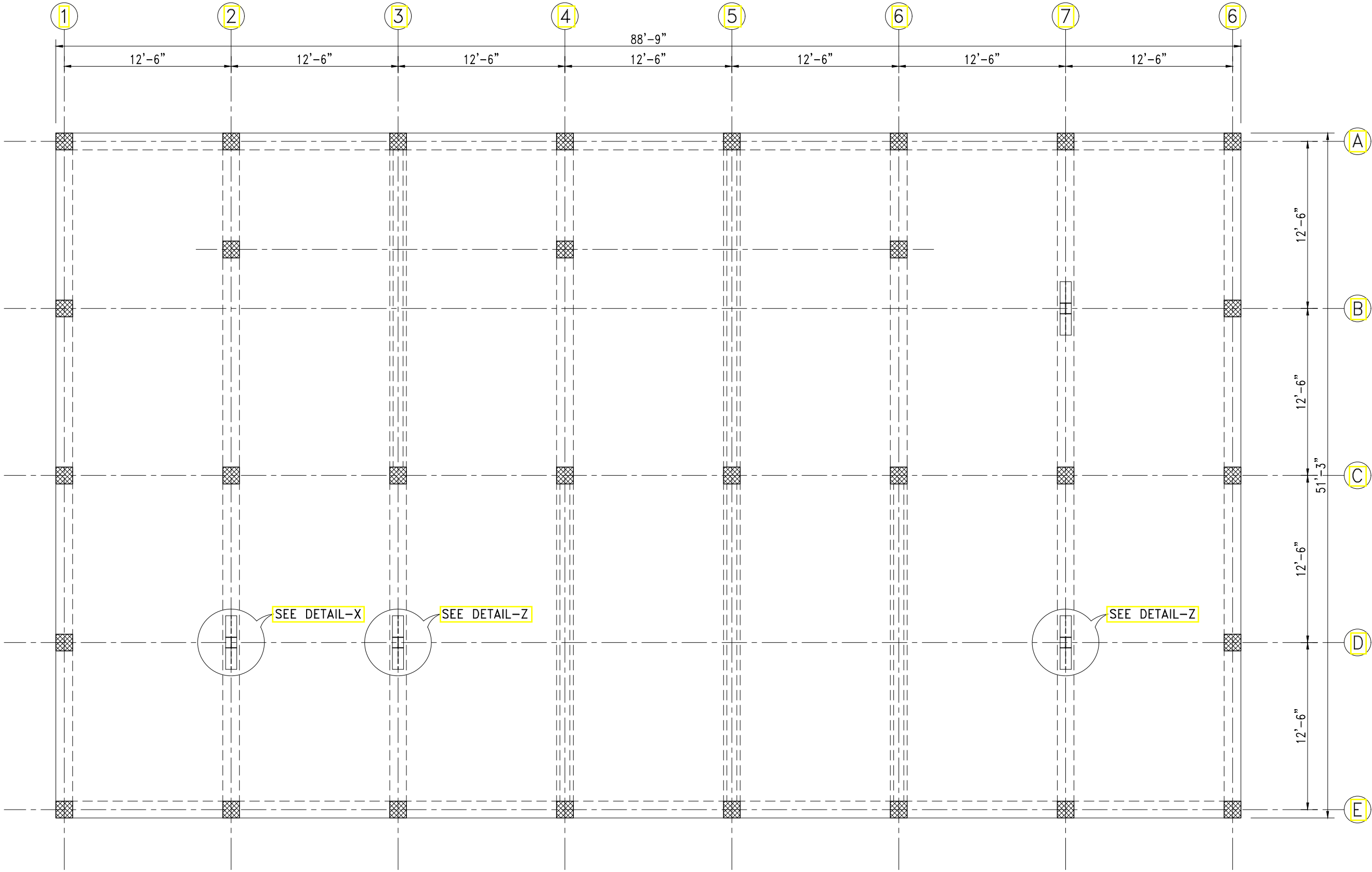
NO.	REVISIONS:	DATE	SIGN.
-----	------------	------	-------

PROJECT: EXISTING PLANT ROOM
STATE BANK OF PAKISTAN
KARACHI.

TITLE: PROPOSED COLUMNS AT
FIRST FLOOR

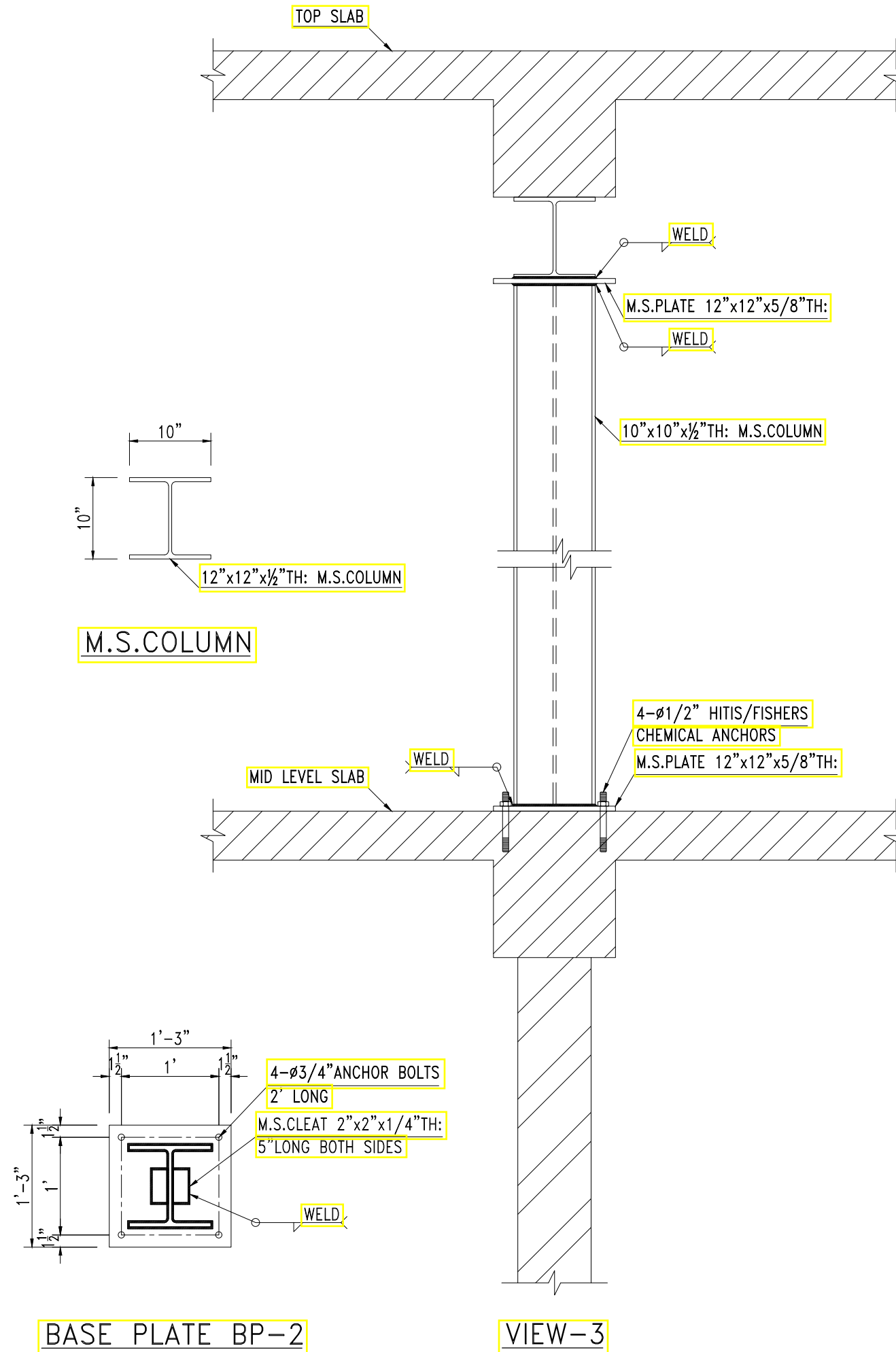
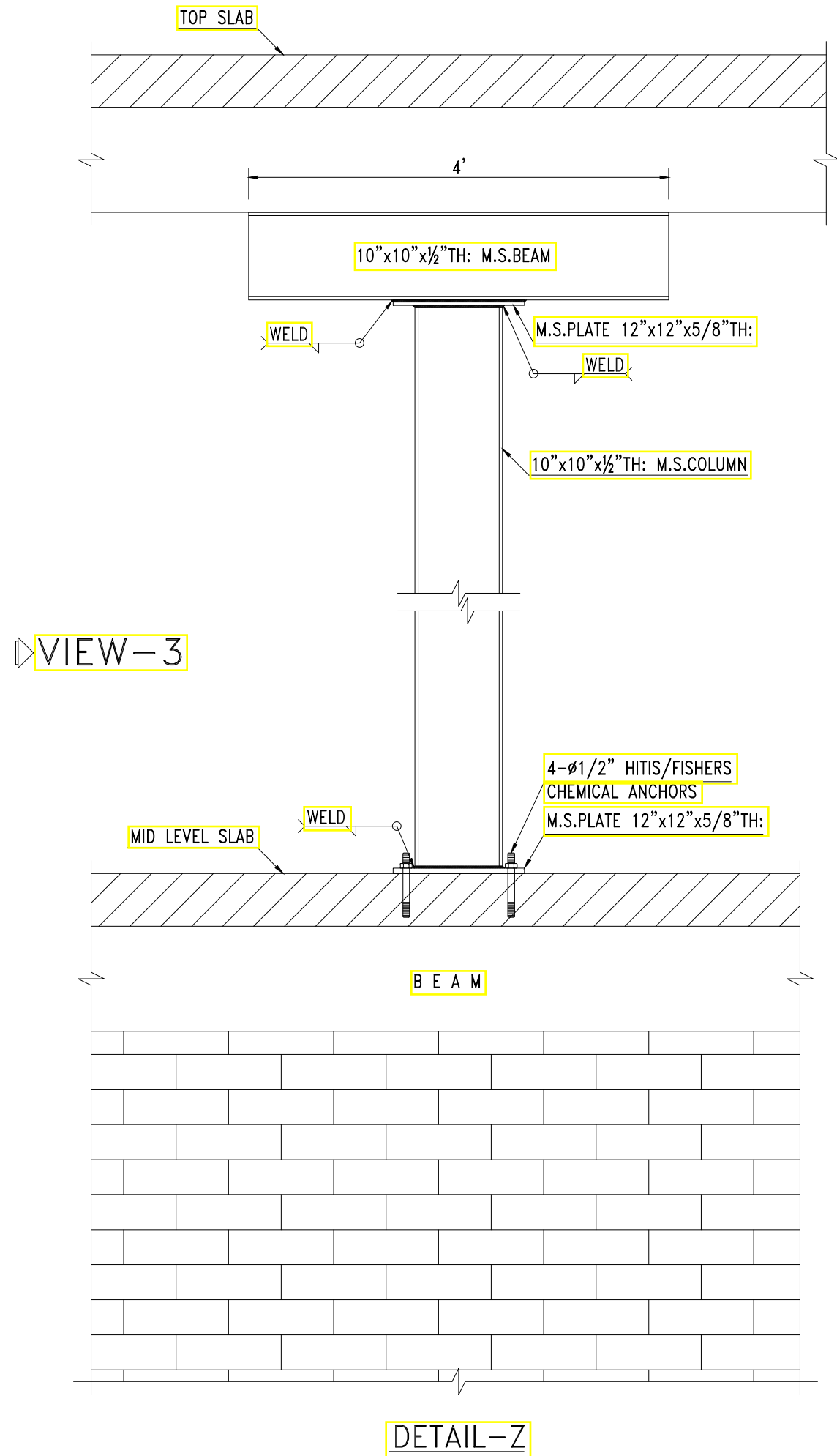
SCALE: N.T.S.	DRAWING NO. S-08
DATE: 05-11-2025	

NOTES:-
* FOR GENERAL NOTES SEE DWG.NO. G-01
* FOR STANDARD HOOK DETAILS SEE DWG.NO. G-02



FIRST FLOOR SLAB BEAM FRAMING

NO.	REVISIONS:	DATE	SIGN.
PROJECT:			
EXISTING PLANT ROOM STATE BANK OF PAKISTAN KARACHI.			
TITLE:			
FIRST FLOOR SLAB BEAM FRAMING			
SCALE:		DRAWING NO.	
DATE:		S-09	
05-11-2025			



NOTES:-

- * FOR GENERAL NOTES SEE DWG.NO. G-01
- * FOR STANDARD HOOK DETAILS SEE DWG.NO. G-02

NO.	REVISIONS:	DATE	SIGN.
PROJECT:	EXISTING PLANT ROOM STATE BANK OF PAKISTAN KARACHI.		
TITLE:	MISLENIUS DETAILS-3		
SCALE:	N.T.S	DRAWING NO.	S-10
DATE:	05-11-2025		

PROPOSED BUILDING AC PLANT SHED KARACHI.

STRUCTURAL DRAWINGS

LIST OF DRAWINGS		
SR. NO.	DRAWING NO.	DRAWING TITLE
1	G-01	GENERAL NOTES & SPECIFICATIONS GUIDLINES
2	G-02	STANDARD HOOK DETAILS
3	S-01	FOOTING LAYOUT PLAN
4	S-02	FOOTING SECTION REINFORCEMENT DETAILS
5	S-03	FIRST FLOOR SLAB REINFORCEMENT DETAILS
6	S-04	FIRST FLOOR SLAB BEAM FRAMING PLAN
7	S-05	FIRST FLOOR SLAB BEAMS REINFORCEMENT DETAILS
8	S-06	ROOF SLAB REINFORCEMENT DETAILS
9	S-07	ROOF SLAB BEAM FRAMING PLAN
10	S-08	ROOF SLAB BEAM BEAMS REINFORCEMENT DETAILS
11	S-09	COOLING TOWER BEAM FRAMING
12	S-10	COOLING TOWER BEAMS REINFORCEMENT DETAILS
13		
14		

GENERAL NOTES

1. Design is in accordance with ACI-318 Code, 1995 Specifications.
2. All work shall be carried out in accordance with the job specifications.
- 3a. All Reinforced concrete in columns & RCC Walls is 4000 psi cylinder strength with min cement content 425Kg/m3 .
- 3a. All Reinforced concrete except columns & RCC Walls is 3000 psi cylinder strength with min cement content 325Kg/m3 .
4. Design of specified concrete mix shall be submitted by the Contractor and shall be got approved from the Engineer well before concreting of relevant structures alongwith result of test cylinders tested as per ASTM C 39. Test specimens shall be made and cured in accordance with ASTM C 31.
5. All reinforcing steel is Deformed 60,Grade 60000 psi min. yield strength and min. ultimate strength of 90000 psi as per ASTM A-615 specifications.
6. Ordinary Portland cement, conforming to BS-12 / PS-232 shall be used in all R.C.C. work except where it is specifically mentioned in the geotechnical report.
7. Cement from different sources shall not be mixed for the structure.
8. Coarse sand from approved quarries / sources shall be used.
9. Well graded crushed stone from approved quarries / sources shall be used as coarse aggregate. Maximum nominal size of the coarse aggregate shall be 20 mm for all R.C.C. work.
10. Potable water shall be used for concrete and shall be free of organic and other impurities.
11. 60 x 60 mm Precast concrete blocks having compressive strength of 6000 psi. and spaced not more than 1 m c/c shall be used for provision of required cover to main reinforcement. Thickness of these blocks shall be equal to the required cover.
12. All dimensions are given in feet. Written dimensions are to be followed.
13. Unless otherwise shown on the plans, Concrete cover provided for reinforcement shall be as follows;

Footings on 1:4:8

Bottom

2"

Sides

2"

Slabs

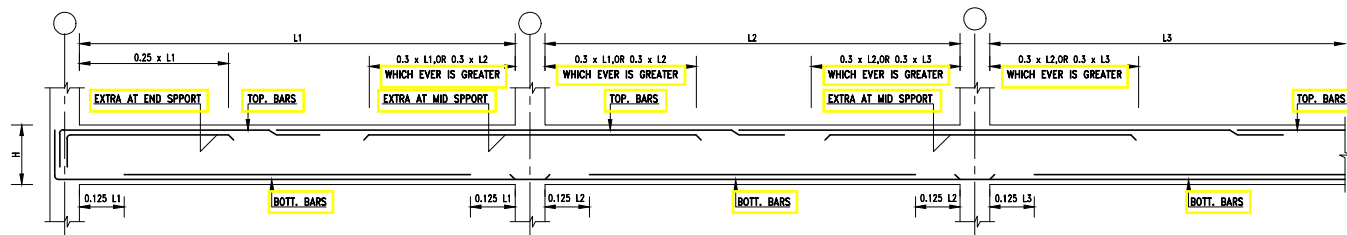
3/4"

Beams & Columns

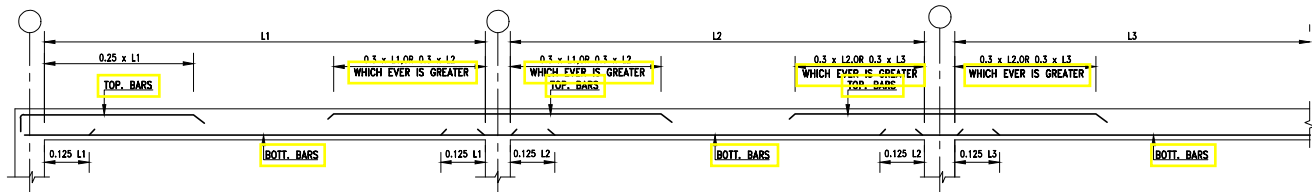
1½"
14. Construction drawings along with bar bending schedule shall be submitted by the contractor for Engineer's approval well before proceeding any work.
15. All layout, configuration, dimensions and levels shall be verified before proceeding with the work.
16. All reinforcing bars shall be held firmly in place before and during the pouring of concrete by means of adequate number of wires and supports to prevent dislocation during the course of construction.
17. Construction joint not shown on the drawing shall be properly planed and so made and located as to least impair the strength of structure and shall need prior approval of the Engineer. In general they shall be located near the middle of the span of slab and beams. Joints shall be perpendicular to main reinforcement. All reinforcing steel shall be continued properly across the joints.

18. During construction, safety and stability of the structure and all temporary works shall be given prime importance. Utmost care and precaution shall be exercised by the contractor during the work against any mishap or accident.
19. Bars in beams shall be joggled in vertical plane for laps and shall be staggered.
20. All Laps are 60 times bar diameter.
21. Bars in column shall be joggled for laps with starter bars.
22. Position of bars in beams shall be adjusted keeping in view the position of vertical bars of the columns.
23. Stirrups shall be placed in such a way that their hooks shall be staggered and located in compression face.
24. Concrete test cylinder shall be cured with the same method and under same conditions as those for the concrete work they represent.
25. No concrete shall be poured until its form work and reinforcement has been inspected and approved by the Engineer.
26. Sequence of removal of form work shall be as approved by the Engineer.
27. All structural Drawings shall be read & checked in conjunction with the Architectural Drawings for layout and levels of different members.
28. Existing underground services if any, required to be left in position, shall be carefully protected during excavation.
29. Excavation adjacent to existing structures and/or under-ground services shall be made by hand.
30. Adequate shoring and support to the sides of all excavation shall be supplied and erected where required to safe guard workmen and protect any adjacent structures.
31. Foundations have been designed for bearing capacity as per geo technical report. In case of any adverse variety of soil or bearing capacity found during construction, it shall be immediately brought to the notice of Engineer in charge for further instructions.
32. While back filling of excavation for footings compaction shall be done in layers.
33. All conduits and pipes to be laid in concrete shall be located above main reinforcement of slabs and beams and with the approval of the Engineer.
34. Preformed expansion joint filler (non extruding and resilient type) where used shall conform to ASTM 1751 (AASHTO M 213) specification.
35. Excavation including dewatering, bracing of excavation to safeguard the adjoining property and life and dewatering pits in case of rain is contractor's responsibility. For that matter, a qualified Geo-Technical engineer can be appointed on his role.

NO.	REVISIONS:	DATE	SIGN.
PROJECT: AC PLANT SHED KARACHI.			
TITLE: GENERAL NOTES & SPECIFICATIONS GUIDELINES			
SCALE: N.T.S	DRAWING NO. G-01		
DATE: 16-11-2025			
 Tech N Blocks Office #06, Building #12J, Block 06, PECHS, Karachi.			



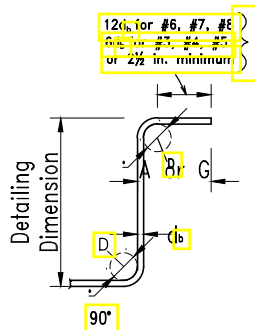
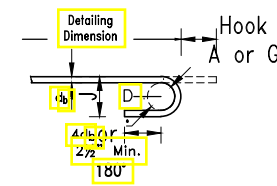
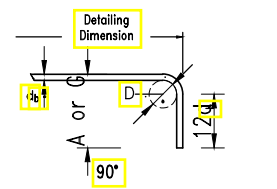
TYP BARS CUTOFF DETAILS FOR BEAM



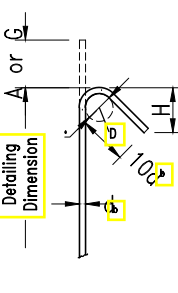
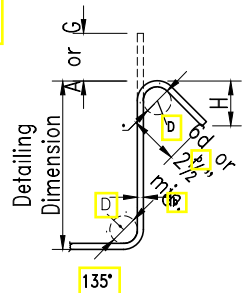
TYP BARS CUTOFF DETAILS FOR SLAB

RECOMENDED END HOOKS, ALL GRADES

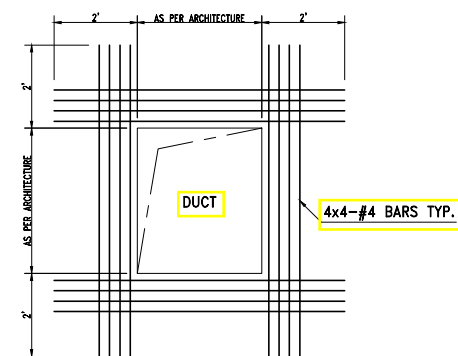
Bar Size	Finished bend diameter D, in.	180-deg hooks		90-deg hooks	
		A or G, in.	J, in.	A or G, in.	
#3	2 1/4	5	3	6	
#4	3	6	4	8	
#5	3 3/4	7	5	10	
#6	4 1/2	8	6	12	
#7	5 1/2	10	7	14	
#8	6	11	8	16	
#9	9 1/2	15	11 1/4	19	
#10	10 3/4	17	13 1/4	20	
#11	12	19	14 3/4	24	
#14	18 1/4	27	21 1/4	31	
#18	24	36	28 1/2	41	



STIRRUP AND TIE HOOKS

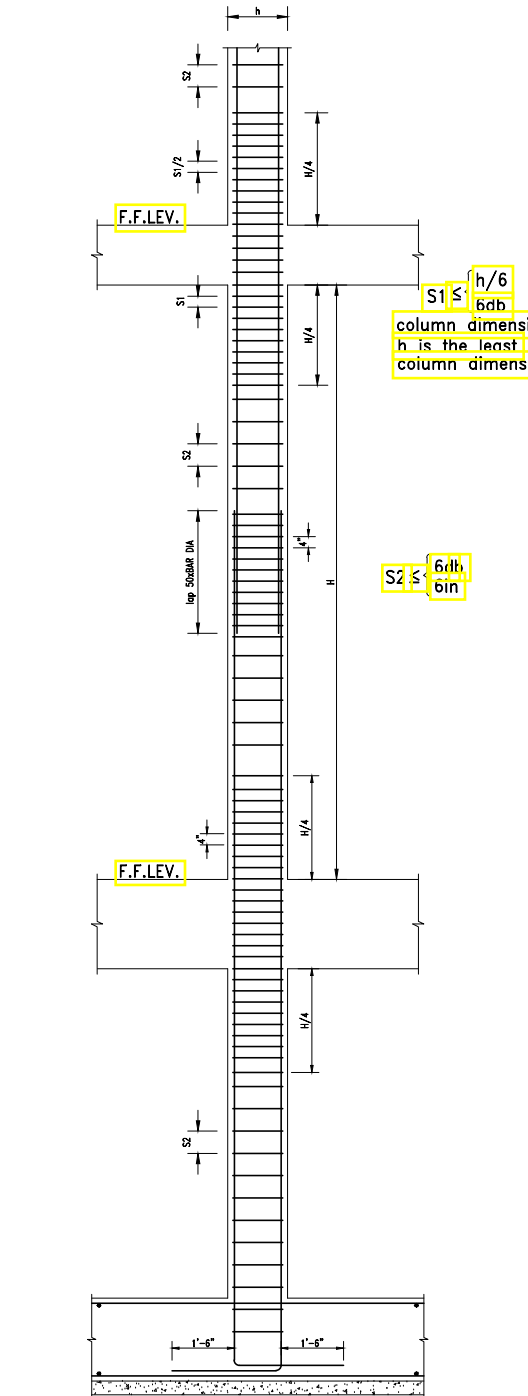


135-DEG SEISMIC STIRRUP/TIE HOOKS

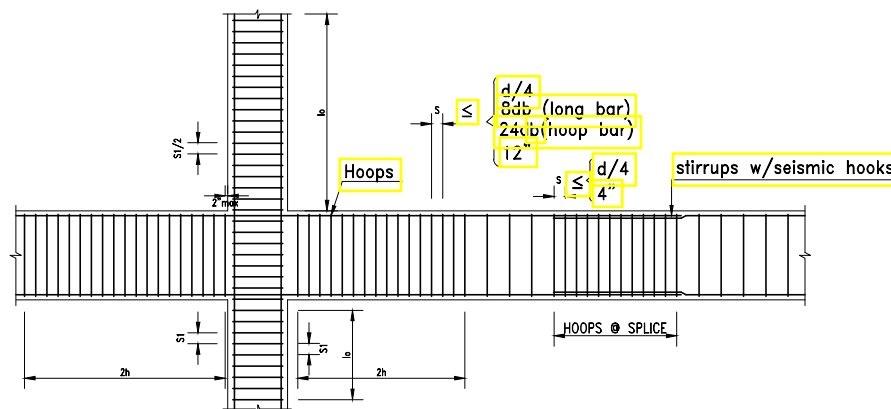


TYP. REINFORCEMENT AROUND DUCTS

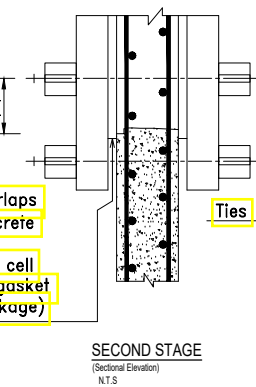
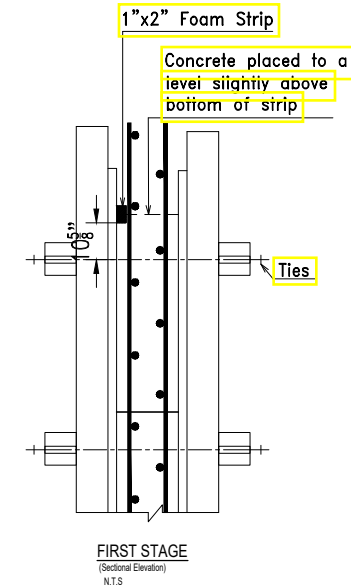
Bar Size	n (in.)	Stirrups and tie hook dimensions, in.			135 deg Stirrup-tie hook dimensions, in.	
		90-deg hooks		135-deg hooks	135-deg hooks	
		A or G,	A or G,	H approx	A or G, in.	H approx
#3	1 1/2	4	4	2 1/2	5	3 1/2
#4	2	4 1/2	4 1/2	3	6 1/2	4 1/2
#6	4 1/2	12	7 1/4	4 1/2	10 1/4	6 1/2



COLUMN TRANSVERSE REINFORCEMENT SPACING REQUIREMENTS



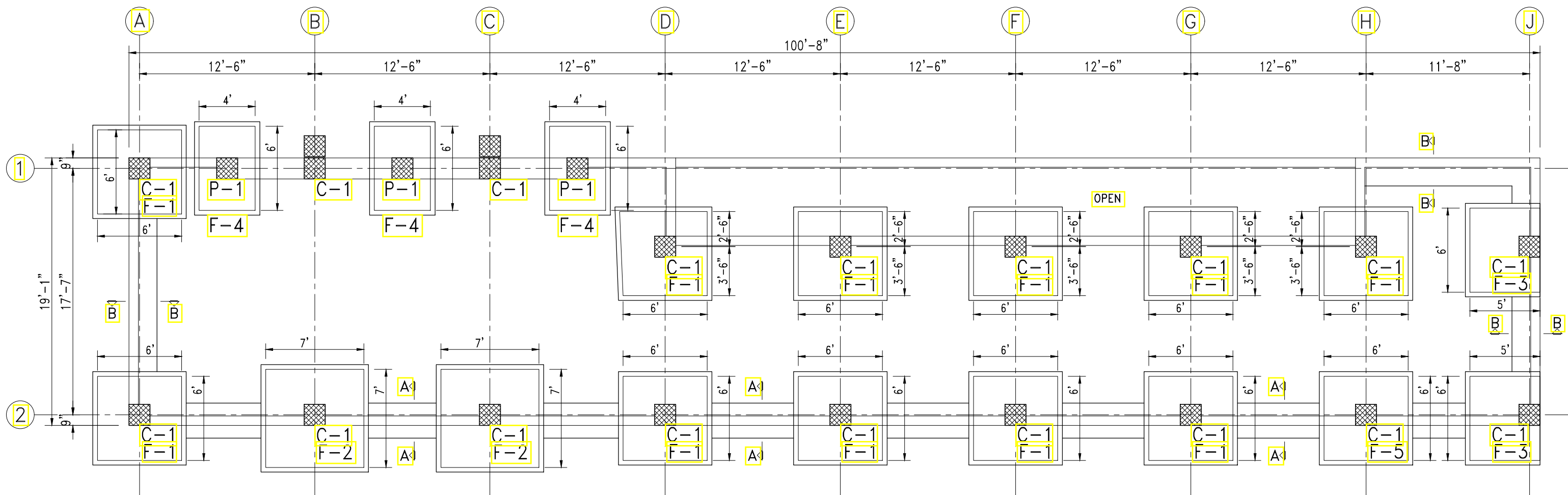
HOOP AND STIRRUP LOCATION AND SPACING REQUIREMENTS FOR BEAM AND BEAM-COLUMN JOINT



CONSTRUCTION JOINT TREATMENT AT FORMED SURFACES (TYP.) R.C.C WALLS

NO.	REVISIONS	DATE	SIGN.
PROJECT: AC PLANT SHED KARACHI.			
TITLE: STANDARD HOOK DETAILS			
SCALE: N.T.S.		DRAWING NO. G-02	
DATE: 16-11-2025			





FOOTING LAYOUT PLAN
PLEASE CONFIRM ALL THE DIMENSIONS
FROM ARCHITECTURAL DRAWINGS

NOTES:-
* FOR GENERAL NOTES SEE DWG.NO. G-01
* FOR STANDARD HOOK DETAILS SEE DWG.NO. G-02

NO.	REVISIONS:	DATE	SIGN.

PROJECT:

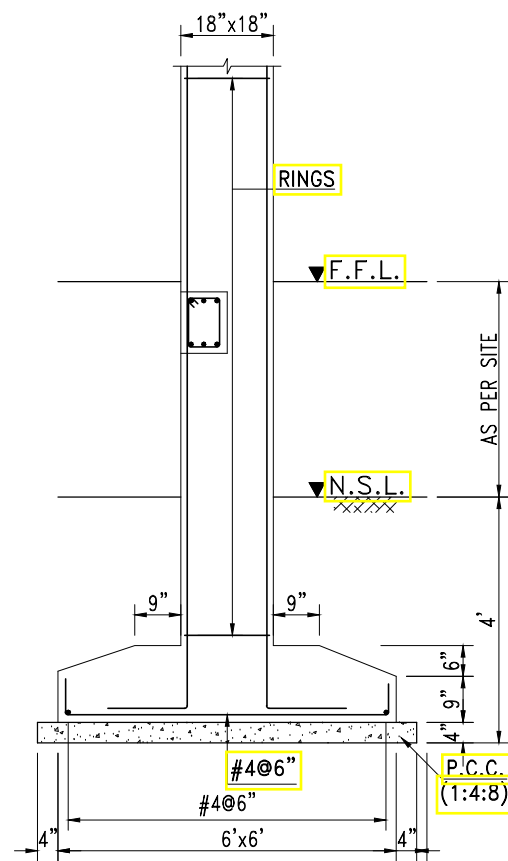
AC PLANT SHED
KARACHI.

TITLE:

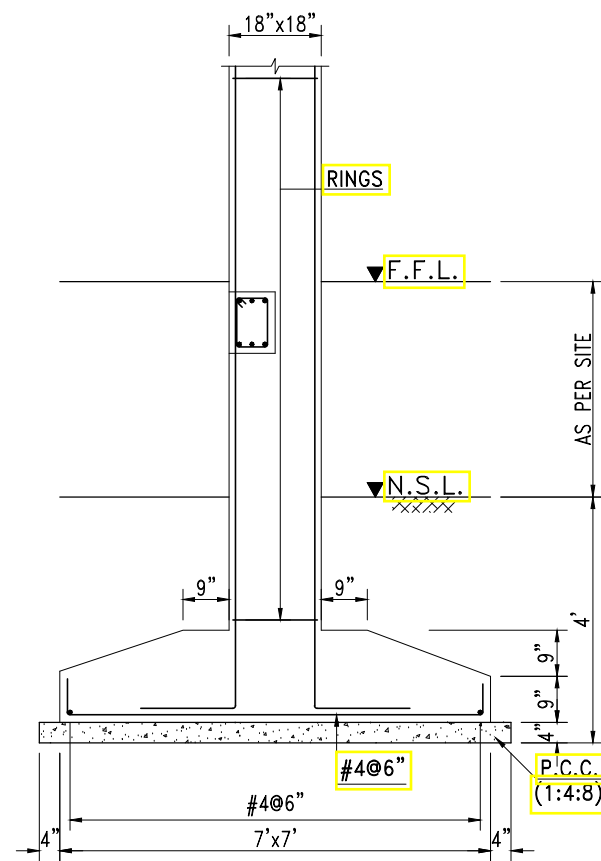
FOOTING
LAYOUT PLAN

SCALE: N.T.S. DRAWING NO.

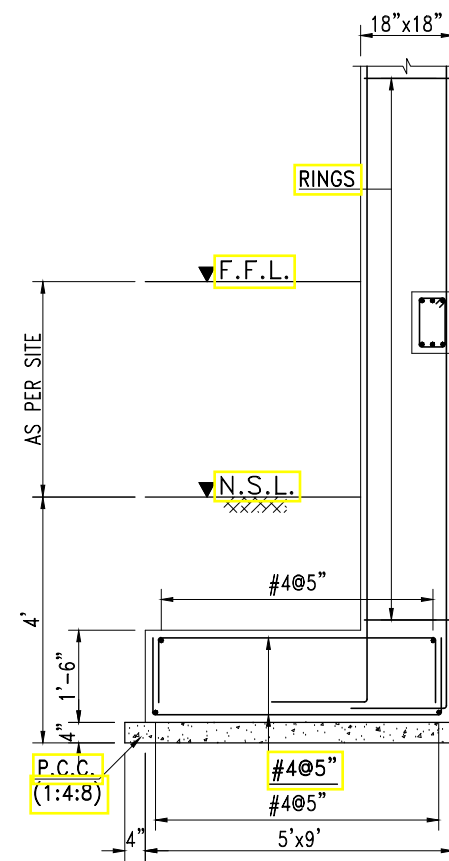
DATE: 16-11-2025 S-01



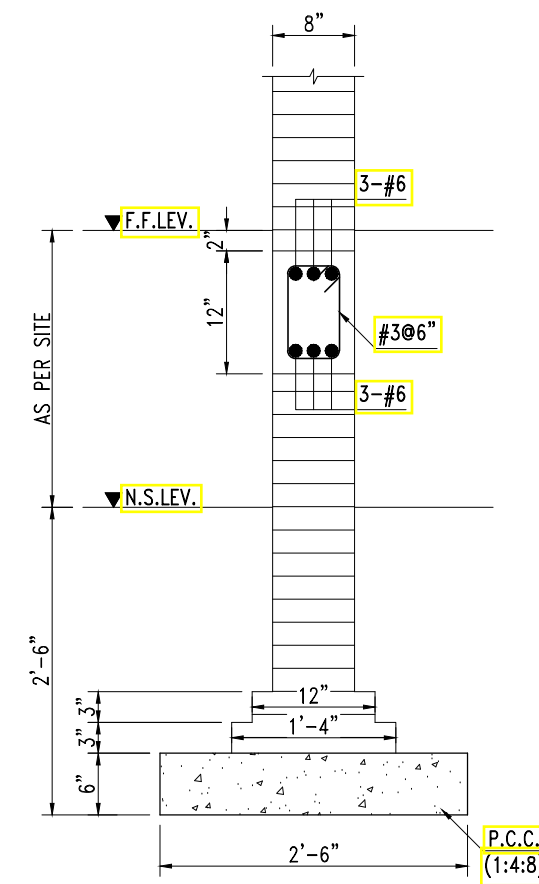
FOOTING F-1



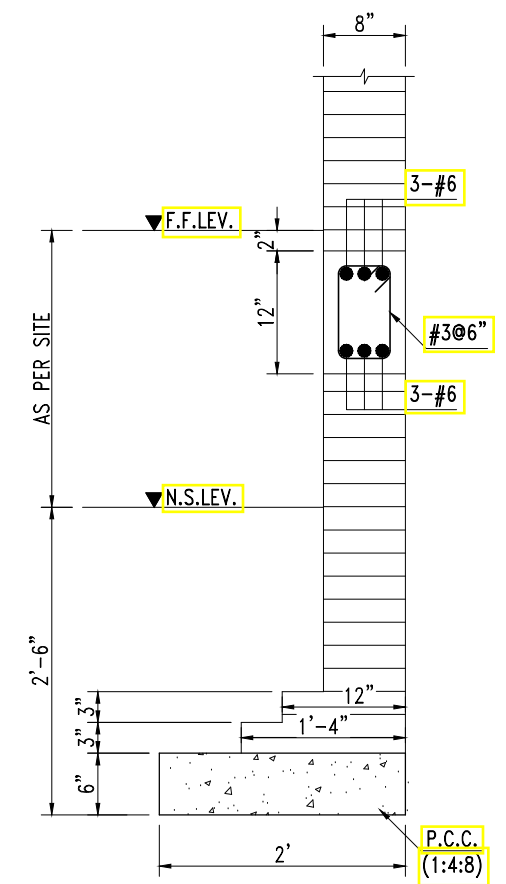
FOOTING F-2



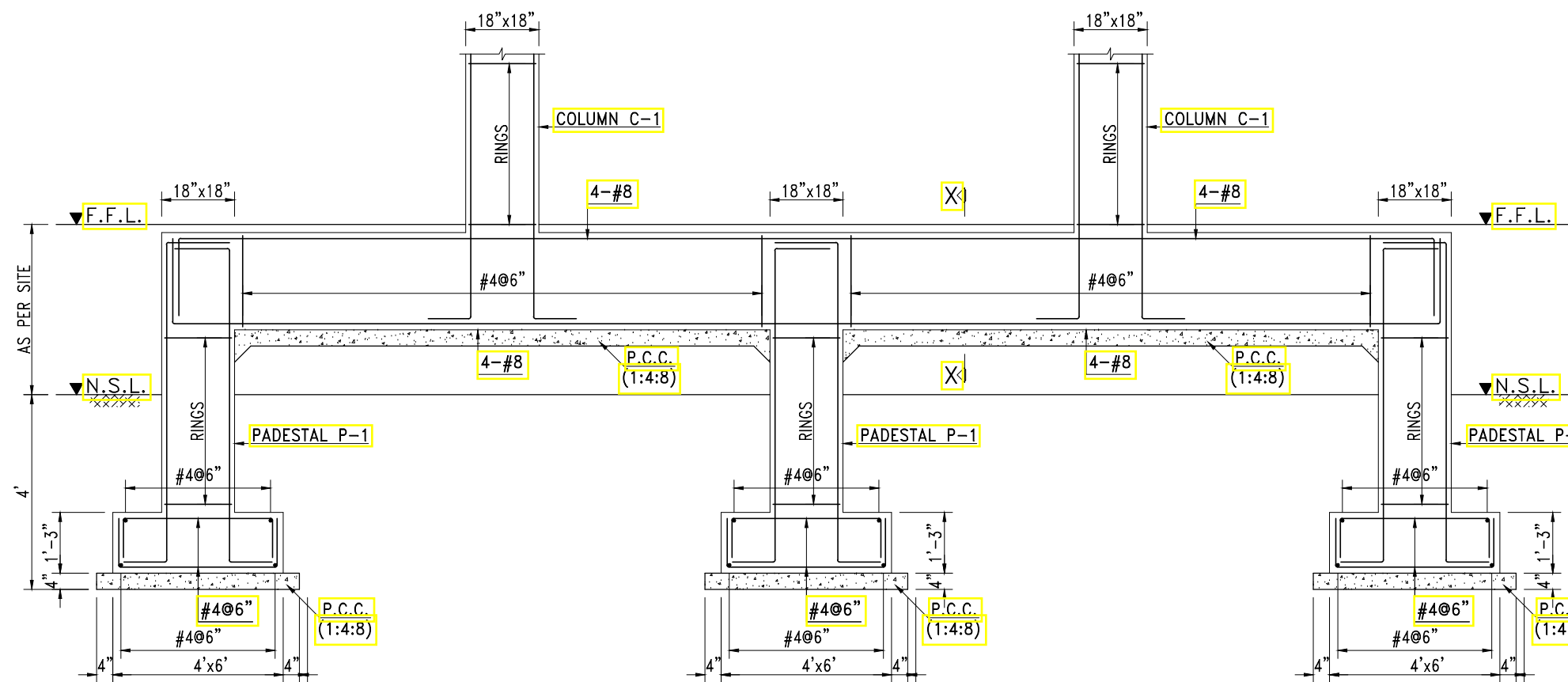
FOOTING F-3



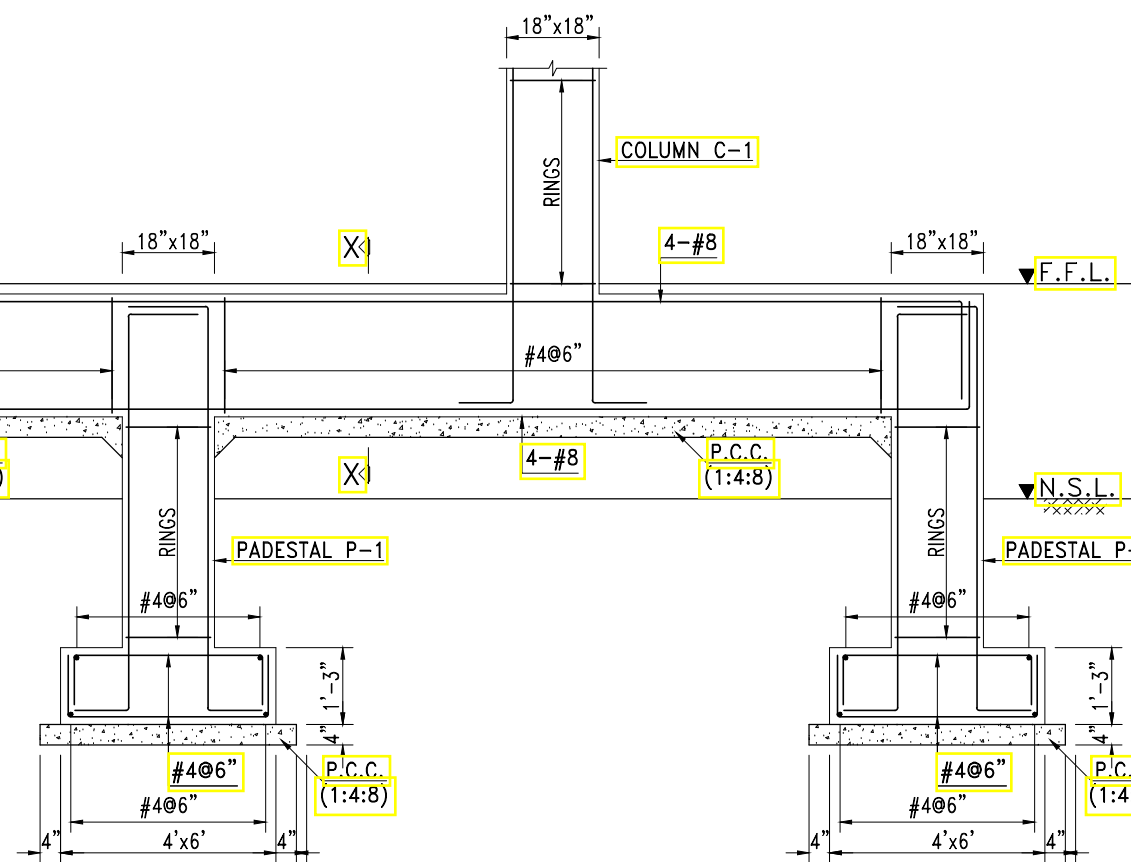
SECTION A-A



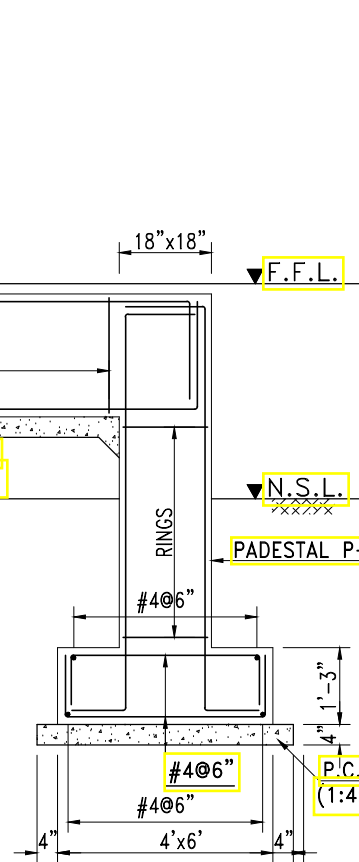
SECTION B-B



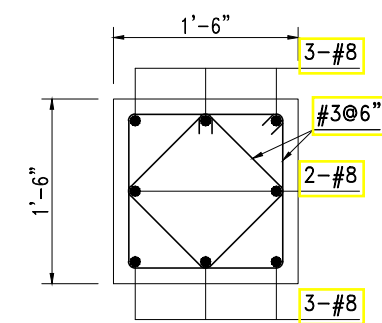
FOOTING F-4



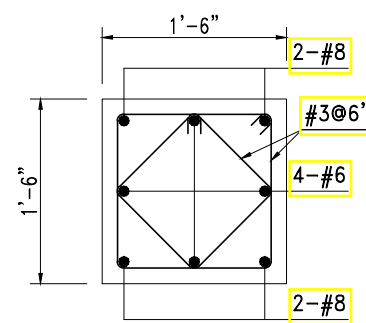
FOOTING F-4



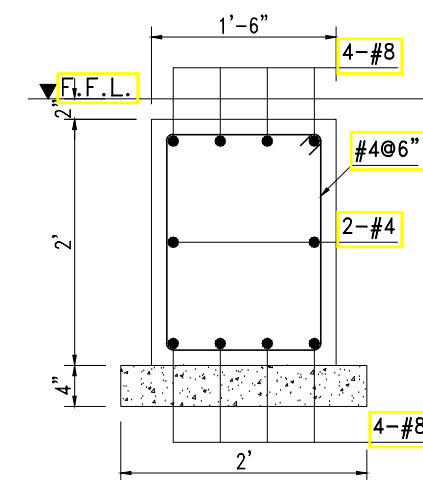
FOOTING F-4



COLUMN C-1



PADESTAL P-1



SECTION X-X

NOTES:-
* FOR GENERAL NOTES SEE DWG.NO. G-01
* FOR STANDARD HOOK DETAILS SEE DWG.NO. G-02

NO.	REVISIONS:	DATE	SIGN.

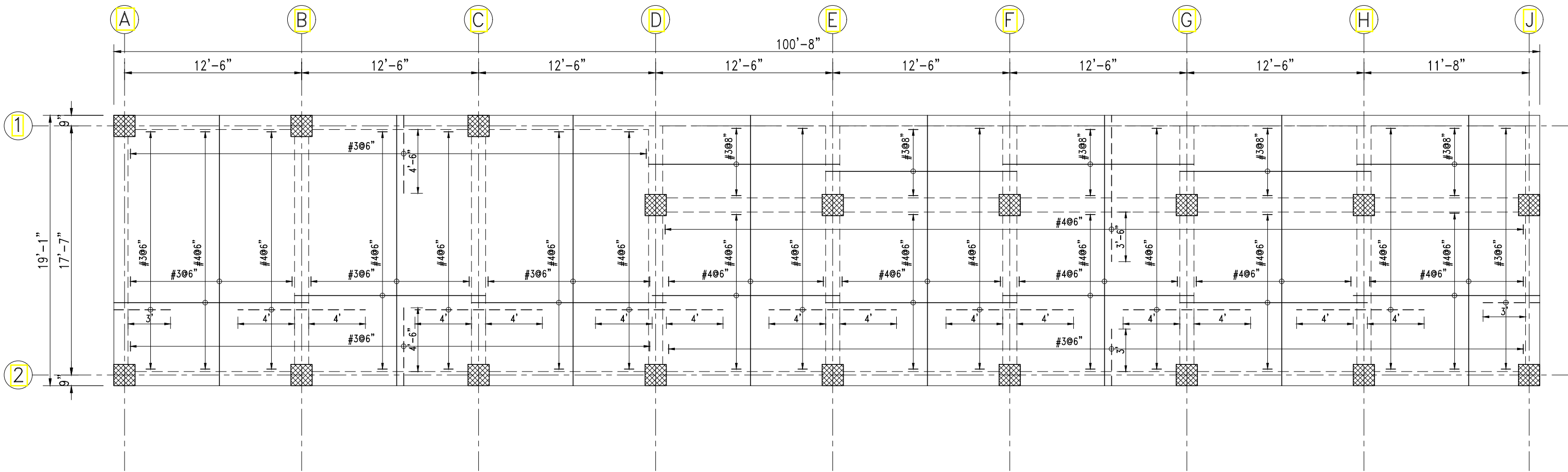
PROJECT: AC PLANT SHED KARACHI.

TITLE: FOOTING SECTIONS REINFORCEMENT DETAILS

SCALE: N.T.S. DRAWING NO. S-02

DATE: 16-11-2025

TECH N BLOCKS
Office #06, Building #12J, Block 06, PECHS, Karachi.



FIRST FLOOR SLAB

ALL SLAB 6" THICK

- NOTES:-
- * FOR GENERAL NOTES SEE DWG.NO. G-01
 - * FOR STANDARD HOOK DETAILS SEE DWG.NO. G-02

NO.	REVISIONS:	DATE	SIGN.
-----	------------	------	-------

PROJECT:

AC PLANT SHED
KARACHI.

TITLE:

FIRST FLOOR SLAB
REINFORCEMENT DETAILS

SCALE:

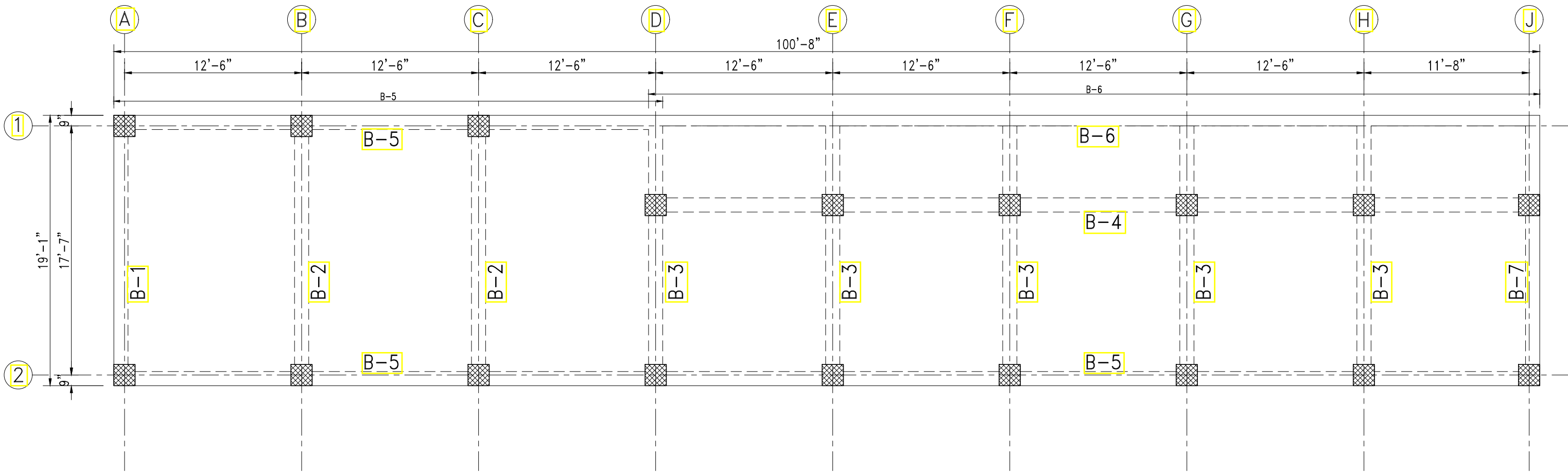
N.T.S

DATE:

16-11-2025

DRAWING NO.

S-03



FIRST FLOOR SLAB
ALL SLAB 6" THICK

NOTES:-
* FOR GENERAL NOTES SEE DWG.NO. G-01
* FOR STANDARD HOOK DETAILS SEE DWG.NO. G-02

NO.	REVISIONS:	DATE	SIGN.

PROJECT:

AC PLANT SHED
KARACHI.

TITLE:

FIRST FLOOR SLAB
BEAM FRAMING PLAN

SCALE:

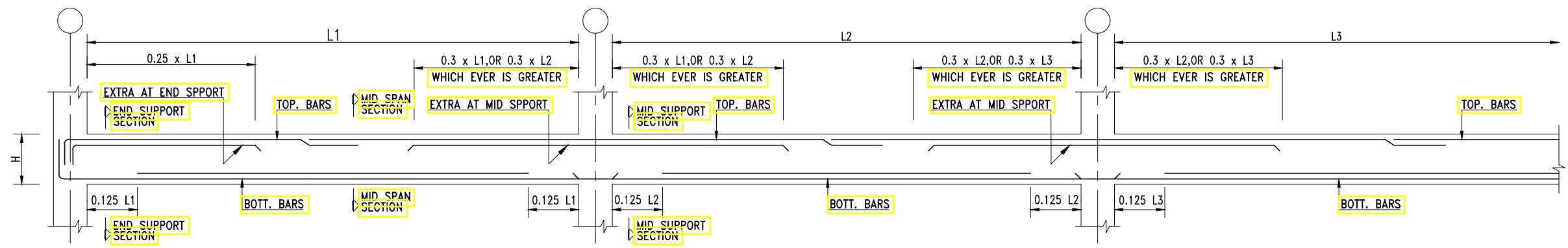
N.T.S

DRAWING NO.

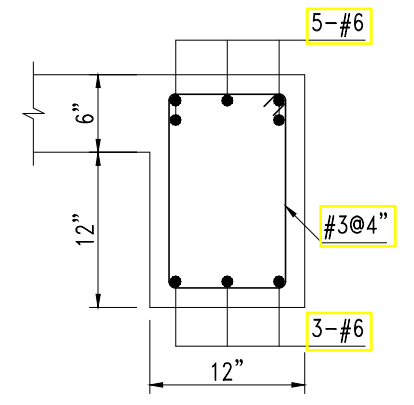
DATE:

16-11-2025

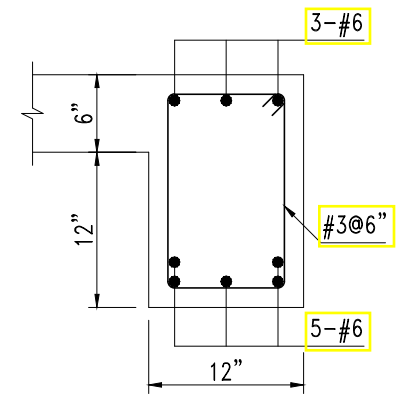
S-04



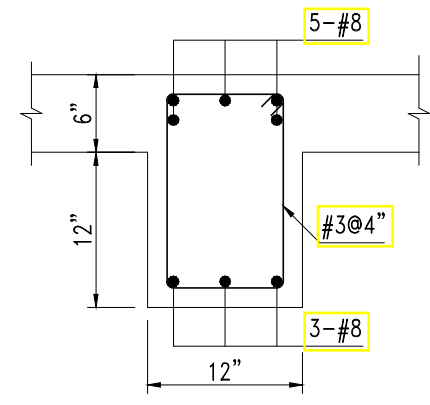
TYPICAL BARS CUTOFF DETAILS FOR BEAM



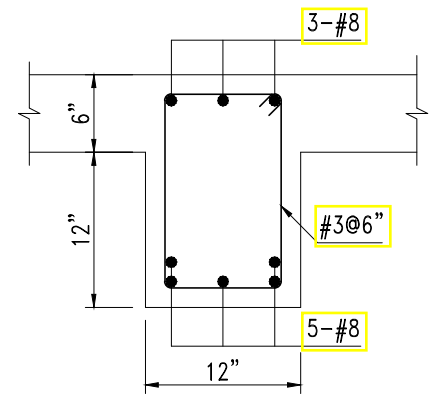
BEAM B-1
END SUPPORT SECTION



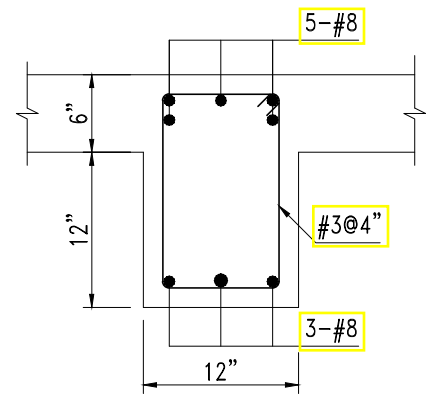
BEAM B-1
MID SPAN SECTION



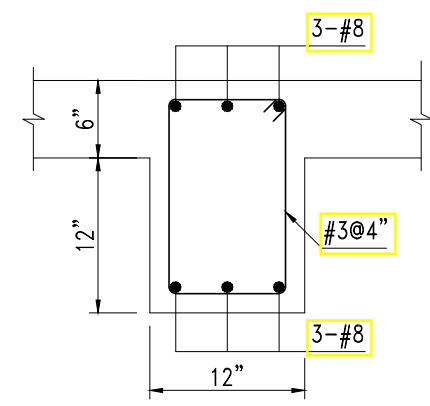
BEAM B-2
END SUPPORT SECTION



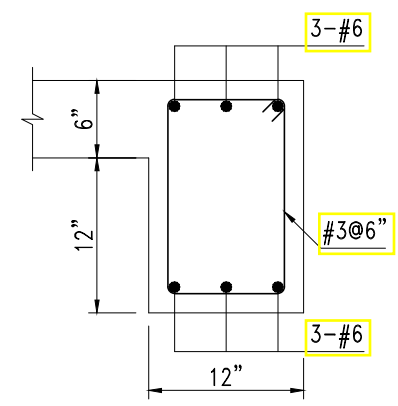
BEAM B-2
MID SPAN SECTION



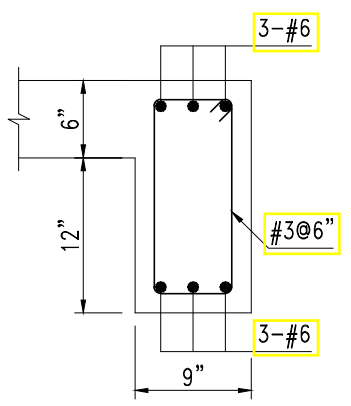
BEAM B-3



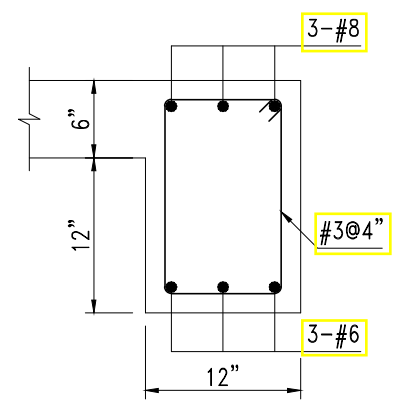
BEAM B-4



BEAM B-5



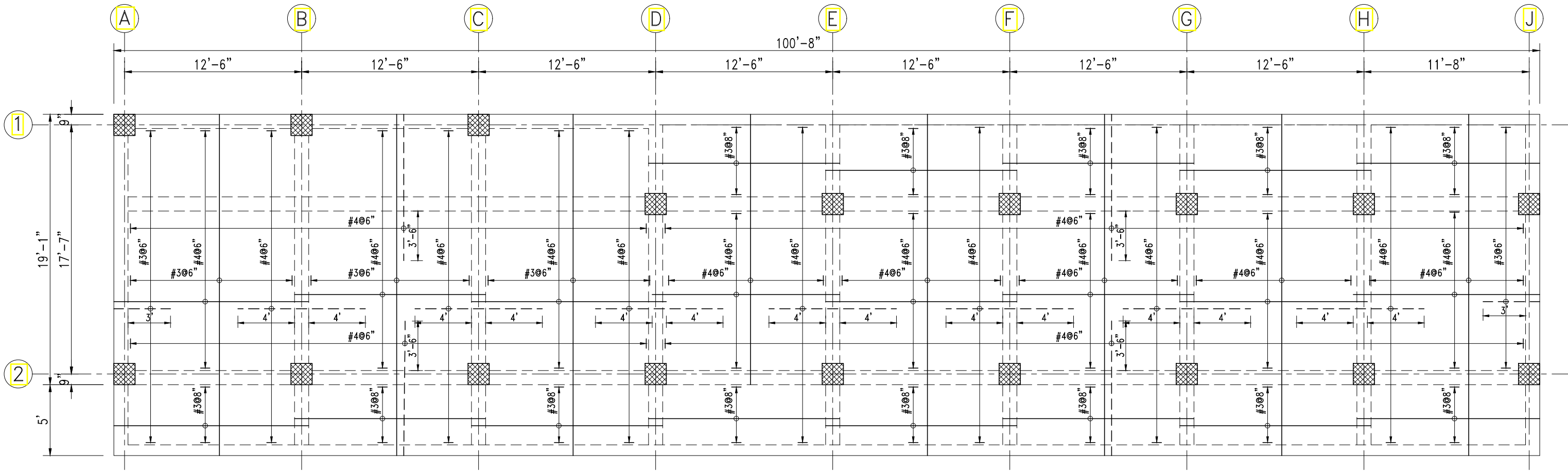
BEAM B-6



BEAM B-7

NOTES:-
* FOR GENERAL NOTES SEE DWG.NO. G-01
* FOR STANDARD HOOK DETAILS SEE DWG.NO. G-02

NO.	REVISIONS:	DATE	SIGN.	
PROJECT:				
AC PLANT SHED KARACHI.				
TITLE:				
FIRST FLOOR SLAB BEAM REINFORCEMENT DETAILS				
SCALE:	N.T.S	DRAWING NO.		
DATE:	16-11-2025	S-05		
 TECH N BLOCKS Tech N Blocks Office #06, Building #12J, Block 06, PECHS, Karachi.				



ROOF SLAB
ALL SLAB 6" THICK

- NOTES:-
- * FOR GENERAL NOTES SEE DWG.NO. G-01
 - * FOR STANDARD HOOK DETAILS SEE DWG.NO. G-02

NO.	REVISIONS:	DATE	SIGN.
-----	------------	------	-------

PROJECT:

AC PLANT SHED
KARACHI.

TITLE:

ROOF SLAB
REINFORCEMENT DETAILS

SCALE:

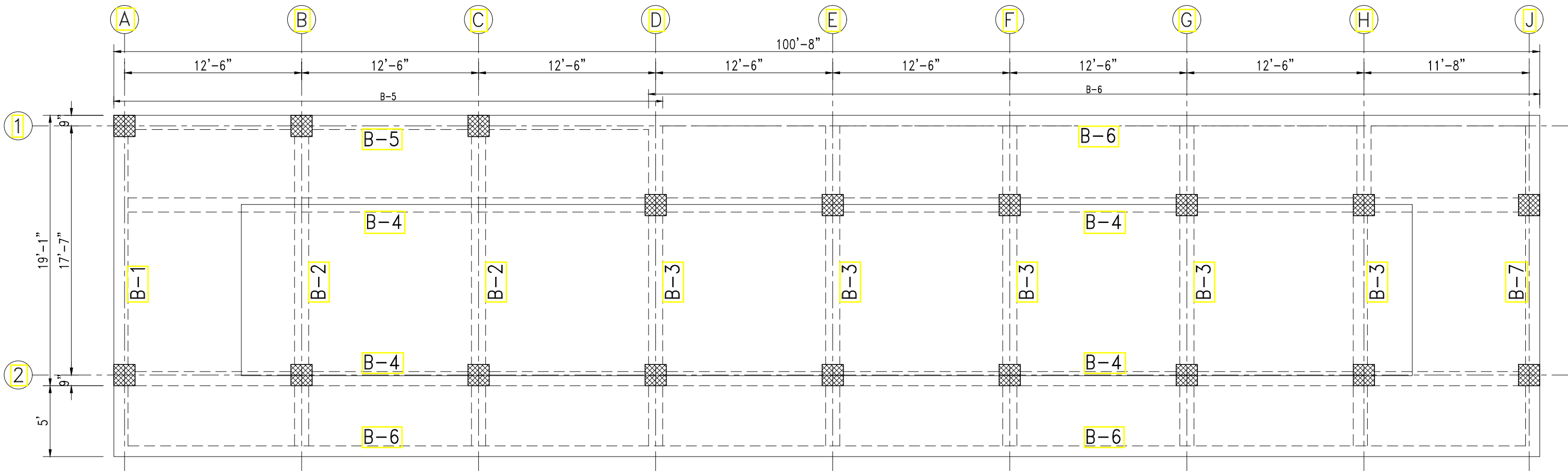
N.T.S

DRAWING NO.

DATE:

16-11-2025

S-06

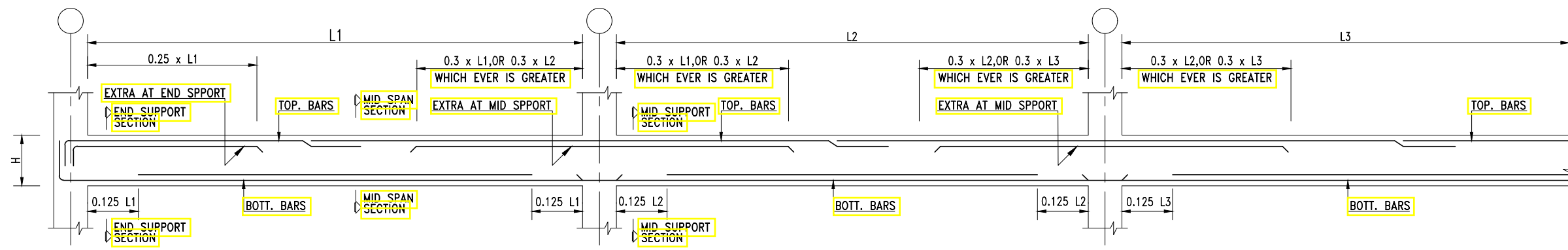


ROOF SLAB
ALL SLAB 6" THICK

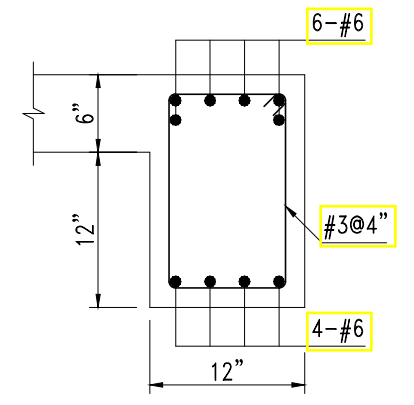
NOTES:-
* FOR GENERAL NOTES SEE DWG.NO. G-01
* FOR STANDARD HOOK DETAILS SEE DWG.NO. G-02

NO.	REVISIONS:	DATE	SIGN.
PROJECT:			
AC PLANT SHED KARACHI.			
TITLE:			
ROOF SLAB BEAM FRAMING PLAN			
SCALE:		DRAWING NO.	
N.T.S		S-07	
DATE:		16-11-2025	

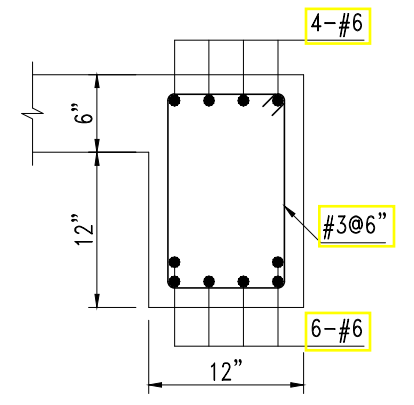
TECH N BLOCKS
Office #06, Building #12J, Block 06,
PECHS, Karachi.



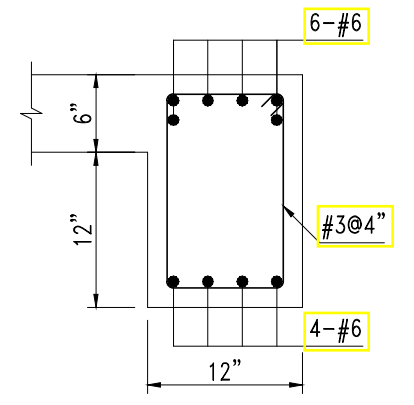
TYPICAL BARS CUTOFF DETAILS FOR BEAM



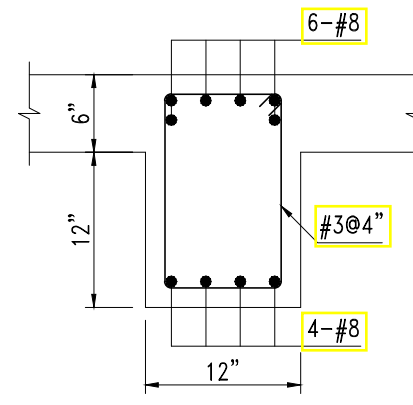
BEAM B-1
END SUPPORT SECTION



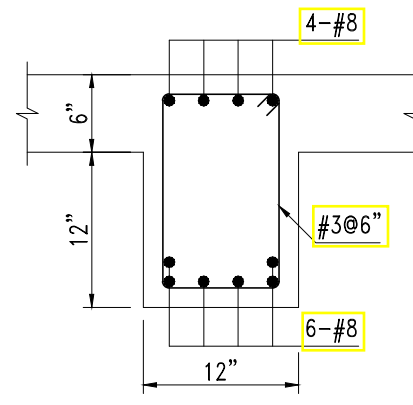
BEAM B-1
MID SPAN SECTION



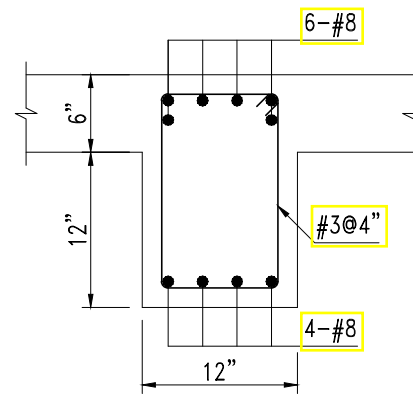
BEAM B-1
MID SUPPORT SECTION



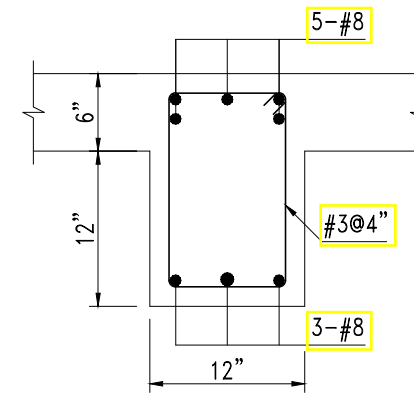
BEAM B-2
END SUPPORT SECTION



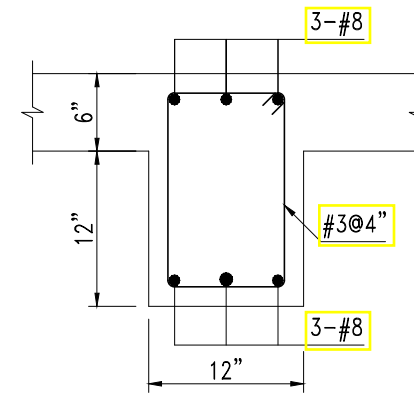
BEAM B-2
MID SPAN SECTION



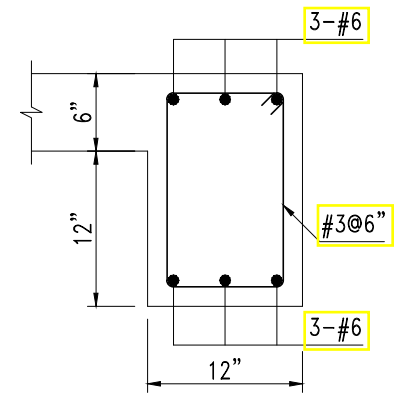
BEAM B-2
MID SUPPORT SECTION



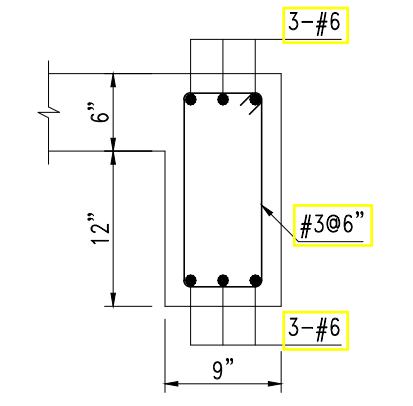
BEAM B-3



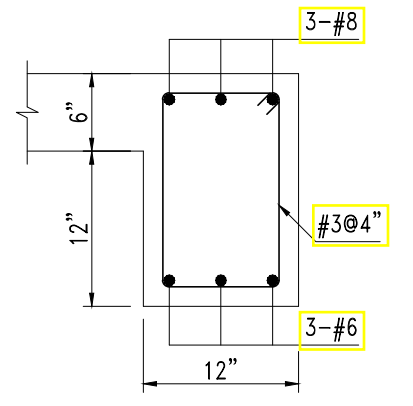
BEAM B-4



BEAM B-5



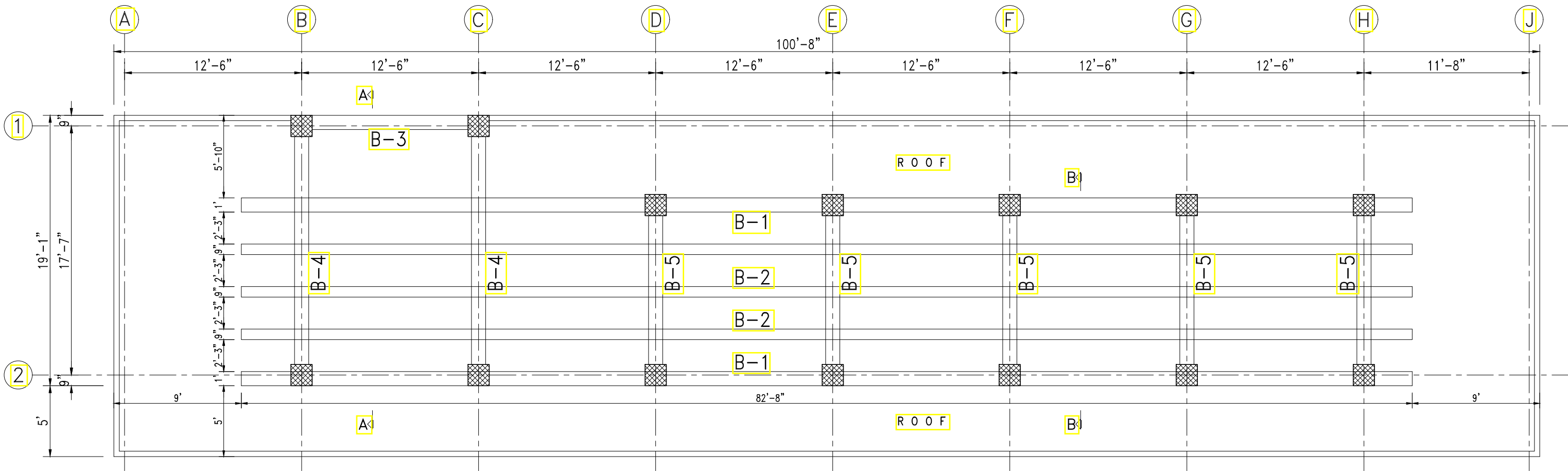
BEAM B-6



BEAM B-7

NOTES:-
 * FOR GENERAL NOTES SEE DWG.NO. G-01
 * FOR STANDARD HOOK DETAILS SEE DWG.NO. G-02

NO.	REVISIONS:	DATE	SIGN.
PROJECT:	AC PLANT SHED KARACHI.		
TITLE:	FIRST FLOOR SLAB BEAM REINFORCEMENT DETAILS		
SCALE:	N.T.S	DRAWING NO.	S-08
DATE:	16-11-2025		



COOLING TOWER BEAM FRAMING

ALL SLAB 6" THICK

- NOTES:-
- * FOR GENERAL NOTES SEE DWG.NO. G-01
 - * FOR STANDARD HOOK DETAILS SEE DWG.NO. G-02

NO.	REVISIONS:	DATE	SIGN.
-----	------------	------	-------

PROJECT:

AC PLANT SHED
KARACHI.

TITLE:

COOLING TOWER
BEAM FRAMING

SCALE:

N.T.S

DRAWING NO.

DATE:

06-12-2025

S-09



STATE BANK OF PAKISTAN
SBP BANKING SERVICES CORPORATION
HEAD OFFICE KARACHI

VOLUME-II: FINANCIAL PROPOSAL

**CONSTRUCTION OF ADDITIONAL SLAB FOR HVAC COOLING
TOWERS AND STRUCTURAL STRENGTHENING OF EXISTING
HVAC PLANT ROOM AND STORE BUILDING, SBP HEAD OFFICE
KARACHI**

Volume-II

Financial Proposal

Feb-26

VOL-II: FINANCIAL PROPOSAL**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 as per 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 labour, supervision, materials, execution, insurance, profit, taxes, GST, Provincial tax 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. Prices quoted by the Supplier will remain fixed during the contract period. Except otherwise mentioned in the Contract, the Supplier shall NOT be entitled for price adjustment on account of any change in wages, material prices, POL prices, tax rates etc. whatsoever on any other account.
6. The Supplier hereby irrevocably and unconditionally waives all claims, direct, indirect or consequential arising out of price escalations, decrease or increase in quantities etc. in connection with the Agreement.
7. 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.
8. General directions and description of work and materials are not necessarily repeated nor summarized in the Bill of Quantities. References to the relevant sections of the Bidding Documents shall be made before entering prices against each item in the priced Bill of Quantities.
9. 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, and the line total will be corrected accordingly.
10. Each cutting should be signed by the authorized person.
11. The brand names have been provided in order to establish a standard of performance and reliability. However, it does not indicate a preference for a particular brand. The bidder may propose other brands which can be accepted subject to necessary tests to establish equivalency.
12. Where packaging size of a sachet/packet/can/pack etc. is included in the description of item of BOQ, this packaging size is only for reference and does not indicate preference for any specific brand. The bidder may offer another packaging size with a margin or tolerance of no more than 15% of the specified size. However, the total quantity to be supplied must be equal to the cumulative quantity required in the BOQ item.
13. The rates of all the items quoted should be calculated considering technical specifications, drawings, nature of work/item used its shape, angle, curve, bends, size etc. to be made at any depth and height with the use of all formwork/ scaffolding or lift to the project work location/floor properly supported as required and as directed by the Engineer to the entire satisfaction of the Engineer In-charge
14. The contractor shall submit submittals along with an adequate number of samples for the items to be used in the project, as required by the Engineer In-charge with relevant brochures, technical specifications, and shop drawings for approval by the Engineer In-charge prior to the commencement of work at the site.
15. Works with risk of noise or dust/smoke emissions will be carried out after office hours and on weekends & holidays.
16. Cost of arrangements required for protection of the existing equipment & services, barricading and testing of concrete and pre-cast blocks from NED, PCSIR or other such approved laboratory will be borne by the Contractor.

Bill of Quantities (BOQ)

Item No.	Description of Item	Unit	Quantity	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
Part – A: Civil Works					
C-1	Dismantling of existing shed, including all supporting pipes, angles and framing members, using approved measures and taking all necessary safety measures to protect installed equipment and services. The item includes careful segregation, stacking and storage of serviceable/useable materials at the designated location within the Bank premises, and removal and lawful disposal of unserviceable debris outside the Bank premises. Complete in all respects, in accordance with site requirements, specifications, and as directed by the Engineer In-Charge. (Approximate area of shed=2000Sft)	Job	1		
C-2	Dismantling / demolition of existing RCC structures, including columns, beams, slabs, foundations and all associated components, by approved methods, ensuring adequate protection and safety of existing equipment, services and adjacent structures. The item includes segregation, cutting (where required), stacking and safe storage of serviceable/useable materials at the designated location within the Bank premises, and removal and proper disposal of all unserviceable debris outside the Bank premises. Complete in all respects, in accordance with site requirements, specifications, and as directed by the Engineer In-Charge.	Cft	700		
C-3	Dismantling of existing PCC floor with sub-flooring, including ensuring safety of existing equipment and piping system installed, segregation and stacking of useable materials at designated location within the Bank premises and disposal of debris away from the Bank premises, complete in all respects as per site requirement and as directed by the Engineer In-Charge.	Cft	625		
C-4	Dismantling of existing masonry wall at any height/depth ensuring safety of existing building structure, equipment installed, segregation and stacking of useable materials at designated location within the Bank premises and disposal of debris away from the Bank premises, complete in all respects as per site requirement and as directed by the Engineer In-Charge	Cft	200		
C-5	Structural excavation in all kinds of soil, including removal of boulders, stones and obstructions, dewatering, and providing and maintaining side protection, shoring and bracing to ensure safety during excavation. The item shall include removal of unsuitable material, clearing and slush removal, preparation and trimming of excavated surfaces, and protection of existing underground services, including water supply lines, sewer lines, manholes, and other utilities, if encountered. Complete in all respects, in accordance with site requirements, specifications, and as directed by the Engineer In-Charge.	Cft	4500		

Item No.	Description of Item	Unit	Quantity	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
	Note: Any damage to the existing underground services, utilities or pipelines shall be made good by the Contractor at his own risk and cost, to the satisfaction of the Engineer In-Charge				
C-6	Providing and applying anti-termite treatment in foundations using approved chemical emulsion such as Hextar 3.5% EC or Agenda 2.5% EC (Jaffer Brothers) or approved equivalent, prepared and applied in accordance with the manufacturer's recommendations. The item includes all materials, application, and incidental works, complete in all respects as per site requirements and as directed by the Engineer In-Charge.	Sft	5500		
C-7	Providing and compacting backfill in foundations with approved suitable excavated soil, including breaking clods, dressing, watering, and mechanical compaction in layers not exceeding 9" thickness to achieve 95% Modified Proctor Dry Density (MPD). The item includes providing earth material from any lead and any lift within the project boundaries, testing where required, and all incidental works, complete in all respects as per specifications, site requirements, and as directed by the Engineer In-Charge.	Cft	2200		
C-8	Providing, laying, leveling, and compaction of crushed concrete debris available at site in excavated trenches/foundations up to a depth of approximately 12 inches (300 mm), including all leads and lifts, tools, plant, and incidental works, complete in all respects, as per site requirements, drawings, and as directed by the Engineer In-Charge.	Cft	1250		
C-9	Providing and laying concrete in foundations, under floors, plinth filling, etc., using approved quality materials, including surface preparation, installation and removal of formwork where required, proper leveling, compaction, finishing, curing, and all incidental works, complete in all respects, as per drawings, specifications, site requirements, and as directed by the Engineer In-Charge.				
(a)	PCC 1:4:8 in foundations and under floor (lean concrete)	Cft	500		
(b)	PCC 1:2:4 in flooring smooth trowel finished, for repairing of damaged parts in existing floor	Cft	100		
(c)	PCC 1:2:4 in flooring smooth trowel finished, for screeding over the roof water proofing and making of 8"x8" size edge fillet all around the roof, laid in alternate panels, including making of roof khurras.	Cft	620		
C-10	Providing and laying structural cement concrete of mix proportions not leaner than (1:2:4) by volume and of (3000 psi) works cubes strength at 28 days, including formwork and its removal, placing, vibrating, compacting, finishing and curing, complete (including screening and washing of stone aggregate) but excluding the cost of steel reinforcement in, as per drawing and specifications, complete in all respects as per site requirements and/or as directed by Engineer In-charge.				

Item No.	Description of Item	Unit	Quantity	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
(a)	3000 psi concrete in RCC footings	Cft	750		
(b)	3000 psi concrete in RCC suspended beams, parapets bracing beams and lintels etc.	Cft	2150		
(c)	3000 psi concrete in RCC slabs	Cft	2300		
(d)	3000 psi concrete in RCC parapet with puddlo mixed 5lbs per bag of cement	Cft	250		
(e)	3750 psi concrete in RCC columns	Cft	1535		
C-11	Providing and fixing steel reinforcement Grade 60 deformed steel bars conforming to ASTM A-615, including cleaning, cutting, bending, placing, binding etc. including provision and cost of spacers and binder wire, cost of chairs, over-laps not shown on drawings etc. in any kind of R.C.C works as specified, complete in all respects as per site requirements and directed by Engineer In-charge.	Kgs	28000		
C-12	Providing and laying pre-cast concrete solid block masonry using machine-made concrete blocks of approved size and make (Izhar or other approved equivalent), at any depth, height, and lead within the premises. The blocks shall have a minimum compressive strength of 1000 psi after 28 days of curing, laid in cement-sand mortar (1:5). The item includes provision and removal of scaffolding, raking out of joints, forming flush or grooved joints, curing, and providing and fixing metal ties for proper bonding between concrete and masonry work along the height of the wall, complete in all respects as per site requirements and as directed by the Engineer In-Charge.	Cft	1380		
C-13a	Providing and laying heavy-duty granolithic flooring comprising 1-3/4" thick PCC screed (1:2:4) and 3/4" thick granolithic topping (1:2) over roof, laid in panels with marble dividing strips 1½" × 3/16" thick. The surface shall be finished hard and smooth by grinding without polishing, including formation of roof khurras, complete in all respects as per site requirements and as directed by the Engineer In-Charge.	Sft	2500		
C-13b	Providing and laying about 3/4" thick granolithic topping (1:2) over RCC slab at 1st floor, laid in panels with marble dividing strips 3/16" thick marble strips of approved quality, including grinding polishing etc., complete in all respects as per site requirements and as directed by the Engineer In-Charge.	Sft	2000		
C-14	Providing and laying heavy-duty granolithic skirting, total thickness 3/4", comprising 3/8" thick cement-sand undercoat (1:3) and 3/8" thick granolithic topping (1:2), finished hard and smooth by grinding without polishing, at any height, complete in all respects as per site requirements and as directed by the Engineer In-Charge.	Sft	200		

Item No.	Description of Item	Unit	Quantity	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
C-15	Supply, prepare, apply, and cure 3/4" thick smooth-finish cement plaster in cement-sand mortar (1:4) on internal and external walls, jambs etc. finished smooth with steel trowel and laid in true line and level as shown on the drawings. The item includes providing and fixing metal lath strips of weight not less than 1.2 kg/m ² , 500 mm wide, at junctions of concrete and masonry, fixed with rust-proof nails or screws (where required), scaffolding, curing, and all incidental works, complete in all respects as per Specifications, drawings, and sample approved by the Engineer.	Sft	8500		
C-16	Supply, make, apply and cure 1/2" thick smooth finished 1:4 cement sand plaster (on ceilings) in true lines as shown in drawings including cost of chipping off concrete surface, curing etc; as per Specifications complete in all respects and as per sample approved by the Engineer.	Sft	4500		
C-17	Providing, mixing, laying and leveling about 3/4" thick layer of cement-sand slurry (1:4) mixed with approved quality SBR mixed @ 3 liters per bag of cement and water repellent admixture puddle mixed @ 5 lbs per bag of cement, over roof, complete in all respects as per site requirements and as directed by the Engineer In-Charge.	Sft	2100		
C-18	Providing and torch-applying 4 mm thick modified bitumen based waterproofing membrane, reinforced with non-woven polyester fibres, of Roofgrip or approved equivalent, having PE-type surface finish strictly in accordance with the manufacturer's specifications and recommendations. The item includes application of approved primer or equivalent at a coverage rate of approximately 4 m ² per litre (or as recommended by the manufacturer), minimum 3" wide overlaps, and providing and laying 200-micron thick polythene sheet over the waterproofing membrane. It further includes anchoring the membrane to parapet walls up to 12" above RCC slab top level by forming a 1" × 1" groove in the parapet, inserting the membrane edge into the groove, and fixing 3/4" wide × 2 mm thick aluminum strip, secured with 1" long stainless-steel screws at approximately 6" center-to-center. The groove shall be filled with 1:4 cement-sand mortar, neatly finished flush with the adjacent parapet surface, including sealing of HVAC flue duct sides using GI sheet/membrane etc as per site. Complete in all respects, as per site requirements, specifications, and as directed by the Engineer In-Charge. (Measurement for payment shall be made on the basis of top surface areas of the membrane irrespective of the overlaps etc.)	Sft	2500		

Item No.	Description of Item	Unit	Quantity	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
C-19	Providing & fixing of Schedule-40 uPVC pipes as per BS-4514/5255 and BS-4660, of Pak Jamal Pipes, Beta or other approved equivalent make, including the cost of jointing, cutting, sockets, clamps made from 2mm thick Stainless steel flat patti, complete in all respects as per drawings, site requirements and as directed by the Engineer In-charge.				
(a)	Rainwater down pipe 4" dia.	Rft	100		
C-20	Providing and Fixing UPVC plug elbow including providing and fixing of heavy-duty SS grating at intake of the roof water pipes on inner side of the parapet wall, watertight connection leak-free.				
(a)	4" inside dia	No.	4		
C-21	Providing and Fixing UPVC simple elbow at bottom of roof water pipes, watertight connection leak-free.				
(a)	4" inside dia	No.	4		
C-22	Providing, fabricating and fixing in position single or double leaf, double-sheeted steel hinged door, manufactured from 16 S.W.G. mild steel sheets, complete with "Z"-section steel frame formed from $1\frac{1}{2}" \times 1\frac{1}{2}" \times \frac{1}{4}"$ MS angle and $\frac{1}{4}"$ thick MS flat plate, welded together to form the required section. The shutters shall be properly braced with $1\frac{1}{2}" \times 1\frac{1}{2}" \times \frac{1}{4}"$ MS angle sections, and fitted with three (03) approved heavy-duty MS hinges per shutter, complete with all necessary fittings and fixtures. The door frame shall be fixed using three (03) MS holdfasts on each side, embedded in plain cement concrete (1:2:4). The item shall also include surface preparation, two (2) coats of red oxide primer, followed by minimum two to three (2-3) coats of approved quality enamel paint, and all hardware, complete in all respects. Executed strictly in accordance with approved drawings, specifications, site requirements, and as directed by the Engineer In-Charge.	Sft	80		
C-23	Providing, fabricating and fixing aluminum glazed fixed and/or sliding windows and ventilators, using approved aluminum sections of Alumex, Chawla Aluminum, or equivalent, minimum 100 mm wide and 1.6 mm thick, in approved color, complete with all necessary fittings and accessories. The item includes 5 mm thick best quality imported plain glass of approved color, approved design MS safety grill fabricated from $\frac{1}{2}" \times \frac{1}{2}"$ solid MS square bars, complete with wire gauze/wire netting in openable portions, all required hardware, fasteners, fixing arrangements, and finishing. Complete in all respects in accordance with approved drawings, specifications, samples, and as directed by the Engineer In-Charge.	Sft	275		

Item No.	Description of Item	Unit	Quantity	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
C-24	Providing and applying one coat of approved primer (Dulux Prime On or equivalent), including proper surface preparation, rubbing down, stopping and base preparation with approved putty, using paint materials of ICI Dulux, Kansai Paint, Berger, or approved equivalent. The item further includes application of three (03) coats (or as required to achieve the specified finish) of approved quality Dulux Enamel Paint, in approved shade and make, complete in all respects, as per specifications, approved samples, and as directed by the Engineer In-Charge.	Sft	8000		
C-25	Providing and applying three (03) coats (or as required to achieve the specified finish) of Dulux Weather shield Exterior Paint of ICI Dulux, Kansai Paint, Berger, or approved equivalent, on properly prepared surfaces, in approved shade and texture. The work shall be carried out strictly in accordance with manufacturers' recommendations, approved specifications, approved samples, complete in all respects and as directed by the Engineer In-Charge.	Sft	4000		
C-26	Providing, fabricating and erecting structural steel work, at any level, floor, height or lift, conforming to ASTM A36, strictly in accordance with approved drawings, including all cutting, drilling, welding, bolting, temporary supports, scaffolding, staging, jacking, handling and hoisting. The item shall be complete in all respects as per site conditions, specifications, and as directed by the Engineer-in-Charge. Note: The quoted rate shall be deemed to include the cost of all wastages, overlaps, consumables, and accessories, whether or not specifically shown on the drawings.	Kg	5500		
C-27	Providing and fixing in position approved quality 12" long × 1" diameter anchor J-bolts embedded in concrete footings including cost of making required holes in structural steel sections as per the site requirements and as directed by the Engineer In-Charge.	Each	40		
C-28	Providing and fixing in position in RCC slab, approved quality 6" long ¾" diameter rawl bolts, including cost of making required holes in structural steel sections as per site requirements and as directed by the Engineer In-charge.	Each	50		
Sub-Total (A)					
Part – B: Electrical Works					
1	Dismantling of all types of electrical, all types of lighting fixtures, electrical wiring with pipes and outlets, power switch sockets carefully and hand over to the engineering store in charge and as per direction of Engineer In-Charge.	Job	1		

Item No.	Description of Item	Unit	Quantity	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
2	Supply of 1x4 ft. LED surface mounted panel lights/fixtures with following specifications: Power Ratings: 35-45W Color Temperature: 6500K Minimum Lumens: 3200 Power Factor ≥ 0.8 Color Rendering Index ≥ 80 Life span: 20,000 hours or above Thermally conductive plastic-coated Aluminum housing Compliance with IEC Code 60598 or 62471 Warranty: At least one year Rates must include the cost of connectors, pins, wires, drivers, powder coated metal frame of gauge not less than 18SWG for supporting the lighting fixtures on the surface etc. complete in all respect as per manufacturer's instructions with necessary installation material, complete in all respects as directed by Engineer In-Charge.	Jobs	32		
3	Supply, installation, testing, and commissioning of lighting circuits from DB to switch, light point from switch to light: 2 x 2.5mm sq. & 1.5mmsqr. as ECC copper/PVC wire (Electrical wiring must be compliant with IEC 60364 or BS 7671 and type tested certification from KEMA/RAWAT/PQSIR) and PVC pipe of 25 mm dia of class C (Electrical PVC pipe must be in compliant with BS 6099-1 or PS 1905-87 or equivalent standards) The cost includes supply, laying, and installation of wires in Cable trays, PVC channel/conduit pipe, wall cutting, chiseling with all necessary installation material and redressing as per original condition, complete in all respects as per standard industry practice to the satisfaction of the Engineer In-Charge.	Mtr	200		
4	Supply, Installation, testing, and commissioning of Lighting circuits for LED Lighting Fixtures for light points and point to point circuits using: 3 x 1.5mm sq. copper/PVC wire (Electrical wiring must be compliant with IEC 60364 or BS 7671 and type tested certification from KEMA/RAWAT/PQSIR) and PVC pipe of 25 mm dia of class C (Electrical PVC pipe must be in compliant with BS 6099-1 or PS 1905-87 or equivalent standards) The cost includes supply, laying, and installation of wires in cable trays, PVC channel/conduit pipe, wall cutting, chiseling with all necessary installation material and redressing as per original condition, complete in all respects as per standard industry practice to the satisfaction of the Engineer In-Charge	Mtr	150		
5	Supply and installation of 04 Gang switch sheets/face plates of with metallic powder coated back box/PVC back box 3"x3" with fixing material by observing beauty and proper level on wall from floor level. Complete in all respects as directed by Engineer In-Charge.	Jobs	5		

Item No.	Description of Item	Unit	Quantity	Unit Rate (Rs.) (Incl. all taxes)	Amount (Rs.) (Incl. all taxes)
6	Supply, installation, testing and commissioning of 32A, 5-Pin Industrial Socket in compliance with IEC 60309-1 & IEC 60309-2 complete with Plug top complete in all respects as directed by Engineer In-Charge	Jobs	2		
7	Supply, installation, testing and commissioning of 16 Sq.mm 4-Core Cu XLPE/PVC Power Cable with 6 sq.mm as ECC Cu/PVC/PVC in compliance with international standards. The job includes cost of all accessories including cost of lugs (metallic, bi metallic, copper etc.), glands, lugs, cable ties, nut bolts, taping etc. complete in all respects as directed by Engineer In-Charge	Mtr	120		
8	Supply, installation, testing and commissioning of at least 32A MCCB Circuit Breaker for lighting as per site requirement complete in all respects directed by engineer in-charge in compliance with BS 387 1 - Miniature & Molded Case Circuit Breakers or equivalent standard	Jobs	2		
Sub-Total (B)					
Total Amount (A+B)					

In words (Rs.): _____

Only