

Standard Bidding Document

Tender for Construction of New Building for PEL Examination Center,
Karachi (Re-Tender)
(Works)

National

Single Stage-Two Envelope



August 03, 2026

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Table of Contents

REQUEST FOR BIDS	1
Instructions to Bidders	3
Bid Data Sheet	31
Bids Data Sheet (BDS)	32
Eligibility Criteria	38
Evaluation Criteria	39
Jobs/Lots	43
Related Services :	45
Work Specifications and Market Rates	46
Scope of Work	47
Price Schedule	50
General Conditions of Contract	52
Special Conditions of Contract	62
Bid Securing Declaration	67
Contract Form	69
Integrity Pact	72
Performance Guarantee Form	74
Annexure	77
Annexure A - Volume I Tender Conditions	78
Annexure B - Volume II Technical Specifications	78
Annexure C - Volume III Financial Formate BOQ	78

Annexure D1 - Volume IV Drawings Architect	78
Annexure D2 - Volume IV Drawings Structure	78
Annexure D3 - Volume IV Drawings E&M	1
Annexure E - List of Approved Banks	79
Procurement Forms	80
Additional Forms and Documents	83

REQUEST FOR BIDS

PROCUREMENT OF CIVIL WORKS

1. The **Pakistan Civil Aviation Authority (Ministry of Defence)** has reserved Funds for the procurement planned for FY **2026-27**. The **Pakistan Civil Aviation Authority (Ministry of Defence)** intends to apply part of the proceeds of this Fund to cover eligible payments under the contract for the "**Tender for Construction of New Building for PEL Examination Center, Karachi (Re-Tender)**" with the reference of "**P78226**".
2. The **Pakistan Civil Aviation Authority (Ministry of Defence)** invites sealed Bids from eligible Bidders for procurement of Works (**Tender for Construction of New Building for PEL Examination Center, Karachi (Re-Tender)**) described in the bidding documents on **EPADS v2.0**.
3. **Single Stage-Two Envelope** will be used by adopting **Least Cost Based Selection (LCBS)** Technique for the subject procurement, in line with the Public Procurement Rules, 2004 and any Regulations, Regulatory Guides, Procurement Guidelines or Instructions issued by the Authority from time to time.
4. All Bids must be accompanied by a Bid Security amount described in Bid Security Section in Bidding Document in the form of **Pay Order**. Or all bids must be accompanied by bid securing declaration in the format specified in the Bidding documents
5. E-Bidding documents, containing detailed terms & conditions, specifications and requirements etc. are available on **e-Pak Acquisition and Disposal System (EPADS)** at **<https://epads.gov.pk/opportunities/federal/procurements/78226>** for all the interested bidders registered on **EPADS v2.0**. Bidders are required to get themselves registered on **EPADS v2.0** to participate in Bidding process.
6. The e-bids, prepared in accordance with the instructions in the e-Bidding documents, must be submitted through **EPADS v2.0** on or before **Wednesday, August 26, 2026 11:00 AM**. E-bids will be opened by using **EPADS v2.0** on the same day at **Wednesday, August 26, 2026 11:30 AM**.

Manual submission of Bids shall not be entertained. Those vendor who have not yet registered on the new version of **EPADS v2.0**, may register themselves on <https://vendors.epads.gov.pk/>. A tutorial to explain the registration process is available at <https://www.youtube.com/watch?v=MNW6T38v7tc>.

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 and on Authority's website at (www.ppra.org.pk).

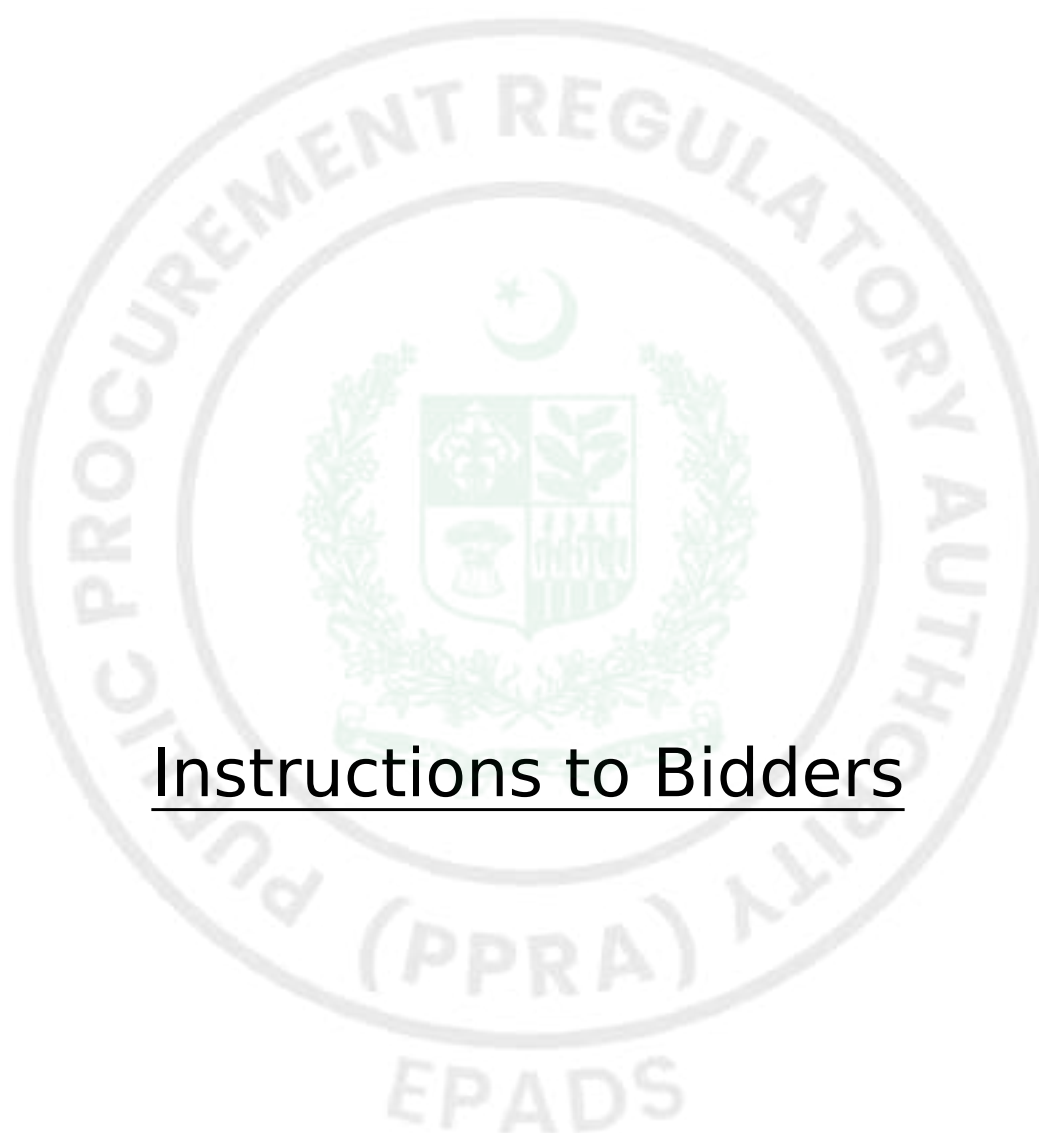
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Instructions to Bidders

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 the BDS.

2. Source of Funds

2.1. Source of funds as referred in Clause 2 of 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. Verifiable copy of the agreement that forms a joint venture, consortium or association shall be required to be submitted as part of the Bid.

Any bid submitted by the joint venture, consortium or association 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 and in line with any instructions issued by the Authority.

(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).

3.2. The invitation for bids is open to all prospective bidders 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. Procuring agencies shall specify the registration/licensing requirements for the foreign bidder keeping in view the requirement of that business.

3.3. 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:

3.3.1. 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

3.3.2. have controlling shareholders in common; or

3.3.3. receive or have received any direct or indirect subsidy from any of them; or

3.3.4. have the same legal representative for purposes of this Bid; or

3.3.5. 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

3.3.6. Submit more than one bid in this bidding process.

3.4. A Bidder may be ineligible if –

3.4.1. he is declared bankrupt or, in the case of company or firm, insolvent;

3.4.2. 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;

3.4.3. the bidder is convicted, by a final judgment of a Court of Law or relevant Professional Statutory Body, of any offence involving professional conduct;

3.4.4. 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.

3.5. As and when required, 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.

3.6. 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”.

B. BIDDING DOCUMENTS

5. Contents of Bidding Documents

5.1. 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 7.1 include:

Section I -Invitation for Bids

Section II Instructions to Bidders (ITBs)

Section III Bid Data Sheet (BDS)

Section IV Eligible Countries

Section V Evaluation and Qualification Criteria

Section VI Works Requirements Technical Specifications & Schedule of Requirements

Section VII Standard Bidding Forms

Section VIII General Conditions of Contract (GCC)

Section IX Particular Conditions of Contract (PCC)

Section X Contract Forms

5.2. 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.

6. Clarification of Bidding Document, Pre-bid Meeting

6.1. A prospective bidder requiring any clarification of the bidding document may notify the Procuring agency/Employer through EPADS.

6.2. The Procuring agency/Employer shall respond to the request for clarification in accordance with Rule 31 of the Public Procurement Rules 2004.

6.3. Should the Procuring Agency deem it necessary to amend the BIDDING document as a result of a clarification, it shall do so following the procedure under ITB 7.

6.4. 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.

6.5. 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 uploaded on EPADS. 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 7. Non-attendance at the pre-bid meeting will not be a cause for disqualification of a bidder.

6.6. 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.

6.7. 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.

7. Amendment of Bidding Documents

7.1. The procuring agency may issue notification of any change, addition, modification or deletion in accordance with Rule 23 of the Public Procurement Rules 2004 i.e. Bidding Documents.

7.2. 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:

Provided that the Procuring agency/Employer shall extend the deadline for submission of bid in pursuance of Rule 27 of the Public Procurement Rules 2004, i.e. Extension of time for submission of bids, if such an addendum is

issued within last three (03) days of the bid submission deadline.

C. PREPARATION OF BIDS

8. Language of Bid

8.1. 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.

9. Documents Constituting the Bids

9.1. The Bids prepared by the Bidder shall constitute of all the documents required in the BDS.

10. Documents Establishing Eligibility of Material, Equipment and Works, their Conformity to Bidding Documents

10.1. The bid prepared by the bidder shall constitute the following components: -

10.1.1. Documentary evidence established in accordance with ITB 10 that the material and equipment to be utilized by the Bidder for the executions of works are eligible material and equipment and conform to the Bidding Documents;

10.1.2. Documentary evidence established in accordance with ITB 11 that the bidder has been authorized to carry out the Construction works;

10.1.3. Documentary evidence established in accordance with ITB 11 that the bidder is eligible and/or qualified for the subject bidding process;

10.1.4. Form of Bid and Bid Prices completed in accordance with ITB 12 and 13;

10.1.5. Completed schedules as required, including priced Bill of Quantities in accordance with ITB 13.

10.1.6. Technical Proposal completed in all aspects in accordance with ITB-15.

10.1.7. Bid security or Bid Securing Declaration furnished in accordance with ITB 17;

10.1.8. Any other document required in the BDS.

10.2. 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.

10.3. 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.

10.4. 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:

10.4.1. a detailed description of the work methodology, approach, schedule and resources to be mobilized at site;

10.4.2. 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;

10.4.3. any other procurement specific documentation requirement as stated in the BDS.

10.5. 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.

11. Documents Establishing Eligibility and Qualification of the Bidder

11.1. 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.

11.2. 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".

11.3. 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:

11.3.1. 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.

11.3.2. 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.

11.3.3. That the bidder meets the qualification criteria listed in Section-V, Evaluation and Qualification Criteria and BDS.

12. Forms of Bid

12.1. The Bidder shall fill the Form of Bids furnished in the bidding documents. The Bids Form must be completed without any alterations to its format and no substitute shall be accepted.

13. Bid Prices

13.1. 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.

13.2. 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.

13.3. 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:

13.3.1. where there is only one (substantially) responsive bidder, or

13.3.2. 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.

13.4. The Bid price to be quoted in the Form of Bid in accordance with ITB 12 shall be the total price of the bid.

13.5. 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.

13.6. If so specified in ITB 1.1, bids may be invited for individual lots (contracts) or for any combination of lots (packages).

13.7. 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 27, unless otherwise price adjustment is permissible under Conditions of the Contract.

13.8. 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.

14. Currencies of Bid and Payment

14.1. Prices shall be quoted in Pakistani Rupees unless otherwise specified in the BDS. Comparison of bids and tie of bid shall be treated in accordance with the Rule 30(2) of Public Procurement Rules, 2004.

15. Documents Comprising the Technical Proposal

15.1. The bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, schedule and any other information as stipulated in Section VII – Standard Bid Forms, in sufficient detail to demonstrate the adequacy of the bidder's proposal to meet the work requirements and the completion time.

16. Bid Validity Period

16.1. 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.

16.2. Under exceptional circumstances, prior to the expiration of the initial Bids/Bid validity period, the Procuring Agency may request the Bidders' consent to an extension of the period of validity of their Bids/Bid. Such request for extension of the period of bid validity shall be carried out in accordance with Rule 26 of the Public Procurement Rules, 2004.

17. Bid Security or Bid Securing Declaration

17.1. Pursuant to ITB 11.1 unless otherwise specified in the BDS, the bidder shall furnish as part of its bid, a Bid Security in accordance with Rule 25 of the Public Procurement Rules, 2004 in the amount and currency specified in the BDS or Bid Securing Declaration as specified in the BDS in the format provided in Section VII (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.

Until the development of functionality of auto verification of financial instrument in EPADS, the scanned copy of bid security or bid securing declaration, as the case may be, shall be uploaded on E-PADS whereas the original instrument to be submitted to the procuring agency before closing of bid submission deadline,

17.2. 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:

17.2.1. 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;

17.2.2. A cashier's or certified cheque; or

17.2.3. Another security as indicated in the **BDS**.

17.3. 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 VII (Standard Bidding Forms) or another form approved by the Procuring agency/Employer prior to the bid submission.

17.4. The Bid Security shall be payable promptly upon written demand by the Procuring agency/Employer in case any of the conditions listed in ITB 17.9 are invoked.

17.5. Any bid not accompanied by a Bid Security or Bid Securing Declaration in accordance with ITB 17.1 or 17.3 shall be rejected by the Procuring agency/Employer and shall be declared as non-responsive bid, pursuant to ITB 27.

17.6. 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 16. 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:

17.6.1. The expiry of the Bid Security;

17.6.2. 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;

17.6.3. The rejection by the Procuring agency/Employer of all Bids;

17.6.4. 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.

17.7. The successful bidder's Bid Security will be discharged upon the bidder signing the contract pursuant to ITB 40, or furnishing the performance security (or guarantee), pursuant to ITB 41.

17.8. The Bid Security may be forfeited or the Bid Securing Declaration executed:

17.8.1. if a Bidder:

17.8.1.1. 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 16.2; or

17.8.2. In the case of a successful bidder, if the bidder fails:

17.8.2.1. to sign the contract in accordance with ITB 40; or

17.8.2.2. to furnish performance security (or guarantee) in accordance with ITB 41.

17.9. 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. In case the JV is not legally constituted at the time of bid submission, the bid security or bid securing declaration shall be in the names of all future members as named in the letter of bid.

18. Withdrawal of Bids

18.1. 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.

19. Format and Signing of Bid

19.1. The Bidder shall prepare and submit Bids through EPADS with due diligence after carefully reading all the terms and condition before bid submission deadline.

D. SUBMISSION OF BIDS

20. Submission of Bids through EPADS v2.0

20.1. All bids shall be submitted through EPADS v2.0.

21. Deadline for Submission of Bids

21.1. All bids shall be received through **EPADS v2.0** not later than bid submission deadline as specified in the **BDS**.

21.2. The Procuring agency/Employer may, under exceptional circumstances and at its discretion, extend the deadline for the submission of bids, pursuant to Rule 27 of the Public Procurement Rules, 2004. Extension of Time for submission of bid, by amending the Bidding Documents in accordance with ITB 7, 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.

22. Substitution and Modification of bids

22.1. 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.

22.2. Revised bid may be submitted after the substitution or modification made in the original bid in accordance with the provisions referred in **ITB 18**.

E. OPENING AND EVALUATION OF BIDS

23. Opening of Bids

23.1. The Procuring Agency will open bids in accordance with Rule 28 of the Public Procurement Rules, 2004 and as specified in the BDS.

24. Confidentiality

24.1. 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.

25. Clarification of Bids

25.1. Clarification of Bidding Documents shall be carried out in accordance with Rule 31 of the Public Procurement Rules, 2004.

25.2. 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:

- 25.2.1. evaluation & qualification criteria;
- 25.2.2. required scope of work;
- 25.2.3. contract price;
- 25.2.4. all securities requirements;
- 25.2.5. tax requirements;
- 25.2.6. terms and conditions of bidding documents.
- 25.2.7. change in the ranking of the bidder

26. Preliminary Examination of Bids

26.1. Prior to the detailed evaluation of bids, the Procuring agency/Employer will determine whether each bid:

- 26.1.1. meets the eligibility criteria defined in **ITB 3** and **ITB 4**;
- 26.1.2. has been prepared as per the format and contents defined by the Procuring agency/Employer in the bidding documents;
- 26.1.3. has been properly signed;

26.1.4. is accompanied by the required securities; and

26.1.5. 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.

26.2. 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: -

26.2.1. affects in any substantial way the scope, quality, or performance of the Works;

26.2.2. limits in any substantial way, inconsistent with the bidding documents, the Procuring agency/Employer's rights or the bidders' obligations under the Contract; or

26.2.3. if rectified, would affect unfairly the competitive position of other bidders presenting substantially responsive bids.

26.3. The Procuring agency/Employer will confirm that the documents and information specified under ITB 9, 10 and 11 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.

26.4. 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 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 –

26.4.1. Submit the number of copies of signed bids required by the invitation;

26.4.2. Furnish required information concerning the number of its employees;

26.4.3. 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.

26.5. 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.

26.6. 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.

26.7. 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.

27. Examination of Terms and Conditions; Technical Evaluation

27.1. The Procuring agency/Employer shall examine the bid to confirm that all terms and conditions specified in the **GCC** and the **PCC** 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.

27.2. The Procuring agency/Employer shall evaluate the technical aspects of the bid submitted in accordance with ITB 30, to confirm that all requirements specified in Section VI – Works Requirement, Technical Specifications of the Bidding Documents have been met without material deviation or reservation.

27.3. 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 27, it shall reject the bid.

28. Correction of Arithmetic Errors

28.1. Bids determined to be substantially responsive will be checked for any arithmetic errors. Errors will be corrected as follows: -

28.1.1. 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;

28.1.2. 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

28.1.3. where there is a discrepancy between the amounts in figures and in words, the amount in words will govern.

28.1.4. 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.

28.2. 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 41.3**.

29. Conversion to Single Currency

29.1. 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. Comparison of bids quoted in different currencies and conversion of bids into a single currency shall be carried out in accordance with Rule 30(2) of the Public Procurement Rules, 2004.

30. Evaluation of Bids

30.1. The Procuring agency/Employer shall evaluate and compare only the bids determined to be substantially responsive, pursuant to **ITB 27**.

30.2. 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.

30.3. The Procuring agency/Employer's evaluation of a bid will take into account:

30.3.1. 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;

30.3.2. converting the amount resulting from applying above, if relevant, to a single currency in accordance with ITB 29;

30.4. 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.

30.5. 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**.

30.6. If the bid, which results in the Evaluated Bid Price (Successful 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:

"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.

31. Domestic Preference

31.1. 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.

32. Determination of Successful Bid

32.1. The Procuring agency/Employer shall compare the evaluated bids in accordance with the predefined bidding procedure, of all substantially responsive bids to determine the Successful bidder.

33. Qualification of Bidder

33.1. The Procuring agency/Employer shall determine to its satisfaction whether the bidder is substantially responsive and whose bid is declared as Successful bid either continues to meet (if prequalification applies) or meets (if post-qualification applies) the qualifying criteria specified in Evaluation and Qualification Criteria.

Note: In case of international bidding, the parameters for incorporation or licensing within Pakistan may be fulfilled as part of post qualification.

33.2. The determination shall be based upon an examination of the documentary evidence of the bidder's qualifications submitted by the bidder, pursuant to **ITB 11**.

33.3. 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.

34. Sub-Contractors

34.1. 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.

34.2. Bidders may propose sub-contracting up to the percentage of total value of contracts or the volume of works as specified in the **BDS**.

35. **Abnormally Low Financial Bid**

35.1. A procuring Agency may reject abnormally low bids. 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. Moreover, the Procuring agency/Employer shall not incur any liability solely by rejecting abnormally bid

Guidance for Procuring agency/Employer:

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. In order to identify the Abnormally Low Bid (ALB) following approaches can be considered to minimize the scope of subjectivity:

35.1.1. Comparing the bid price with the cost estimate;

35.1.2. Comparing the bid price with the bids offered by other bidders submitting substantially responsive bids; and

35.1.3. Comparing the bid price with prices paid in similar contracts in the recent past either government- or development partner-funded.

35.2. The Procuring agency/Employer will determine to its satisfaction whether the bidder that is selected as having submitted the successful bid is qualified to perform the contract satisfactorily, in accordance with the criteria listed in **ITB 11**

35.3. 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 11**, 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.

35.4. 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.

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.

35.5. 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

36. **Criteria of Award**

36.1. 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 Successful Bidder, provided that such bidder has been determined to be:

36.1.1. eligible in accordance with the provisions of **ITB 3**;

36.1.2. is determined to be qualified to perform the Contract satisfactorily;
and

36.1.3. Successful negotiations have been concluded, if any.

37. **Negotiations**

37.1. The Committee of the Procuring agency/Employer may negotiate with the Most Advantageous Bidder relating to the following areas:

37.1.1. a minor alteration to the technical (drawings, design technical specifications) details of the statement of works;

37.1.2. Methodology, work plan, staffing in view to streamline the work;

37.1.3. a minor amendment to the Particular conditions of Contract;

37.1.4. finalizing payment arrangements;

37.1.5. clarifying details that were not apparent or could not be finalized at the time of Bidding;

37.2. 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.

38. Procuring agency's Right to reject All Bids

38.1. The procuring agency has the right to reject all bids in accordance with Rule 33 of the Public Procurement Rules, 2004. However, the Authority (i.e. **PPRA**) may call from the Procuring agency/Employer the justification of those grounds.

39. Notification of Award

39.1. The procuring agency shall announce and publish the evaluation result in accordance with Rule 35 of the Public Procurement Rules, 2004.

39.2. 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 through EPADS. However, the Procuring agency/Employer shall not award any procurement contract at least for five (05) days after the announcement of final evaluation report. 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).

39.3. 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 41** and signing of the contract in accordance with **ITB 40**.

39.4. Upon the successful bidder's furnishing of the performance security (or guarantee) pursuant to **ITB 41**, 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 17**.

40. Signing of Contract

40.1. 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.

40.2. 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.

40.3. Where no formal signing of a contract is required, work order issued to the bidder shall be construed to be the contract.

41. Performance Security (or Guarantee)

41.1. 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 PCC, denominated in the type and proportions of currencies in the Letter of Acceptance and in accordance with the Conditions of Contract.

41.2. 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:

41.2.1. certified cheque, cashier's or manager's cheque, or bank draft;

41.2.2. 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;

41.2.3. bank guarantee confirmed by a reputable local bank or, in the case of a successful foreign bidder, bonded by a foreign bank; or

41.2.4. surety bond callable upon demand issued by any reputable surety or insurance company.

Any Performance Guarantee submitted shall be enforceable in Pakistan.

41.3. Failure of the Most Advantageous Bidder to comply with the requirement of **ITB 40** 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 reinitiate the procurement process afresh (as a case may be).

42. **Advance Payment**

42.1. 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.

42.2. 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 **PCC**.

43. General Performance of the Bidders

43.1. 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.

44. Corrupt & Fraudulent Practices

44.1. 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

45. Grievance Redressal

45.1. Grievance Redressal shall be carried out in accordance with Rule 48 of the Public Procurement Rules, 2004 i.e. Redressal of grievances by the procuring agency and “Redressal of Grievances Regulations 2021”.

H. MECHANISM OF BLACKLISTING

46. Mechanism of Blacklisting

46.1. The Procuring agency/Employer shall proceed Blacklisting of Bidders/Contractors in accordance with Rule 19 of the Public Procurement Rules, 2004 i.e. Blacklisting and “Blacklisting and Debarment of Bidders or Contractors Regulations 2024.



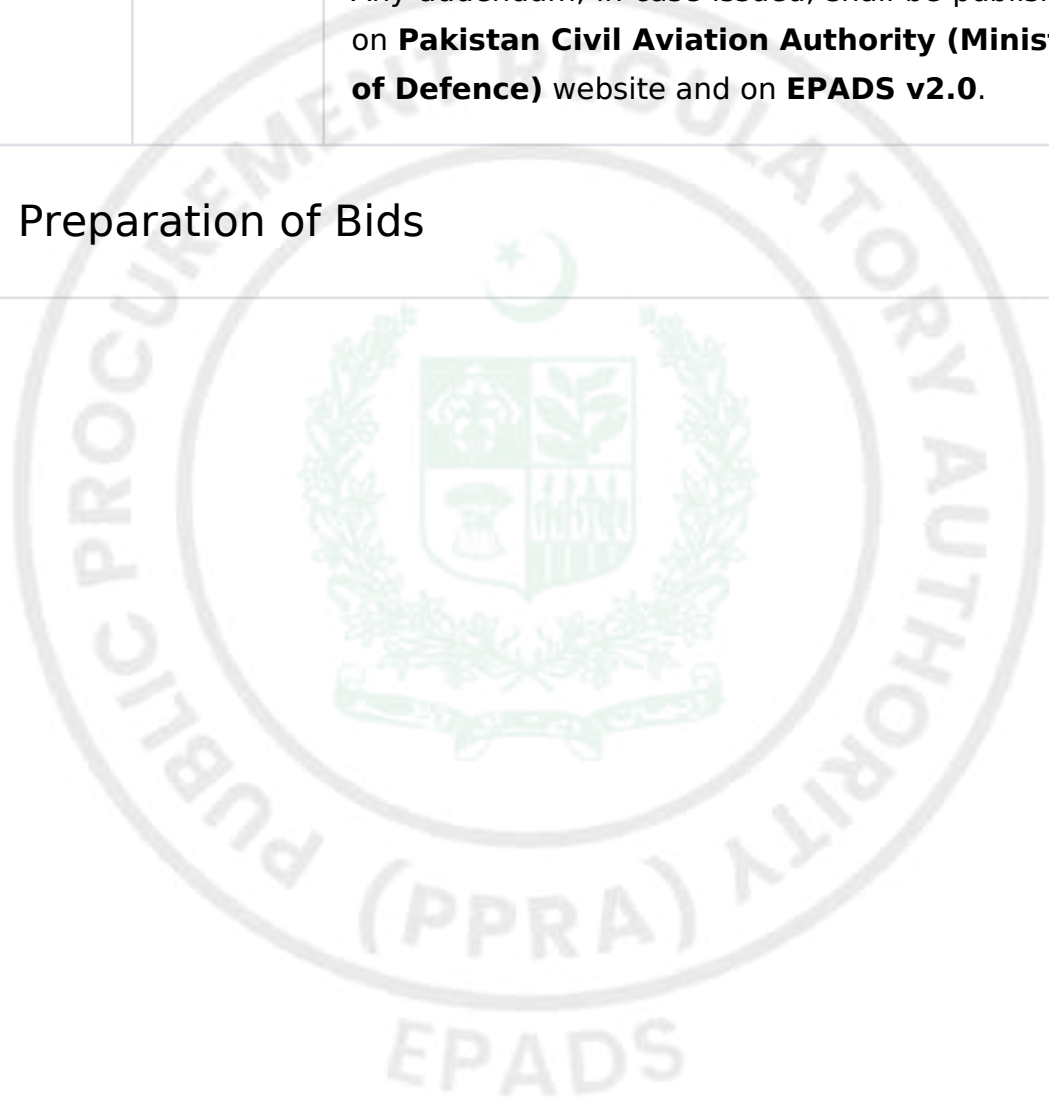
Bid Data Sheet

Bids Data Sheet (BDS)

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

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:Pakistan Civil Aviation Authority (Ministry of Defence) The subject of procurement is:Tender for Construction of New Building for PEL Examination Center, Karachi (Re-Tender) Expected commencement date: Wednesday, September 30, 2026
2.	2.1	Financial year for the operations of the Procuring Agency:2026-27 Name and identification number of the Contract: P78226
3.	3.1	JV/Consortium or Association Allowed: No Number of JV/Consortium Members: Nil
B. Bidding Documents		

4.	6.2 & 6.4	The Bidders may seek clarifications through EPADS v2.0: Clarification Date: Monday, August 10, 2026 Pre-Bid Meeting: Tuesday, August 11, 2026 12:00 PM Venue: Headquarter Pakistan Civil Aviation Authority B-6, KDA Scheme-1, Karsaz, Karachi
5.	7.2	Any addendum, in case issued, shall be published on Pakistan Civil Aviation Authority (Ministry of Defence) website and on EPADS v2.0.
C. Preparation of Bids		



6.

8.1

List of documents required along with the bid:

1. i. The Bidder applying must have a valid registration with the Pakistan Engineering Council (PEC) in Constructor's Category C-4 or above. (Provide copy of valid PEC registration)
The Bidder must also be registered by the Pakistan Engineering Council within the Discipline / specialization Codes CE-10, CE-11 and EE-11. (Provide copy of valid PEC registration)
2. ii. The Bidder must be registered with Income Tax Department / FBR. (Provide copy of Income Tax/ FBR registration and tax returns for last three years). The bidder's name appears on the Active Taxpayers List (ATL) issued by the Federal Board of Revenue (FBR) from time to time.
3. iii. The Bidder must provide audited financial statement, audited by chartered accountant for the last 3 years.
4. iv. The Bidder is not black listed by PEC, PPRA, SPPRA or any Government, semi government or autonomous body. (Provide affidavit on Rs. 100 stamp paper).
5. v. An affidavit to the effect that all documents / particulars / information given with this bid document are true. Dis-Qualification of the Bidder (Applicant), "The Employer shall disqualify a contractor if it finds, at any time, that the information submitted by him concerning his qualification as contractor was false and materially inaccurate or incomplete." (Provide affidavit on Rs. 100 stamp paper).
6. vi. An affidavit to the effect that the firm is not presently involved nor has been in the past in litigation with the Employer/Government

7.	9.1	The qualification criteria to establish the supply / production capability of the bidder. <i>see Eligibility Criteria</i>
8.	11.2	Works and Their related documents: <i>See section Required Scope of Work</i>
9.	11.1	Price schedule will be provided according to the format defined and acquired. <i>see section price schedule.</i>
10.	11.4	Specifications: <i>see section of specifications.</i>
11.	11.5 & 13.5	The price shall be Fixed . The bid price shall be adjusted in accordance with Appendix provided - Formula for Price Adjustment.
12.	14.1	Currency of the Bids shall be : PKR
13.	16.1	The Bids/Bid Validity period shall be: 120 Days
14.	17.1	The amount of Bid Security shall be as defined in Bid Security Section for items and lots given in BDS 6
15.	17.2	The Bid Security shall be in the form of: Pay Order
16.	15.1	Alternative Bids to the requirements of the bidding documents will not be permitted.

D. Submission of Bids

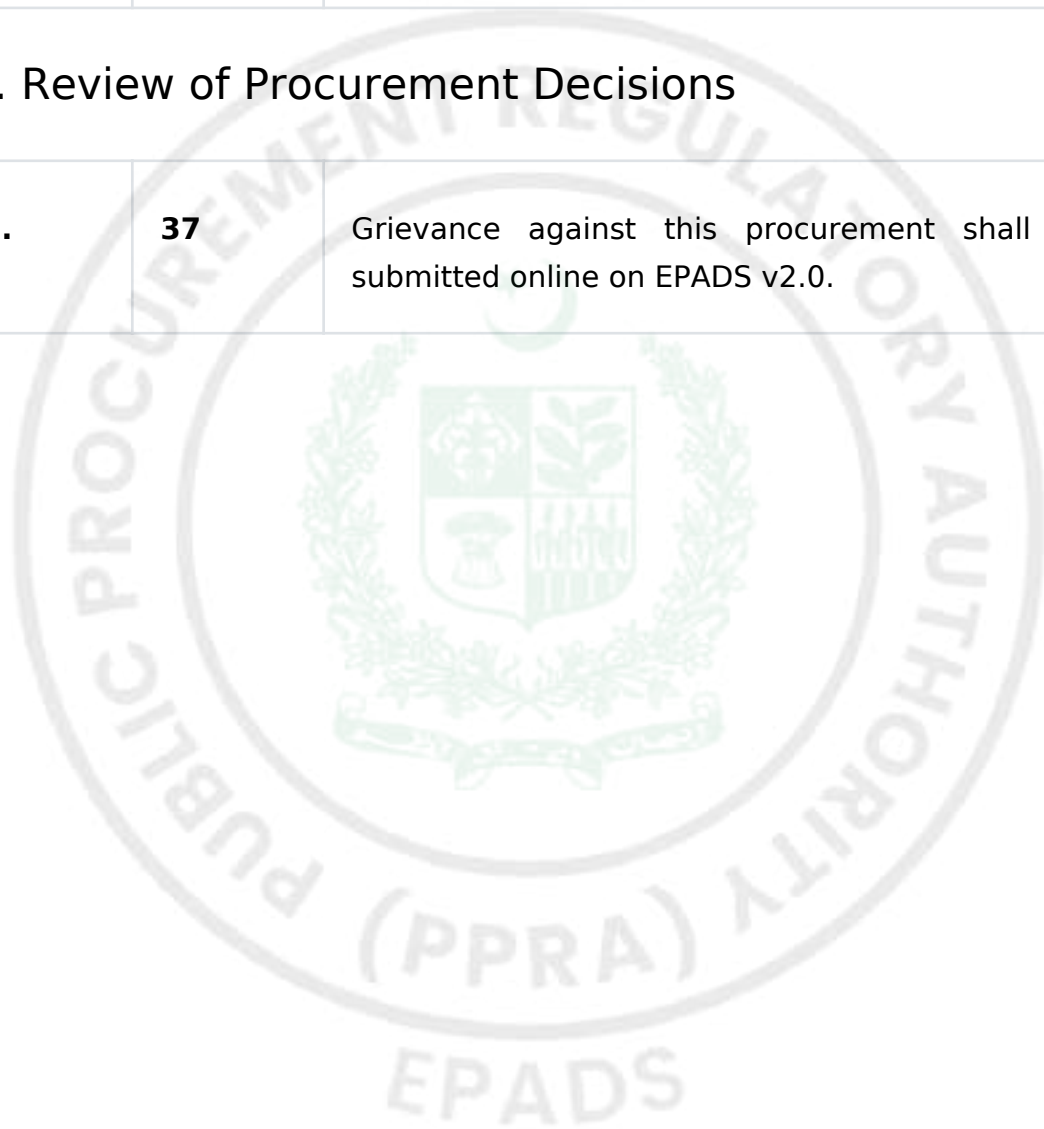
17.	18.1 & 21.1	Bid shall be submitted online on EPADS v2.0 whereas hard copy of the bid security should be submitted to the following; Headquarter Pakistan Civil Aviation Authority B-6, KDA Scheme-1, Karsaz, Karachi Bids that are not submitted on EPADS v2.0 shall be disqualified. The deadline for Bids submission is: Wednesday, August 26, 2026 11:00 AM
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E. Opening and Evaluation of Bids

18.	24.1	The Bids opening shall take place on EPADS v2.0. Day : Wednesday Date: August 26, 2026 Time : 11:30 AM
19.	30.2	Selection technique adopted will be: Least Cost Based Selection (LCBS) <i>see Evaluation Criteria</i>

F. Award of Contract

20.	41.1 & 41.2	The Performance guarantee shall: 10.00%. The Performance Guarantee shall be acceptable in the form of:Pay Order, Call at Deposit, Bank Guarantee
21.	45.1	Arbitrator shall be appointed by mutual consent of the both parties.
G. Review of Procurement Decisions		
22.	37	Grievance against this procurement shall be submitted online on EPADS v2.0.



Eligibility Criteria

Bidder's Type	Required Registration
Individual / Individual Consultant	NADRA CITIZENSHIP (CNIC/NICOP)
Sole Proprietorship	FBR (NTN)
Partnership Firm	FBR (GSTN)
Company (Private Limited)	SECP
Company (Public Limited)	PEC
Company (Holding Company)	
Company (Limited by Guarantee)	
State Owned Enterprise (Private Limited)	
State Owned Enterprise (Public Limited)	

Evaluation Criteria

Least Cost Based Selection (LCBS)

Technical Marks	100
Passing Marks	60
Experience : Each contract shall be counted only once under the highest applicable contract-value category	
General Construction Experience: (Qualitative)(Doc Required) Provide list of construction contracts successfully completed during the last 7 years give name of project, name of Employer, start and completion dates, contract value etc. Its mandatory to provide completion certificates for each completed construction contract (10) 1 to 3 Construction Contracts having value Rs 100 Million or above 2 Marks each (6) 1 to 3 Construction Contracts having value Rs 80 Million or above 1 Mark each (3) 1 Construction Contracts having value Rs 50 Million or above 1 Mark (1)	10

Carried out similar projects: (Qualitative)(Doc Required) Contracts during last 05 years of similar nature (building works) and complexity completed. (Its mandatory to provide completion certificates for each completed construction contract, in the completion certificate it must be mentioned name of project, contract value, date of start and date of completion) (20) 1-3 Contracts or more each having value Rs 80 Million or above 4 Marks each (12) 1-4 Contracts each having value Rs 50 Million or above 2 Marks each (8)	20
Projects in Hand (Qualitative)(Doc Required) Provide list of construction contracts in hand give name of project, name of Employer, start and tentative completion dates, contract value etc. It's mandatory to provide Work Order for each contract). (5) 1 Contracts or more each having value Rs 80 Million or above (3) 1-2 Contracts or more each having value Rs 50 Million or above 1 Mark each (2)	5
Personnel	
Project Manager and Construction Manager (Qualitative)(Doc Required) BE Civil registered with PEC (Attach copies of Degrees & PEC) Overall General experience 10 years or more in civil works Specific Experience 5 years or more for construction of Buildings (4)	4
Site Engineer (Qualitative)(Doc Required) BE, Civil registered with PEC (Attach copies of Degrees & PEC) Overall General experience 10 years or more as Site Engineer Specific Building Experience 5 years or more (3)	3

Electrical Engineer (Qualitative)(Doc Required) BE Electrical registered with PEC (Attach copies of Degrees & PEC) Overall 5 years' experience in similar works as electrical engr 3 - 5 years' experience in similar works (2)	2
Quantity Surveyor (Qualitative)(Doc Required) BE/MSc Civil 5 years or more overall experience in building construction 2-4 years' experience in building construction (2)	2
Site Inspector (Civil) (Qualitative)(Doc Required) Diploma in Civil Technology(Attach copy of Diploma) 5 years or more overall Experience in Building construction 2-4 years' experience in Building construction (2)	2
HSE Inspector (Qualitative)(Doc Required) Diploma in Civil Technology or Relevant Certificate 5 years or more overall Experience in Building construction 2-4 years' experience in Building construction (2)	2
Equipment	

Equipment (The allocation of Marks shall be on Pro-rata basis if requirement equipment(s) are insufficient (Qualitative)(Doc Required) a. Excavators /Excavation Equipment (2 or more in full working conditions b. Dumpers (1-2 number or more in full working condition c. Concrete Mixer / batching arrangement (1-2 numbers or more) d. Vibrators (upto 4 in full working condition) e. Survey Equipment /Testing Equipment (2 sets in full working condition). (10) a. Excavators /Excavation Equipment (1 in full working conditions b. Dumpers (1 in full working condition c. Concrete Mixer / batching arrangement (1 in working condition) d. Vibrators (Less than 3 full working condition) e. Survey Equipment /Testing Equipment (Less than 2 sets in full working condition). (3)	10
Financial Capability	
Annual average Construction Turn Over, avg. last 3 years (Qualitative)(Doc Required) More than Rs. 200 Million (10) Rs. 150 to Rs. 200 Million (7) Rs. 100 to Rs. 150 Million (5) Rs. 50 to Rs. 100 Million Less than Rs. 50 Million ---- 0 (3)	10
Working Capital (avg. for last three year) (Qualitative)(Doc Required) More than Rs. 150 Million (10) Rs 100 to Rs. 150 Million (7) Rs. 40 to Rs. 100 Million Less than Rs. 40 Million -- 0 (5)	10

Marking for Detail Work understanding and approach	
SITE ORGANIZATION i. Team Organization chart (1 Marks) ii. Staff Duty Matrix (1 Marks) iii. Staffing Schedule (1 Marks) iv. Communication & Reporting Lines (1 Marks) (Qualitative)(Doc Required)	4
METHOD STATEMENT i. Sequence of Construction Activities (1 Marks) ii. Safety plan (1 Marks) iii. QA / QC Procedures (1 Marks) iv. Sub-contractors & Machinery Management (1 Marks) (Qualitative)(Doc Required)	4
MOBILIZATION SCHEDULE i. Resource Mobilization with Timeframe (1 Marks) ii. Machinery & Equipment Mobilization (1 Marks) iii. Site Setup & Utilities (1 Marks) iv. Risk mitigation (1 Marks) (Qualitative)(Doc Required)	4
CONSTRUCTION SCHEDULE i. Project timeline (Gantt chart) (1 Marks) ii. Block-wise Work Plan (1 Marks) iii. Phasing & Scheduling (1 Marks) iv. Progress Monitoring & Updating (using IT tools) (1 Marks) (Qualitative)(Doc Required)	4
CONSTRUCTION CAMP AND HOUSING FACILITIES i. Camp Layout & Drawings (1 Marks) ii. Health & Safety / Medical Facilities (1 Marks) iii. Operational Facilities (1 Marks) iv. Accommodation & Furnishing (1 Marks) (Qualitative)(Doc Required)	4

Jobs/Lots

Lot Title : Construction of New Building for PEL Examination Center, Karachi

Bid Security : 2000000 PKR

Job	Delivery Schedule	Quantity
Lot 1: Civil	Address: HeadquarterPakistan Civil Aviation AuthorityB-6, KDA Scheme-1, Karsaz,Karachi Schedule: Within 08 Months after signing of Contract Agreement Quantity: 1/job	1/job

Job	Delivery Schedule	Quantity
Lot 2: E/M Works	Address: HeadquarterPakistan Civil Aviation AuthorityB-6, KDA Scheme-1, Karsaz,Karachi Schedule: Within 08 Months after signing of Contract Agreement Quantity: 1/job	1/job



Related Services :

No



Work Specifications and Market Rates

Lot Title: Construction of New Building for PEL Examination Center, Karachi

Specifications / Requirements:

Sr. No	Ref. No.	Description	Unit	Qty	Rate		Amount
1	---	Construction of New Building for PEL Examination Center, Karachi As per the BoQ attached as Annexure to this Document	1	Job	48137640	(Rupees Forty Eight Million One Hundred thirty Seven Thousand Six Hundred and Forty)	48137640
						GRAND TOTAL:	Rs48,137,640.00

Scope of Work

Scope of Works

Construction of New Building for PEL Examination Center Karachi

The Pakistan Civil Aviation Authority (PCAA) intends to construct a purpose-built, technologically advanced, and secure Personnel Licensing (PEL) Examination Centre at its Regulatory Block premises, HQCAA, Karachi. The proposed facility is to be developed as a two-storey reinforced concrete building with an approximate covered footprint area of 2,473 square feet, designed and constructed in accordance with UKCAAi Guidance on Examination Venue and IT Specifications, applicable ICAO requirements, Pakistan Building Code, and all relevant international engineering and safety standards. The scope of works shall include, but not necessarily be limited to, the following:

1. Civil & Structural Works

- Construction of a two-storey reinforced concrete (RCC) building comprising foundations, columns, beams, slabs, staircases, and roofing system in accordance with approved structural drawings and Pakistan Building Code.
- Masonry, plastering, waterproofing, and all associated civil works including earthworks, excavation, backfilling, and compaction.

2. Architectural & Finishing Works

- Complete architectural fit-out of all functional spaces including examination halls, reception, waiting lounge, invigilator rooms, server room, administrative offices, cafeteria, and male/female/accessible toilet blocks.

- Internal and external finishes comprising flooring, wall finishes, false ceilings, acoustic treatment, doors, windows, glazing, joinery, signage, and furniture as per approved finish schedule and interior design drawings.

3. HVAC & Mechanical Works

- Supply, installation, and commissioning of centralized or split-type air conditioning, ventilation, and exhaust systems throughout the building including dedicated precision cooling for the server room.

4. Electrical Works

- Complete internal power distribution system including main panel, DBs, wiring, energy-efficient LED lighting, earthing, and lightning protection.
- Supply and installation of emergency power systems comprising diesel generator and UPS with automatic changeover facility.

5. Plumbing, Drainage & Sanitary Works

- Complete water supply, distribution, sanitary, soil, waste, and grey water drainage systems including underground and overhead storage tanks, sanitary fixtures, and connection to existing campus infrastructure.

6. Fire Protection & Life Safety Works

- Supply, installation, and commissioning of addressable fire alarm, smoke detection, fire suppression, emergency exit lighting and fire extinguisher systems in compliance with applicable safety standards.

7. ICT, Security & Surveillance Works

- Supply, installation, and commissioning of structured cabling (LAN/WAN), IP CCTV surveillance, biometric access control, audio-visual examination monitoring systems, server room fit-out, and physical security measures including secure doors and turnstiles.

8. External Development Works

- Paved parking, driveways and pedestrian pathways.

9. Health, Safety & Environmental (HSE) Compliance

- Implementation of all HSE standard practices, site safety measures, dust/noise/waste management, and compliance with PCAA campus security and operational protocols throughout the construction period.

Price Schedule

For Individual Jobs

#	Job Title	Quantity	Unit Price (PKR)	Total Price (PKR)	Delivery Location	Delivery Period / Year	Country of Origin
1							
2							

For Lots

#	Lot Title	Total Lot Price (PKR)	Country of Origin
1	[Lot 1 Title]		





General Conditions of Contract

A. General

1. Definitions

1.1. Unless the context otherwise requires, the following terms whenever used in this Contract shall have the same meaning and shall be interpreted as indicated

1.1.1. “Applicable Law” means the laws and any other instruments having the force of law in the Government’s Country, or in such other country as may be specified in the Special Conditions of the Contract (SC), as they may be issued and in force from time to time;

1.1.2. “The Contract” means an agreement enforceable by law;

1.1.3. “The Contract Price” means the price payable to the Contractor under the Contract for the full and proper performance of its contractual obligations;

1.1.4. “The Services” means the work to be performed by the Contractor pursuant to this Contract and as prescribed in the Specifications and Schedule of Activities included in the Contractor’s Bid;

1.1.5. “Ancillary Services” means those services ancillary to the provision of Services, such as transportation and insurance, and any other incidental services, such as installation, commissioning, provision of technical assistance, training, and other such obligations of the Contractor covered under the Contract;

1.1.6. “GCC” means the General Conditions of Contract contained in this section;

1.1.7. “SCC” means the Special Conditions of Contract by which the GCC may be amended or supplemented;

1.1.8. “Day” means calendar day unless indicated otherwise;

1.1.9. “Effective Date” means the date on which this Contract comes into force and effect;

1.1.10. “The Contractor” means the individual or corporate body whose Bids to provide the Services has been accepted by the Procuring Agency;

1.1.11. “The Project Site,” where applicable, means the place or places named in Bid Data Sheet and technical Specifications;

1.1.12. “Government” means the Government of Pakistan;

1.1.13. “Local Currency” means the currency of Pakistan;

1.1.14. “In Writing” means communicated in written form with proof of receipt;

1.1.15. “Completion Date” means the date of completion of the Services by the Contractor as certified by the Procuring Agency;

1.1.16. “Foreign Currency” means any currency other than the currency of the country of the Procuring Agency;

1.1.17. "Party" means the Procuring Agency or the Contractor, as the case may be, and "Parties" means both of them;

1.1.18. "Service" means any object of procurement other than goods or works;

1.1.19. "Subcontractor" means any entity to which the Bidder subcontracts any part of the Services.

2. Applicable Law

2.1. The contract shall be governed and interpreted in accordance with the laws of Pakistan, unless otherwise specified in SCC.

3. Language

3.1. The Contract as well as all correspondence and documents relating to the Contract exchanged between the Contractor and the Procuring Agency, shall be written in the **English language** unless otherwise stated in the SCC. Supporting documents and printed literature that are part of the Contract may be in another language provided these are accompanied by an accurate translation of the relevant passages in English, in which case, for purposes of interpretation of the Contract, this translation shall govern.

4. Notices

4.1. Any notice, request, or consent made pursuant to this Contract shall be in writing and shall be deemed to have been made when delivered in person to an authorized representative of the Party to whom the communication is addressed, or when sent by registered mail, telex, telegram, or facsimile to such Party at the address specified in the SCC.

5. Location

5.1. The Services shall be performed at such locations as the Procuring Agency may approve and as specified in SCC.

5.2. A {DOCUMENTS}

6. Authorized Representatives / Authority of Member in charge

6.1. Any action required or permitted to be taken, and any document required or permitted to be executed, under this Contract by the Procuring Agency or the Contractor may be taken or executed by the officials specified in the SCC.

B. Commencement, Completion, Modification, and Termination of Contract

7. Effectiveness of Contract

7.1. This Contract shall come into effect on the date the Contract is signed by both parties and such other later date as may be stated in the SCC.

8. Commencement of Services

8.1. The Contractor shall confirm availability of Key Experts and begin carrying out the Services not later than the number of days after the Effective Date specified in the SCC.

9. Program schedule

9.1. Before commencement of the Services, the Contractor shall submit to the Procuring Agency for approval a Program showing the general methods, arrangements, order and timing for all activities. The Services shall be carried out in accordance with the approved Program as updated.

10. Starting Date/Expiration Date

10.1. The Contractor shall start carrying out the Services Five (05) days after the date the Contract becomes effective, or at such other date as may be specified in the SCC.

10.2. Unless terminated earlier pursuant to Clause **GCC 14** hereof, this Contract shall expire at the end of such time period after the Effective Date as specified in the SCC.

11. Entire Agreement

11.1. This Contract contains all covenants, stipulations and provisions agreed by the Parties. No agent or representative of either Party has authority to make, and the Parties shall not be bound by or be liable for, any statement, representation, promise or agreement not set forth herein.

12. Modification

12.1. Any modification or variation of the terms and conditions of this Contract, including any modification or variation of the scope of the Services, may only be made by written agreement between the Parties. However, each Party shall give due consideration to any modification(s) or variation(s) made by the other Party.

12.2. In cases of any modification(s) or variation(s), the prior written consent of the Procuring Agency is required.

13. Force Majeure

13.1. Definition

For the purposes of this Contract, "Force Majeure" means an event which is beyond the reasonable control of a Contractor and which makes a Contractor's performance of its obligations under the Contract impossible or so impractical as to be considered impossible under the circumstances.

13.2. No Breach of Contract

The failure of a Party to fulfill any of its obligations under the contract shall not be considered to be a breach of, or default under, this Contract in so far as such inability arises from an event of Force Majeure, provided that the Party affected by such an event (a) has taken all reasonable precautions, due care and reasonable alternative

measures in order to carry out the terms and conditions of this Contract, and (b) has informed the other Party as soon as possible about the occurrence of such an event.

13.3. Extension of Time

Any period within which a Contractor shall, pursuant to this Contract, complete any action or task, shall be extended for a period equal to the time during which such Party was unable to perform such action as a result of Force Majeure.

13.4. Payments

During the period of their inability to perform the Services as a result of an event of Force Majeure, the Contractor shall be entitled to continue to be paid under the terms of this Contract, as well as to be reimbursed for additional costs reasonably and necessarily incurred by them during such period for the purposes of the Services and in reactivating the Service after the end of such period.

14. Termination

14.1. By the Procuring Agency

The Procuring Agency may terminate this Contract in case of the occurrence of any of the events specified in paragraphs (a) through (e) of this Clause. In such an occurrence the Procuring Agency shall give at least thirty (30) calendar days' written notice of termination to the Contractor in case of the events referred to in (a) through (d); at least sixty (60) calendar days' written notice in case of the event referred to in (e);

14.1.1. If the Contractor fails to remedy a failure in the performance of its obligations hereunder, as specified in a notice of suspension;

14.1.2. If the Contractor becomes (or, if the Contractor consists of more than one entity, if any of its members becomes) insolvent or bankrupt or enter into any agreements with their creditors for relief of debt or take advantage of any law for the benefit of debtors or go into liquidation or receivership whether compulsory or voluntary;

14.1.3. If the Contractor fails to comply with any final decision reached as a result of arbitration proceedings;

14.1.4. If, as the result of Force Majeure, the Contractor is unable to perform a material portion of the Services for a period of not less than sixty (60) calendar days;

14.1.5. If the Procuring Agency, in its sole discretion and for any reason whatsoever, decides to terminate this Contract;

14.2. By the Contractor

The Contractor may terminate this Contract, by not less than thirty (30) calendar days' written notice to the Procuring Agency, in case of the occurrence of any of the events specified in paragraphs (a) through (d) of this Clause.

14.2.1. If the Procuring Agency fails to pay any money due to the Contractor pursuant to this Contract and not subject to dispute within forty-five (45) calendar days after receiving written notice from the Contractor that such payment is overdue;

14.2.2. If, as the result of Force Majeure, the Contractor is unable to perform a material portion of the Services for a period of not less than sixty (60) calendar days;

14.2.3. If the Procuring Agency fails to comply with any final decision reached as a result of arbitration;

14.2.4. If the Procuring Agency is in material breach of its obligations pursuant to this Contract and has not remedied the same within forty-five (45) days (or such longer period as the Bidder may have subsequently approved in writing) following the receipt by the Procuring Agency of the Contractor's notice specifying such breach.

C. Obligations of the Contractor

15. General

15.1. Standard of Performance

15.1.1. The Contractor shall perform the Services and carry out the Services with all due diligence, efficiency and economy, in accordance with generally accepted professional standards and practices, and shall observe sound management practices, and employ appropriate technology and safe and effective equipment, machinery, materials and methods. The Contractor shall always act, in respect of any matter relating to this Contract or to the Services, as a faithful adviser to the Procuring Agency, and shall at all times support and safeguard the Procuring Agency's legitimate interests in any dealings with the third parties;

15.1.2. The Contractor shall employ and provide such qualified and experienced Experts and Sub-Contractors as are required to carry out the Services.

15.2. Law Applicable to Services

The Contractor shall perform the Services in accordance with the Contract and in accordance with the Law of Pakistan and shall take all practicable steps to ensure that any of its Experts and Sub-Bidders, comply with the Applicable Law.

16. Conflict of Interests

16.1. Contractor Not to Benefit from Commissions and Discounts

The remuneration of the Contractor shall constitute the Contractor's sole remuneration in connection with this Contract or the Services, and the Contractor shall not accept for their own benefit any trade commission, discount, or similar payment in connection with activities pursuant to this Contract or to the Services or in the discharge of their obligations under the Contract, and the Contractor shall use their best efforts to ensure that the Personnel, any Subcontractors, and agents of either of them similarly shall not receive any such additional remuneration.

16.2. Contractor and Affiliates Not to be Otherwise Interested in Project

The Contractor agree that, during the term of this Contract and after its termination, the Contractor and its affiliates, as well as any Subcontractor and any of its affiliates, shall be disqualified from providing Services (other than the Services and any continuation thereof) for any project resulting from or closely related to the Services.

16.3. Prohibition of Conflicting Activities

Neither the Bidder nor its Subcontractors nor the Personnel shall engage, either directly or indirectly, in any of the following activities:

16.3.1. during the term of this Contract, any business or professional activities in the Government's country which would conflict with the activities assigned to them under this Contract;

16.3.2. during the term of this Contract, neither the Contractor nor their Subcontractors shall hire public employees in active duty or on any type of leave, to perform any activity under this Contract;

16.3.3. after the termination of this Contract, such other activities as may be specified in the SCC.

17. Insurance to be Taken Out by the Contractor

17.1. The Contractor(a) shall take out and maintain, and shall cause any Subcontractors to take out and maintain, at its (or the Sub-contractors', as the case may be) own cost but on terms and conditions approved by the Procuring Agency, insurance against the risks, and for the coverage, as shall be specified in the SCC; and (b) at the Procuring Agency's request, shall provide evidence to the Procuring Agency showing that such insurance has been taken out and maintained and that the current premiums have been paid.

18. Contractor's Actions Requiring Procuring Agency's Prior Approval

18.1. The Contractor shall obtain the Procuring Agency's prior approval in writing before taking any of the following actions:

18.1.1. appointing such members of the Personnel not provided by the Contractor;

18.1.2. changing the Program of activities; and

18.1.3. any other action that may be specified in the SCC.

19. Reporting Obligations

19.1. The Contractor shall submit to the Procuring Agency the reports and documents in the numbers, and within the periods as prescribed by the Procuring Agency.

20. Liquidated Damages

20.1. Payments of Liquidated Damages

The Contractor shall pay liquidated damages to the Procuring Agency at the rate per day stated in the SCC for each day that the Completion Date is later than the Intended Completion Date. The total amount of liquidated damages shall not exceed the amount defined in the SCC. The Procuring Agency may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages shall not affect the Contractor's liabilities.

20.2. Correction for Over-payment

If the Intended Completion Date is extended after liquidated damages have been paid, the Procuring Agency shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate. The

Contractor shall be paid interest on the overpayment, calculated from the date of payment to the date of repayment, at the rates specified in SCC.

20.3. Lack of performance penalty

If the Contractor has not corrected a Defect within the time specified in the Procuring Agency's notice, a penalty for Lack of performance will be paid by the Contractor. The amount to be paid will be calculated as a percentage of the cost of having the Defect corrected, assessed as specified in the Contractor

21. Performance Guarantee

21.1. Within the time stipulated in the acceptance letter from the Procuring Agency, the successful Bidder shall furnish the Performance Guarantee in shape and amount **specified in SCC.**

21.2. The proceeds of the Performance Guarantee shall be payable to the Procuring agency as compensation for any loss resulting from the Supplier's failure to complete its obligations under the Contract.

21.3. The Performance Guarantee shall be denominated in the currency of the Contract, or in a freely convertible currency acceptable to the Procuring agency and shall be in the acceptable form as specified in SCC.

21.4. The Performance Guarantee will be discharged by the Procuring agency and returned to the Supplier not later than thirty (30) days following the date of completion of the Supplier's performance obligations under the Contract, including any warranty obligations, unless otherwise **specified in SCC.**

22. Sustainable Procurement

22.1. The Contractor shall conform to the sustainable procurement contractual provisions, if and as specified in the SCC.

D. Contractor's Personnel

23. Description of Personnel

23.1. The titles, agreed job descriptions, minimum qualifications, and estimated periods of engagement in the carrying out of the Services of the Contractor's Key Personnel. The Key Personnel listed by title as well as by name are hereby approved by the Procuring Agency.

24. Removal and / or Replacement of Personnel

24.1. Except as the Procuring Agency may otherwise agree, no changes shall be made in the Key Personnel. If, for any reason beyond the reasonable control of the Contractor, it becomes necessary to replace any of the Key Personnel, the Contractor shall provide as a replacement a person of equivalent or better qualifications.

24.2. If the Procuring Agency finds that any of the Personnel have (i) committed serious misconduct or have been charged with having committed a criminal action, or (ii) have reasonable cause to be dissatisfied with the performance of any of the Personnel, then the Contractor shall, at the Procuring Agency's written request specifying the grounds thereof, provide as a replacement a person with qualifications and experience acceptable to the Procuring Agency.

24.3. The Contractor shall have no claim for additional costs arising out of or incidental to any removal and/or replacement of Personnel.

E. Obligations of the Procuring Agency

25. Change in the Applicable Law

25.1. If, after the date of this Contract, there is any change in the Applicable Law with respect to taxes and duties which increases or decreases the cost of the Services rendered by the Contractor, then the remuneration and reimbursable expenses otherwise payable to the Contractor under this Contract shall be increased or decreased accordingly by agreement between the Parties, and corresponding adjustments shall be made to the amounts referred in the SCC.

26. Services and Facilities

26.1. The Procuring Agency shall make available to the Contractor and the Experts, for the purposes of the Services and free of any charge, the services, facilities and property described in the Terms of Reference, at the times and in the manner specified in the Terms of Reference.

26.2. In case that such services, facilities and property shall not be made available to the Contractor, the Parties shall agree on (i) any time extension that it may be appropriate to grant to the Contractor for the performance of the Services, (ii) the manner in which the Contractor shall procure any such services, facilities and property from other sources, and (iii) the additional payments, if any, to be made to the Contractor as a result thereof.

F. Payments to the Contractor

27. Contract Price

27.1. The price payable shall be in Pakistani Rupees unless otherwise specified in the SCC.

28. Terms and Conditions of Payment

28.1. Payments will be made to the Contractor according to the payment schedule stated in the SCC and as per actual invoice submitted by the Contractor.

28.2. Unless otherwise stated in the SCC, the advance payment shall be made against the provision by the Contractor of a bank guarantee for the same amount, and shall be valid for the period stated in the SCC. Any other payment shall be made after the conditions listed in the SCC for such payment have been met, and the Contractor have submitted an invoice to the Procuring Agency specifying the amount due.

29. Quality Control Identifying Defects

29.1. The principle and modalities of Inspection of the Services by the Procuring Agency shall be as indicated in the SCC. The Procuring Agency shall check the Contractor's performance and notify him of any Defects that are

found. Such checking shall not affect the Contractor's responsibilities. The Procuring Agency may instruct the Contractor to search for a Defect and to uncover and test any service that the Procuring Agency considers may have a Defect. Defect Liability Period is as defined in the SCC.

29.2. A {INSPECTION}

30. Correction of Defects, and Lack of Performance Penalty

30.1. The Procuring Agency shall give notice to the contractor of any Defects before the end of the Contract. The Defects liability period shall be extended for as long as Defects remain to be corrected.

30.2. Every time notice a Defect is given; the contractor shall correct the notified Defect within the length of time specified by the Procuring Agency's notice.

30.3. If the contractor has not corrected a Defect within the time specified in the Procuring Agency's notice, the Procuring Agency will assess the cost of having the Defect corrected, the contractor will pay this amount, and a Penalty for Lack of Performance.

31. Settlement of Disputes Amicable Settlement

31.1. The Parties shall use their best efforts to settle amicably all disputes arising out of or in connection with this Contract or its interpretation.

32. Dispute Settlement

32.1. Arbitration

If any dispute of any kind whatsoever shall arise between the procuring agency and the contractor in connection with or arising out of the Contract, including without prejudice to the generality of the foregoing, any question regarding its existence, validity or termination, or the execution of the contract, the parties shall seek to resolve any such dispute or difference by mutual consultation. If the parties fail to resolve such a dispute or difference even after negotiations or mediation, then the dispute shall be referred within fourteen (14) days in writing by either party to the Arbitrator, with a copy to the other party.

Any dispute in respect of which a notice of intention to commence arbitration has been given, in accordance with **GCC sub-clause 32.1**, shall be finally settled by arbitration. Arbitration may be commenced prior to or after completion of the Contract. Arbitration proceedings shall be conducted in accordance with Arbitration Act 1940. Notwithstanding any reference to arbitration herein, the parties shall continue to perform their respective obligations under the Contract unless otherwise agreed. The Procuring Agency shall continue to pay the Contractor any undisputed amounts due under the Contract during the resolution of any dispute.



Special Conditions of Contract

SECTION VIII. SPECIAL CONDITIONS OF CONTRACT

The following Special Conditions of Contract shall supplement the General Conditions of Contract. Whenever there is a conflict, the provisions herein shall prevail over those in the Conditions of Contract. The corresponding clause number of the GCC is indicated in parentheses.

Number of GC Clause

Amendments of, and Supplements to, Clauses in the General Conditions of Contract

Number of GC Clause 1

Definitions

The Procuring Agency is: Pakistan Civil Aviation Authority (Ministry of Defence), Additional Director Admin Headquarter Pakistan Civil Aviation Authority B-6, KDA Scheme-1, Karsaz, Karachi

The Supplier is:

The title of the subject procurement is: Tender for Construction of New Building for PEL Examination Center, Karachi (Re-Tender)

Number of GC Clause 2

Applicable/Governing Law:

The Contract shall be interpreted in accordance with the laws of Islamic Republic of Pakistan

Number of GC Clause 3

Language:

The language of the Contract, all correspondence and communications to be given, and all other documentation to be prepared and supplied under the Contract shall be in **English**.

Number of GC Clause 4

Notices:

The addresses for the notices are:

Procuring Agency:

Pakistan Civil Aviation Authority (Ministry of Defence), Additional Director Admin Headquarter Pakistan Civil Aviation Authority B-6, KDA Scheme-1, Karsaz, Karachi
+92-303-667-2767
rehan.shaukat@pcaa.gov.pk

Contractor/ Bidder:

[Name, address and telephone number]

The Contractor/ Bidder's Representative(s)

[Name, address, telephone number and e-mail address]

Number of GC Clause 6.1

The Authorized Representatives are:

For the Procuring Agency:

Pakistan Civil Aviation Authority (Ministry of Defence), Additional Director Admin
Headquarter Pakistan Civil Aviation Authority B-6, KDA Scheme-1, Karsaz, Karachi
+92-303-667-2767
rehan.shaukat@pcaa.gov.pk

For the Bidder:

Name:

Designation:

Address:

Number of GC Clause 7

Effectiveness of the contract

The Contractor/Bidder shall be effective within days from the date of signature of the Contract by both parties

Number of GC Clause 8

Commencement of Contract:

The Contractor/Bidder shall provide Non-Consultancy Services from the effective date of contract.

Number of GC Clause 10.2

Expiration of Contract:

The time period shall be

Number of GC Clause 14

Termination

In the event of termination of the contract due to any reason as already defined in the General Conditions of Contract, the Bidder shall be responsible for providing to the Authority the Goods till the time of alternate arrangements.

Number of GC Clause 16

Conflict of Interest:

The Procuring Agency reserves the right to determine on a case-by-case basis whether the Bidder should be disqualified from providing goods or services due to a conflict of a nature described in Clause GCC 17.

Number of GC Clause 20

Liquidated Damages

If the Bidder fails to provide services as required under the contract or in case of any data loss/data breach or any incident compromising the data security or other such failures related to any services, the Bidder shall pay to the Procuring Agency as Liquidated Damages at a rate of **0.01% to 10.00%** of the Contract value, in accordance with the extent of performance failure & the cost of investigating such incidents as judged by the Authority.

Number of GC Clause 21

Performance Guarantee:

The amount of performance guarantee shall be **10.00%** of the contract price in acceptable form of **Pay Order, Call at Deposit, Bank Guarantee**

Number of GC Clause 27

Currency of Payment:

All the payment to be released to the contractor/Bidder shall be in Pakistani Rupees.

Number of GC Clause 28

Payment terms:

Payment will be made to the Bidder against the procured Goods and services according to the actual invoice or running bills submitted by the Bidder against the services provided within the time given in the conditions of the contract.

Number of GC Clause 29

Identifying Defects:

The Authority reserves the right at any time to inspect the premises of the provider to inspect the goods and monitor the goods being provided.

Delivery & Documents

Insurance Certificate;

Manufacturer's or Supplier's Valid Warranty Certificate;

Test Report Certificates Required from concerned laboratories (if Required) (Borne by the Contractor)

Number of GC Clause 31

Following is the guidance for Dispute Resolution

- i. If any dispute of any kind whatsoever shall arise between the Authority and the Bidder in connection with or arising out of the Contract... (full clause unchanged)

- ii. At future of negotiation the dispute shall be resolved through mediation...
- iii. At failure of mediation, arbitration under Arbitration Act 1940...
- iv. Cost sharing equally...
- v. Proceedings may commence before/after completion...

Notwithstanding any reference to the arbitration herein, the parties shall continue to perform their respective obligations under the Contract.

Rules of procedure for arbitration proceedings:

Any dispute between the Authority and a Bidder shall be referred to arbitration under the laws of Pakistan including Arbitration Act 1940.

Place of Arbitration and Award:

The arbitration shall be conducted in English language and place shall be Islamabad. The award shall be final and binding.





Bid Securing Declaration

Form 9: Bid Securing Declaration

Date: *[insert date (as day, month and year)]*

Bid No.: **P78226**

To: **Pakistan Civil Aviation Authority (Ministry of Defence), Additional Director Admin Headquarter
Pakistan Civil Aviation Authority B-6, KDA Scheme-1, Karsaz, Karachi**

We, the undersigned, declare that:

We understand that, according to your conditions, Bids must be supported by a Bid Securing Declaration.

We accept that we will be blacklisted and henceforth cross debarred for participating in respective category of public procurement proceedings for a period of (not more than) six months, if fail to abide with a bid securing declaration, however without indulging in corrupt and fraudulent practices, if we are in breach of our obligation(s) under the Bid conditions, because we:

1. have withdrawn or modified our Bid during the period of Bid Validity specified in the Form of Bid;
2. Disagreement to arithmetical correction made to the Bid price; or
3. having been notified of the acceptance of our Bid by the Procuring Agency during the period of Bid Validity, (i) failure to sign the contract if required by Procuring Agency to do so or (ii) fail or refuse to furnish the Performance Security or to comply with any other condition precedent to signing the contract specified in the Bidding Documents.

We understand this Bid Securing Declaration shall expire if we are not the successful

Bidder, upon the earlier of (i) our receipt of your notification to us of the name of the successful Bidder; or (ii) twenty-eight (28) days after the expiration of our Bid.



Contract Form

SECTION IX: CONTRACT FORMS

THIS AGREEMENT made the ____ day of _____ 20____ between **Pakistan Civil Aviation Authority (Ministry of Defence), Additional Director Admin Headquarter Pakistan Civil Aviation Authority B-6, KDA Scheme-1, Karsaz, Karachi**

(hereinafter called “the Procuring Agency”) of the one part and [name of Bidder] of [city and country of Bidder] (hereinafter called “the Bidder”) of the other part:

WHEREAS the Procuring Agency invited Bids for provision of goods, viz., **Tender for Construction of New Building for PEL Examination Center, Karachi (Re-Tender) (P78226)** and has accepted a Bids by the Bidder for the provision of Goods 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:-

1. This form of Contract;
2. the Form of Bids and the Price Schedule submitted by the Bidder;
3. the Schedule of Requirements;
4. the Technical Specifications;
5. the Special Conditions of Contract;
6. the General Conditions of the Contract;
7. the Procuring Agency’s Letter of Acceptance; and
8. [add here: any other documents]

3. In consideration of the payments to be made by the Procuring Agency to the Bidder as hereinafter mentioned, the Bidder hereby covenants with the Procuring Agency to provide the Goods related services and to remedy defects therein in conformity in all respects with the provisions of the Contract.

4. The Procuring Agency hereby covenants to pay the Bidder in consideration of the provision of Goods 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.

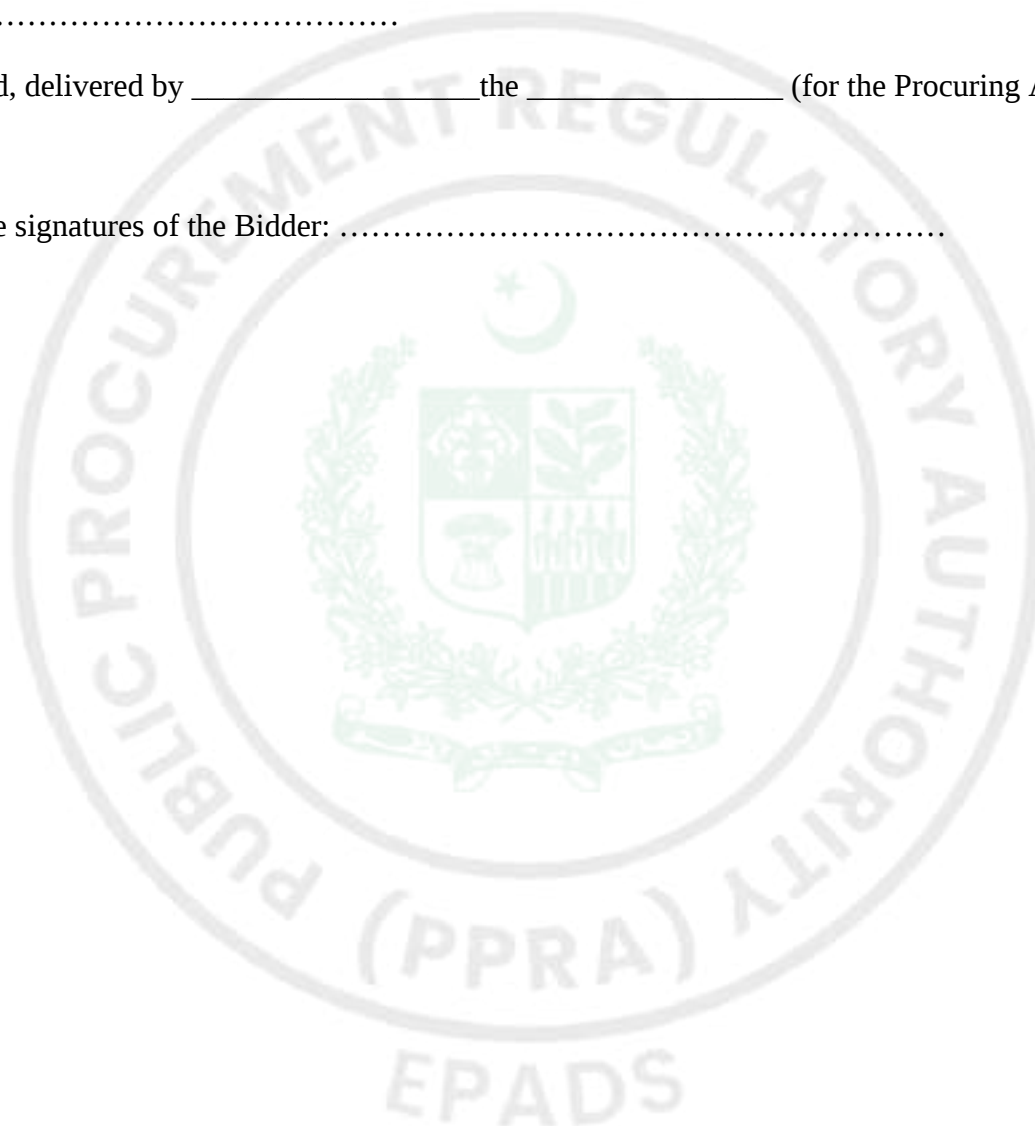
Signed, sealed, delivered by _____ the _____ (for the Procuring Agency)

Witness to the signatures of the Procuring Agency:

.....

Signed, sealed, delivered by _____ the _____ (for the Procuring Agency)

Witness to the signatures of the Bidder:





Integrity Pact

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 Supplier] hereby declares that it has not obtained or induced the procurement of any contract, right, interest, privilege or other obligation or benefit from Government of Pakistan 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 Supplier] 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 Supplier] certifies that it has made and will make full disclosure of all agreements and arrangements with all persons in respect of or related to the transaction with GoP and has not taken any action or will not take any action to circumvent the above declaration, representative or warranty.

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



Performance Guarantee Form

Performance Guarantee Form

To: **Pakistan Civil Aviation Authority (Ministry of Defence), Additional Director
Admin Headquarter Pakistan Civil Aviation Authority B-6, KDA Scheme-1, Karsaz, Karachi**

WHEREAS *[name of Bidder]* (hereinafter called “the Bidder”) has undertaken, in pursuance of Contract No. *[reference number of the contract]* dated *[insert date]* for provision of Goods(hereinafter called “the Contract”).

AND WHEREAS it has been stipulated by you in the said Contract that the Bidder shall furnish you with a Bank Guarantee by a reputable bank for the sum specified therein as security for compliance with the Bidder’s performance obligations in accordance with the Contract.

AND WHEREAS we have agreed to give the Bidders guarantee:

THEREFORE, WE hereby affirm that we are Guarantors and responsible to you, on behalf of the Bidder, up to a total of *[amount of the guarantee in words and figures]*, and we undertake to pay you, upon your first written demand declaring the Bidder 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: *[insert date]*

Signature and seal of the Guarantors

[name of bank or financial institution]

[address]

[date]





Annexure

Annexure A - Volume I Tender Conditions

Information (Read-Only)

See Form Under Additional Forms and Documents: **Annexure A - Volume I Tender Conditions** (page number: 84)

Annexure B - Volume II Technical Specifications

Information (Read-Only)

See Form Under Additional Forms and Documents: **Annexure B - Volume II Technical Specifications** (page number: 223)

Annexure C - Volume III Financial Formate BOQ

Financial Submission (Vendor)

Document Required

See Form Under Additional Forms and Documents: **Annexure C - Volume III Financial Formate BOQ** (page number: 399)

Annexure D1 - Volume IV Drawings Architect

Information (Read-Only)

See Form Under Additional Forms and Documents: **Annexure D1 - Volume IV Drawings Architect** (page number: 418)

Annexure D2 - Volume IV Drawings Structure

Information (Read-Only)

See Form Under Additional Forms and Documents: **Annexure D2 - Volume IV Drawings Structure** (page number: 449)

Annexure D3 - Volume IV Drawings E&M

Information (Read-Only)

See Form Under Additional Forms and Documents: **Annexure D3 - Volume IV Drawings E&M** (page number: 462)

Annexure E - List of Approved Banks

Information (Read-Only)

See Form Under Additional Forms and Documents: **Annexure E - List of Approved Banks** (page number: 495)





Procurement Forms







Additional Forms and Documents



PAKISTAN CIVIL AVIATION AUTHORITY
B-6, KDA Scheme-1, Karsaz Karachi, Pakistan.



BIDDING AND CONDITIONS OF CONTRACT

VOLUME - I

Construction of New Building for PEL Examination Centre Karachi

Serving Since 1965



UMAR MUNSHI ASSOCIATES
CONSULTING ENGINEERS, ARCHITECTS, & PLANNERS

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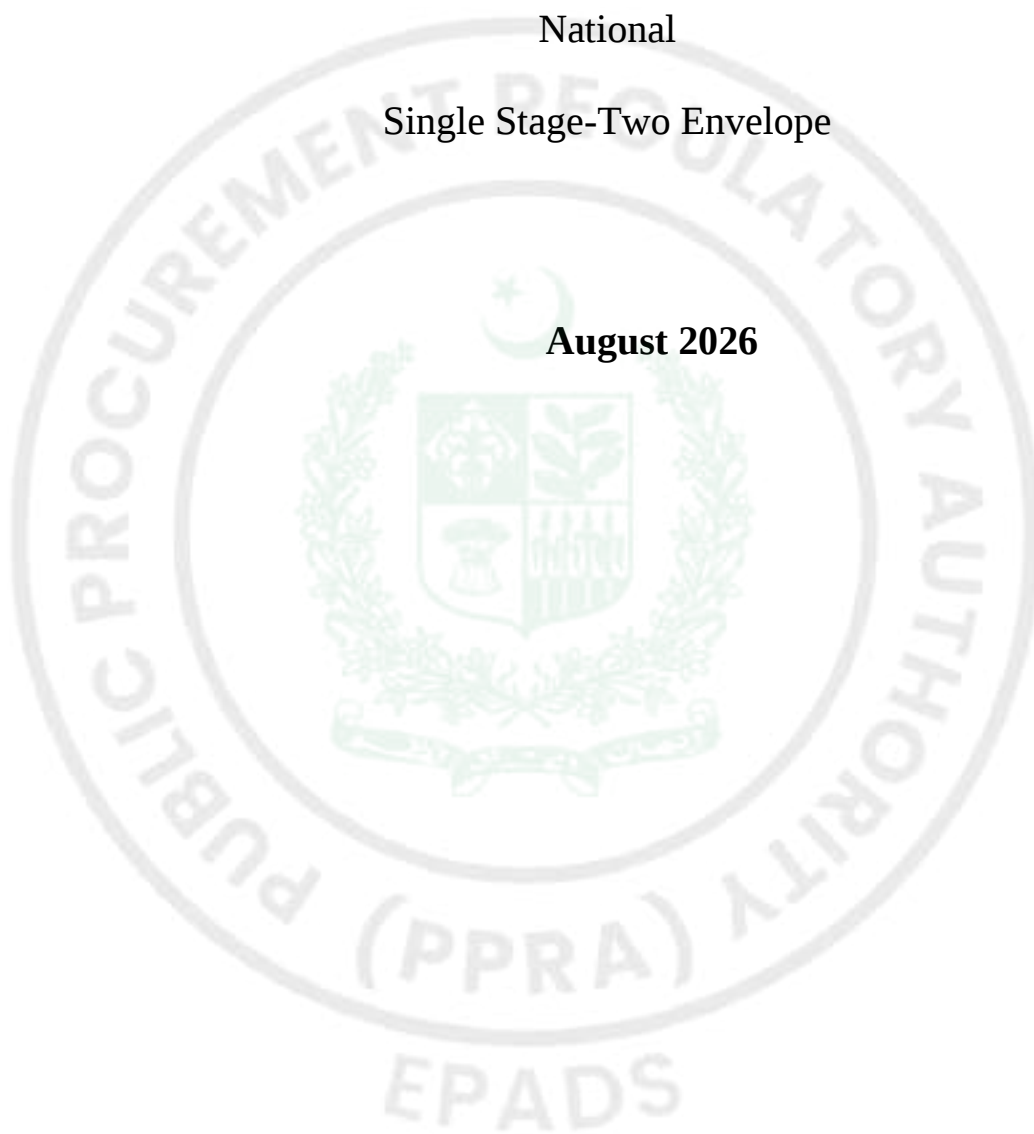
Standard Bidding Document

TENDER FOR CONSTRUCTION OF NEW BUILDING FOR PEL
EXAMINATION CENTRE, KARACHI
(Works)

National

Single Stage-Two Envelope

August 2026



Section I -Invitation for Bids

Procurement of Civil Works

1. The **Pakistan Civil Aviation Authority** invites electronic as well as sealed Bids from eligible Bidders for procurement of works **Construction of Personnel Licensing PEL Examination Centre Karachi** described in bidding documents on **EPADS v2.0**.
2. **Single Stage–Two Envelope** will be used by adopting Least Cost Based Selection (LCBS) Technique for the subject procurement, in line with the Public Procurement Rules, 2004 and any Regulations, Regulatory Guides, Procurement Guidelines or Instructions issued by the Authority from time to time.
3. All Bids must be accompanied by a Bid Security amounting to **Rs. 2,000,000/- (Pak Rupees Two Million Only)** in favor of Pakistan Civil Aviation Authority, from a scheduled Bank approved by PCAA (List attached as Attachment 1) in the form of Pay Order, Call Deposit, Bank Guarantee. Or all bids must be accompanied by bid securing declaration in the format specified in the Bidding documents
4. The original Bid Security instrument must be submitted in a sealed envelope, clearly marked with the Tender Title, to the address of the undersigned, before the e-bid submission deadline on EPADS v2.0 scanned copy must also be attached with electronic bid
5. E-Bidding documents, containing detailed terms & conditions, works requirements, technical specifications, drawings, supplementary information and bill of quantities etc. are available on E-Pak Acquisition & Disposal System (EPADS) at (www.eprocure.gov.pk) for all the interested bidders registered on EPADS (free of cost). Bidders are required to get themselves registered on EPADS to participate in bidding process.
6. The e-bids, prepared in accordance with the instructions in the e-Bidding documents, must be submitted through **EPADS** on or before August 24, 2026 11:00 AM. E-bids will be opened by using EPADS on the same day at August 24, 2026 11:30 AM Manual submission of Bids shall not be entertained. Those vendor who have not yet registered on the new version of EPADS v2.0, may register themselves on <https://pa.epads.gov.pk/>. A tutorial to explain the registration process is available at <https://www.youtube.com/watch?v=MNW6T38v7tc>.
7. A pre-bid meeting shall be conducted as per the scheduled date, time and venue defined in the bidding documents.
8. In case an e-bid submitted on EPADS v2.0 is found corrupt, unreadable, contains a virus, or is partial / incomplete in any respect, the e-bid shall be rejected.
9. 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 (*mention website*) and on Authority's website at (www.ppra.org.pk).

Additional Director Admin
Pakistan Civil Aviation Authority
HQCAA, B-6 KDA Scheme-1 Karsaz Karachi

Table of Contents

Section I -Invitation for Bids	3
Section II Instructions to Bidders (ITBs)	6
A. INTRODUCTION	6
1. Scope of Bid	6
2. Source of Funds.....	6
3. Eligible Bidders.....	6
4. Eligible Material and Equipment	8
B. BIDDING DOCUMENTS.....	8
5. Contents of Bidding Documents	8
6. Clarification of Bidding Document, Pre-bid Meeting.....	8
7. Amendment of Bidding Documents.....	9
C. PREPARATION OF BIDS.....	10
8. Language of Bid	10
9. Documents Constituting the Bids.....	10
10. Documents Establishing Eligibility of Material, Equipment and Works, their Conformity to Bidding Documents	10
11. Documents Establishing Eligibility and Qualification of the Bidder.....	11
12. Forms of Bid.....	12
13. Bid Prices	12
14. Currencies of Bid and Payment.....	13
15. Documents Comprising the Technical Proposal	13
16. Bid Validity Period.....	13
17. Bid Security or Bid Securing Declaration	14
18. Withdrawal of Bids	16
19. Format and Signing of Bid	16
D. SUBMISSION OF BIDS.....	17
20. Submission of Bids through EPADS.....	17
21. Deadline for Submission of Bids.....	17
22. Substitution and Modification of bids	17
E. OPENING AND EVALUATION OF BIDS	17
23. Opening of Bids.....	17
24. Confidentiality.....	17
25. Clarification of Bids	17
26. Preliminary Examination of Bids	18
27. Examination of Terms and Conditions; Technical Evaluation	20
28. Correction of Arithmetic Errors	21
29. Conversion to Single Currency	22
30. Evaluation of Bids	22
31. Domestic Preference.....	24
32. Determination of Successful Bid.....	24
33. Qualification of Bidder.....	24
34. Sub-Contractors.....	24
35. Abnormally Low Financial Bid.....	25
F. AWARD OF CONTRACT	26

36.	Criteria of Award.....	26
37.	Negotiations.....	26
38.	Procuring agency/Employer’s Right to reject All Bids.....	27
39.	Notification of Award	27
40.	Signing of Contract	27
41.	Performance Security (or Guarantee).....	28
42.	Advance Payment.....	28
43.	General Performance of the Bidders	29
44.	Corrupt & Fraudulent Practices.....	29
	G. GRIEVANCE REDRESSAL & COMPLAINT REVIEW MECHANISM.....	29
45.	Grievance Redressal	29
	H. MECHANISM OF BLACKLISTING	29
46.	Mechanism of Blacklisting.....	29
	Section III: Bid Data Sheet (BDS)	30
	A. Introduction	31
	B. Bidding Documents	32
	C. Preparation of Bids	32
	D. Submission of Bids.....	33
	E. Opening and Evaluation of Bids	33
	F. Award of Contract.....	34
	G. Review of Procurement Decisions	34
	Section IV. Eligible Countries.....	35
	Section V. Evaluation and Qualification Criteria.....	36
	Contractor’s Representative and Key Personnel	49
	Section VI: Works Requirement, Technical Specifications, Environmental & Social Requirements, Drawings, Supplementary Information And Bill of Quantities	50
	Technical Specifications.....	53
	Environmental and Social Safeguard (ESS) requirements	54
	Bill of Quantities	57
	Technical Proposal	66
	Section VII: Standard Bidding Forms	72
	Section VIII. General Conditions (GC).....	105
	Section IX. Particular Conditions of the Contract.....	106
	Section X: Contract Forms	126
	Environmental and Social Safeguard (ESS) Performance Security	134
	Advance Payment Security	136
	Retention Money Security	138
	Integrity Pact	139

Section II Instructions to Bidders (ITBs)

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 the BDS.
2. Source of Funds	2.1	Source of funds as referred in Clause 2 of 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. <i>Note: (JV or Consortium is not permitted).</i>
	3.2	The invitation for bids is open to all prospective bidders 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. agencies shall specify the registration/licensing requirements for the foreign bidder keeping in view the requirement of that business.
	3.3	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) have controlling shareholders in common; or c) receive or have received any direct or indirect subsidy from any of them; or d) have the same legal representative for purposes of this Bid; or e) 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 f) Submit more than one bid in this bidding process.
	3.4	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) the bidder is convicted, by a final judgment of a Court of Law or relevant Professional Statutory Body, of any offence involving professional conduct; (d) 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.
	3.5	As and when required, 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.
	3.6	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”.
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B. BIDDING DOCUMENTS

5. Contents of Bidding Documents	5.1	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 7.1 include: Section I -Invitation for Bids Section II Instructions to Bidders (ITBs) Section III Bid Data Sheet (BDS) Section IV Eligible Countries Section V Evaluation and Qualification Criteria Section VI Works Requirements Technical Specifications & Schedule of Requirements Section VII Standard Bidding Forms Section VIII General Conditions of Contract (GCC) Section IX Particular Conditions of Contract (PCC) Section X Contract Forms
	5.2	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.
6. Clarification of Bidding Document, Pre-bid Meeting	6.1	A prospective bidder requiring any clarification of the bidding document may notify the Procuring agency/Employer through EPADS.
	6.2	The Procuring agency/Employer shall respond to the request for clarification in accordance with the Public Procurement Rules 2004, Rule No.38 i.e. Clarifications.
	6.3	Should the Procuring Agency deem it necessary to amend the BIDDING document as a result of a clarification, it shall do so following the procedure under ITB 7 .
	6.4	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.
	6.5	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 uploaded on EPADS. 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 7 . Non-attendance at the pre-bid meeting will not be a cause for disqualification of a bidder.
	6.6	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.
	6.7	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.
7. Amendment of Bidding Documents	7.1	The procuring agency may issue notification of any change, addition, modification or deletion in accordance with the PP Rules 2004, rule no. 34 i.e. Bidding Documents.
	7.2	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 in pursuance of PP Rules 2004, rule no. 39 i.e. Extension of time for submission of bids, if such an addendum is issued within last three (03) days of the bid submission deadline.</i>

C. PREPARATION OF BIDS

8. Language of Bid	8.1	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.
9. Documents Constituting the Bids	9.1	The Bids prepared by the Bidder shall constitute of all the documents required in the BDS .
10. Documents Establishing Eligibility of Material, Equipment and Works, their Conformity to Bidding Documents	10.1	The bid prepared by the bidder shall constitute the following components: - a) Documentary evidence established in accordance with ITB 10 that the material and equipment to be utilized by the Bidder for the executions of works are eligible material and equipment and conform to the Bidding Documents; b) Documentary evidence established in accordance with ITB 11 that the bidder has been authorized to carry out the Construction works; c) Documentary evidence established in accordance with ITB 11 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 12 and 13; e) Completed schedules as required, including priced Bill of Quantities in accordance with ITB 13. f) Technical Proposal completed in all aspects in accordance with ITB-15. g) Bid security or Bid Securing Declaration furnished in accordance with ITB 17; h) Any other document required in the BDS.

	10.2	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. <i>Note: (JV or Consortium is not permitted).</i>
	10.3	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.
	10.4	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.
	10.5	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.
11. Documents Establishing Eligibility and Qualification of the Bidder	11.1	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.
	11.2	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”.
	11.3	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) That the bidder meets the qualification criteria listed in Section-V, Evaluation and Qualification Criteria and BDS.
12. Forms of Bid	12.1	The Bidder shall fill the Form of Bids furnished in the bidding documents. The Bids Form must be completed without any alterations to its format and no substitute shall be accepted.
13. Bid Prices	13.1	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.
	13.2	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.
	13.3	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.

	13.4	The Bid price to be quoted in the Form of Bid in accordance with ITB 12 shall be the total price of the bid.
	13.5	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.
	13.6	If so specified in ITB 1.1 , bids may be invited for individual lots (contracts) or for any combination of lots (packages).
	13.7	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 27 , unless otherwise price adjustment is permissible under Conditions of the Contract.
	13.8	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, prices and total Bid Price, except Provincial Sales Tax on services, from which PCAA is exempt.
14. Currencies of Bid and Payment	14.1	Prices shall be quoted in Pakistani Rupees unless otherwise specified in the BDS. Comparison of bids and tie of bid shall be treated in accordance with the PP rules 2004, rule no. 42.
15. Documents Comprising the Technical Proposal	15.1	The bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, schedule and any other information as stipulated in Section VII – Standard Bid Forms , in sufficient detail to demonstrate the adequacy of the bidder's proposal to meet the work requirements and the completion time.
16. Bid Validity Period	16.1	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.
	16.2	Under exceptional circumstances, prior to the expiration of the initial Bids/Bid validity period, the Procuring Agency

		may request the Bidders' consent to an extension of the period of validity of their Bids/Bid. Such request for extension of the period of bid validity shall be carried out in accordance with the PP rules 204, rule no. 37 i.e. Bid Validity. .
17. Bid Security or Bid Securing Declaration	17.1	Pursuant to ITB 11.1 unless otherwise specified in the BDS, the bidder shall furnish as part of its bid, a Bid Security in accordance with the PP Rules 2004, rule no. 36 in the amount and currency specified in the BDS or Bid Securing Declaration as specified in the BDS in the format provided in Section VII (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. Until the development of functionality of auto verification of financial instrument in EPADS, the scanned copy of bid security or bid securing declaration, as the case may be, shall be uploaded on E-PADS whereas the original instrument to be submitted to the procuring agency before closing of bid submission deadline,
	17.2	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 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; - A cashier's or certified cheque; or - Another security as indicated in the BDS.
	17.3	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 VII (Standard Bidding Forms) or another form approved by the Procuring

		agency/Employer prior to the bid submission.
	17.4	The Bid Security shall be payable promptly upon written demand by the Procuring agency/Employer in case any of the conditions listed in ITB 17.9 are invoked.
	17.5	Any bid not accompanied by a Bid Security or Bid Securing Declaration in accordance with ITB 17.1 or 17.3 shall be rejected by the Procuring agency/Employer and shall be declared as non-responsive bid, pursuant to ITB 27 .
	17.6	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 16. 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.
	17.7	The successful bidder's Bid Security will be discharged upon the bidder signing the contract pursuant to ITB 40 , or furnishing the performance security (or guarantee), pursuant to ITB 41 .
	17.8	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 16.2; or b) In the case of a successful bidder, if the bidder fails: i) to sign the contract in accordance with ITB 40; or ii) to furnish performance security (or guarantee) in

		accordance with ITB 41.
	17.9	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. In case the JV is not legally constituted at the time of bid submission, the bid security or bid securing declaration shall be in the names of all future members as named in the letter of bid.
		N/A
18. Withdrawal of Bids	18.1	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.
19. Format and Signing of Bid	19.1	The Bidder shall prepare and submit Bids through EPADS with due diligence after carefully reading all the terms and condition before bid submission deadline.

D. SUBMISSION OF BIDS

20. Submission of Bids through EPADS	20.1	All bids shall be submitted through EPADS.
21. Deadline for Submission of Bids	21.1	All bids shall be received through EPADS not later than bid submission deadline as specified in the BDS.
	21.2	The Procuring agency/Employer may, under exceptional circumstances and at its discretion, extend the deadline for the submission of bids, pursuant to PP Rules 2004, rule no.39 Extension of Time for submission of bid, by amending the Bidding Documents in accordance with ITB 7 , 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.
22. Substitution and Modification of bids	22.1	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.
	22.2	Revised bid may be submitted after the substitution or modification made in the original bid in accordance with the provisions referred in ITB 18 .

E. OPENING AND EVALUATION OF BIDS

23. Opening of Bids	23.1	The Procuring Agency will open bids in accordance with the PP rules 2004, rule no 40 and as specified in the BDS.
24. Confidentiality	24.1	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.
25. Clarification of Bids	25.1	Clarification of Bidding Documents shall be carried out in accordance with the PP Rules 2004, rule no 38 i.e. Clarifications.
	25.2	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
26. Preliminary Examination of Bids	26.1	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.
	26.2	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.
	26.3	The Procuring agency/Employer will confirm that the documents and information specified under ITB 9, 10 and 11 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.

	26.4	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 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 – (a) Submit the number of copies of signed bids required by the invitation; (b) Furnish required information concerning the number of its employees; (c) 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.
	26.5	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.
	26.6	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.
	26.7	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.
27. Examination of Terms and Conditions; Technical Evaluation	27.1	The Procuring agency/Employer shall examine the bid to confirm that all terms and conditions specified in the GCC and the PCC 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.
	27.2	The Procuring agency/Employer shall evaluate the technical aspects of the bid submitted in accordance with ITB 30 , to confirm that all requirements specified in Section VI – Works Requirement, Technical Specifications of the Bidding Documents have been met without material deviation or reservation.
	27.3	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 27 , it shall reject the bid.

28. Correction of Arithmetic Errors	28.1	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.
	28.2	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 41.3.

29. Conversion to Single Currency	29.1	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. Comparison of bids quoted in different currencies and conversion of bids into a single currency shall be carried out in accordance with the PP Rule 2004, rule no. 42 (2).
30. Evaluation of Bids	30.1	The Procuring agency/Employer shall evaluate and compare only the bids determined to be substantially responsive, pursuant to ITB 27.
	30.2	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.
	30.3	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) converting the amount resulting from applying above, if relevant, to a single currency in accordance with ITB 29;
	30.4	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.

	30.5	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 .
	30.6	If the bid, which results in the Evaluated Bid Price (Successful 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>

31. Domestic Preference	31.1	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.
32. Determination of Successful Bid	32.1	The Procuring agency/Employer shall compare the evaluated bids in accordance with the predefined bidding procedure, of all substantially responsive bids to determine the Successful bidder.
33. Qualification of Bidder	33.1	The Procuring agency/Employer shall determine to its satisfaction whether the bidder is substantially responsive and whose bid is declared as Successful 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>
	33.2	The determination shall be based upon an examination of the documentary evidence of the bidder's qualifications submitted by the bidder, pursuant to ITB 11 .
	33.3	Prior to contract award, the Procuring agency/Employer will verify that the successful bidder is not blacklisted/debarred. The Procuring agency/Employer will conduct the same verification for each sub-contractor proposed by the successful bidder.
34. Sub-Contractors	34.1	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.
	34.2	Bidders may propose sub-contracting up to the percentage of total value of contracts or the volume of works as specified in the BDS .

35. Abnormally Low Financial Bid	35.1	A procuring Agency may reject abnormally low bids in accordance with the PP Rules 2004 rule no. 43. 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. Moreover, the Procuring agency/Employer shall not incur any liability solely by rejecting abnormally bid Guidance for Procuring agency/Employer: 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. 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.
	35.2	The Procuring agency/Employer will determine to its satisfaction whether the bidder that is selected as having submitted the successful bid is qualified to perform the contract satisfactorily, in accordance with the criteria listed in ITB 11
	35.3	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 11, 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.
	35.4	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. Explanation: <i>The Certificate shall be furnished by the bidder. The bidder shall certify that the price is determined</i>

		<i>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>
	35.5	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

36. Criteria of Award	36.1	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 Successful 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.
37. Negotiations	37.1	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 Particular conditions of Contract; (d) finalizing payment arrangements; (e) clarifying details that were not apparent or could not be finalized at the time of Bidding;
	37.2	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.

38. Procuring agency/Employer's Right to reject All Bids	38.1	The procuring agency has the right to reject all bids in accordance with the PP Rules 2004 rule no. 45. However, the Authority (i.e. PPRA) may call from the Procuring agency/Employer the justification of those grounds.
39. Notification of Award	39.1	The procuring agency shall announce and publish the evaluation result in accordance with the PP Rules 2004, rule no. 48.
	39.2	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 through EPADS. However, the Procuring agency/Employer shall not award any procurement contract at least for five (05) days after the announcement of final evaluation report. 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).
	39.3	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 41 and signing of the contract in accordance with ITB 40 .
	39.4	Upon the successful bidder's furnishing of the performance security (or guarantee) pursuant to ITB 41 , 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 17 .
40. Signing of Contract	40.1	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.
	40.2	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.
	40.3	Where no formal signing of a contract is required, work order issued to the bidder shall be construed to be the contract.

41. Performance Security (or Guarantee)	41.1	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 PCC , denominated in the type and proportions of currencies in the Letter of Acceptance and in accordance with the Conditions of Contract.
	41.2	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.
	41.3	Failure of the Most Advantageous Bidder to comply with the requirement of ITB 40 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 reinitiate the procurement process afresh (as a case may be).
42. Advance Payment	42.1	Advance payment will be provided to the bidder in percentage and in the manner as agreed by the parties in terms of Conditions of the Contract.
	42.2	The Procuring agency/Employer shall make an advance payment as stipulated in the Conditions of the Contract, subject to a maximum amount, as specified in the Conditions of the Contract. The advance payment request shall be accompanied by the 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 PCC .
43. General Performance of the Bidders	43.1	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.
44. Corrupt & Fraudulent Practices	44.1	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

45. Grievance Redressal	45.1	Grievance Redressal shall be carried out in accordance with the PP Rules 2004, rule no. 65 i.e. Redressal of grievances by the procuring agency and "Redressal of Grievances Regulations 2021".
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H. MECHANISM OF BLACKLISTING

46. Mechanism of Blacklisting	46.1	The Procuring agency/Employer shall proceed Blacklisting of Bidders/Contractors in accordance with PP Rules 2004, rule no.25 i.e. Blacklisting and "Blacklisting and Debarment of Bidders or Contractors Regulations 2024.
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SECTION III: BID DATA SHEET

Bid Data Sheet (BDS)

The following specific data for the procurement of works 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/Employer: Pakistan Civil Aviation Authority. The subject of procurement is: <u>CONSTRUCTION OF NEW BUILDING FOR PEL EXAMINATION CENTER, KARACHI</u> <i>(Detail scope of work is described at Scope of Work Section)</i> Period for completion of the works: 8 Months + 6 DLP Commencement date execution of the works: Sep, 2026
2.	2.1	Financial year for the operations of the Procuring agency/Employer: 2026-27 Name of Project: Construction of New Building for PEL Examination Center, Karachi Name and identification number of the Contract: Contract No. 1
3.	3.1	JV/Consortium or Association Allowed: NO Maximum number of members in the joint venture, consortium shall be: NIL

B. Bidding Documents

4.	6.2 & 6.4	The Bidders may seek clarifications through EPADS v2.0: Clarification Date: August 10, 2026 Pre-bid meeting will be held: Tuesday 11th August, 2026 12:00 noon Venue : HQCAA B-6, KDA Scheme No. 01, Karsaz Karachi
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C. Preparation of Bids

5.	8.1	The Language of all correspondences and documents related to the Bid is: English
6.	9.1	In addition to the documents stated in ITB 5, the following documents must be included with the Bid: Refer Part-B, Section IX, Sub-Clause 1.5 “Particular Condition of Contract” at Page 121
7.	10.4 (c)	Other procurement specific documentation requirements are: No.
8.	13.4	The bid price shall be applicable including all the taxes, excluding provincial sales tax. PCAA is exempted from levy of Provincial Tax hence all rates shall be exclusive of PST on services.
9.	13.5	The contract shall be on Fixed Price Basis and no price adjustment/escalation shall be admissible during the currency of the contract.
10.	14.1	The currency of the Bid shall be Pak Rupees ;
11.	16.1	The Bid Validity period shall be 90 days .
12.	17.1	The amount of Bid Security shall be Rs. 2,000,000/- (Pak Rupees Two Million Only) The currency of the Bid Security shall be: Pak Rupees
13.	17.2	The Bid Security shall be in the form of a Pay Order / Bank Guarantee from any Scheduled Bank in Pakistan approved by the Employer. The list of Employer approved Bank is annexed with this document. The Bid Security shall be in favour of the Employer valid for a period of one hundred eighteen (118) days i.e. 28 days beyond the bid validity date.

		No other form of Bid Security is acceptable. Standard form of Bid Security is provided in this document.
14.	17.5	Bid Shall be Submitted Online on EPADS v2.0 whereas Original Bid Security must be submitted (hard format in a sealed envelope) on or before the submission date and time at the address given below or else bid will be cancelled. Additional Director Administration Headquarter, Pakistan Civil Aviation Authority, B-6, KDA Scheme No. 01, Karsaz, Karachi.

D. Submission of Bids

15.	21.1	The deadline for Bid submission is a) Day : <i>Monday</i> b) Date: 24th August, 2026 c) Time: 11:00 am
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E. Opening and Evaluation of Bids

16.	23.1	The Bid opening shall take place at: Additional Director Administration Headquarter, Pakistan Civil Aviation Authority, B-6, KDA Scheme No. 01, Karsaz, Karachi. a) Day: <i>Monday</i> b) Date: 24th, August 2026 c) Time: 11:30 am
17.	24.1	Currency of Payment of Contract Price: Pak Rupees
18.	30.2	Evaluation Techniques Single Stage Two Envelopes basis The details are mentioned in the Evaluation Criteria section. The financial marks shall be awarded in accordance with the formula stipulated in the BDS or Evaluation Criteria prescribed in the bidding documents. The highest ranked bid shall be declared, on the basis of combined evaluation.
19.	30.5	No separate lots for this procurement.
20.	31.1	Domestic preference not applicable. Preference to

		domestic or national suppliers or contractors shall be provided in accordance with policies of the Federal Government and/or in accordance with the regulations issued by the Authority.
21.	34.2	Sub-contracting (30%) of the total value of the contract.
F. Award of Contract		
22.	41.1	The Performance Security (or guarantee) shall be 10% Percent of Contract Price.
23.	41.2	The Successful Bidder shall provide Performance Security to the Employer in the prescribed form. The Performance Security shall be equal to an amount of 10% of the Contract Price stated in the Letter of Acceptance. Such Security shall, at the option of the bidder, be in the form of Pay order / unconditional irrevocable Bank Guarantee from any Employer's approved Scheduled Banks in Pakistan (annexed to this document) and shall be valid for a period three (03) months after the date of issue of Defect Liability Certificate. The cost of complying with requirements of this Sub-Clause shall be borne by the Contractor, with no claim to the Employer.

G. Review of Procurement Decisions

24.	45.1	The Address of PPRA to submit a copy of appeal: Grievance Redressal Appellate Committee, Public Procurement Regulatory Authority 1st Floor, G-5/2, Islamabad, Pakistan Tel: +92-51-9202254
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Section IV. Eligible Countries

Countries enlisted by the Ministry of Interior, Government of Pakistan as business-friendly counties (BVL), are eligible to participate in the public procurement of works. The list of these countries can be found at the official website of the Directorate General of Immigration and Passport, Ministry of Interior, Government of Pakistan.



Section V. Evaluation and Qualification Criteria

Bidders' qualification will be based on the bidder's eligibility, general and particular experience, personnel and equipment capabilities and financial position, as demonstrated by the bidder's responses in the forms attached. Sub-contractor's experience and resources shall not be taken into account in determining the bidder's compliance with the qualifying criteria. However, Joint Venture Consortium or Association of firms is not permitted.

Maximum Marks are 100. Minimum passing marks are 60%. Qualification of each bidder will be evaluated considering his technical and financial capabilities to undertake the contract package.

1. Mandatory Requirements/ Eligibility:

- i. The Bidder applying must have a valid registration with the Pakistan Engineering Council (PEC) in Constructor's Category C-4 or above. (Provide copy of valid PEC registration) The Bidder must also be registered by the Pakistan Engineering Council within the Discipline / specialization Codes CE-10, CE-11 and EE-11. (Provide copy of valid PEC registration)
- ii. The Bidder must be registered with Income Tax Department / FBR. (Provide copy of In- come Tax/ FBR registration and tax returns for last three years). The bidder's name appears on the Active Taxpayers List (ATL) issued by the Federal Board of Revenue (FBR) from time to time.
- iii. The Bidder must provide audited financial statement, audited by chartered accountant for the last 3 years.
- iv. The Bidder is not black listed by PEC, PPRA, SPPRA or any Government, semi government or autonomous body. (Provide affidavit on Rs. 100 stamp paper).
- v. An affidavit to the effect that all documents / particulars / information given with this bid document are true. Dis-Qualification of the Bidder (Applicant), "The Employer shall disqualify a contractor if it finds, at any time, that the information submitted by him concerning his qualification as contractor was false and materially inaccurate or incomplete." (Provide affidavit on Rs. 100 stamp paper).
- vi. An affidavit to the effect that the firm is not presently involved nor has been in the past in litigation with the Employer/Government entity. Should this be otherwise the Applicant must provide such details "Litigation History". It is noted that, litigation / arbitration with the Employer / Government Entity resulting in award against the bidder may be considered as sufficient ground for disqualification. (Provide affidavit on Rs. 100 stamp paper).
- vii. An affidavit to the effect that the Applicant has never indulged in corrupt, fraudulent or collusive practice for procuring contracts on stamp paper.

- viii. The bidder shall submit the Integrity Pact duly executed on the requisite stamp paper.

Applicants who have applied to PEC for any required PEC Codes that have not yet been granted may submit documentary evidence of such application during the bidding process. However, if declared the Lowest Evaluated Responsive Bidder, the Applicant shall be required to obtain and furnish the duly granted PEC Codes prior to the execution of the Contract Agreement.

Any bidder not fulfilling any of the above mentioned mandatory requirements will be rejected/ disqualified straight away and no further evaluation will be considered or taken in hand for that bidder. The details have to be provided and enlisted by the firm annexed with documentary evidences in their technical bid.

2. Experience

35 Marks

Each contract shall be counted only once under the highest applicable contract-value category. The same contract shall not be considered for the award of marks under more than one category. Marks shall be awarded only for separate and distinct contracts supported by the required documentary evidence.

a	General Construction Experience: (Provide list of construction contracts successfully completed during the last 7 years give name of project, name of Employer, start and completion dates, contract value etc. Its mandatory to provide completion certificates for each completed construction contract). (Qualitative)(Doc Required)	10 Marks (Max)
i)	1 to 3 Construction Contracts having value Rs 100 Million or above 2 Marks each	6 Marks (Max)
ii)	1 to 3 Construction Contracts having value Rs 80 Million or above 1 Mark each	3 Marks (Max)
iii)	1 Construction Contracts having value Rs 50 Million or above 1 Mark	1 Marks (Max)
b	Carried out similar projects: Contracts during last 05 years of similar nature (building works) and complexity completed. (Its mandatory to provide completion certificates for each completed construction contract, in the completion certificate it must be mentioned name of project, contract value, date of start and date of completion) (Qualitative)(Doc Required)	20 Marks (Max)
i)	1-3 Contracts or more each having value Rs 80 Million or above 3 Marks each	12 Marks (Max)
ii)	1-4 Contracts each having value Rs 50 Million or above 2 Marks each	8 Marks (Max)
c	Projects in Hand Provide list of construction contracts in hand give name of project,	5 Marks (Max)

	name of Employer, start and tentative completion dates, contract value etc. It's mandatory to provide Work Order for each contract). (Qualitative)(Doc Required	
i)	1 Contracts or more each having value Rs 80 Million or above	3 Mark (Max)
ii)	1-2 Contracts or more each having value Rs 50 Million or above 1 Mark each	2 Marks (Max)

3. Personnel15 Marks

A. Project Manager and Construction Manager4 Marks

- a. BE Civil registered with PEC (Attach copies of Degrees & PEC) 2 Mark
Overall General experience 10 years or more in civil works1 Mark
Specific Experience 5 years or more for construction of Buildings ...1 Mark
Less than 5 years0 Mark

B. Site Engineer 3 Marks

- a. BE, Civil registered with PEC (Attach copies of Degrees & PEC).....1 Mark
Overall General experience 10 years or more as Site Engineer1 Mark
Specific Building Experience 5 years or more.....1 Mark
less than 5 years.....0 Mark

C. Electrical Engineer2 Marks

- a. BE Electrical registered with PEC (Attach copies of Degrees & PEC) 1 Mark
Overall 5 years' experience in similar works as electrical engr.1 Mark
3 - 5 years' experience in similar works0.5 Mark
less than 3 years' experience in similar works0 Mark

D. Quantity Surveyor.2 Marks

- a. BE/MSc Civil1 Mark
5 years or more overall experience in building construction1 Mark
2-4 years' experience in building construction.....0.5 Mark
less than 2 years' experience0 Mark

E. Site Inspector (Civil)2 Marks

- a. Diploma in Civil Technology(Attach copy of Diploma)1 Mark
5 years or more overall Experience in Building construction1 Mark
2-4 years' experience in Building construction.....0.5 Mark
less than 2 years' overall construction experience0 Mark

F. HSE Inspector2 Marks

- a. Diploma in Civil Technology or Relevant Certificate1 Mark
5 years or more overall Experience in Building construction1 Mark
2-4 years' experience in Building construction.....0.5 Mark

less than 2 years' overall construction experience0 Mark

- 4. Equipment10 Marks**
- a. Excavators /Excavation Equipment (2 or more in full working condition).2 Marks
 - b. Dumpers (1-2 number or more in full working condition)..... 2 Marks
 - c. Concrete Mixer / batching arrangement (1-2 numbers or more) 2 Marks
 - d. Vibrators (upto 4 in full working condition) 2 Marks
 - e. Survey Equipment /Testing Equipment (2 sets in full working condition). 2 Marks

[The allocation of Marks may be on Pro-rata basis if required equipment(s) are insufficient)

- 5. Financial Capability 20 Marks**
- a. Annual average Construction Turn Over, avg. last 3 years 10 Marks
 - More than Rs. 200 Million..... 10 Marks
 - Rs. 150 to Rs. 200 Million 7 Marks
 - Rs. 100 to Rs. 150 Million..... 5 Marks
 - Rs. 50 to Rs. 100 Million 3 Marks
 - Less than Rs. 50 Million..... 0 Mark
 - b. Working Capital (avg. for last three year).....10 Marks
 - More than Rs. 150 Million.....10 Marks
 - Rs 100 to Rs. 150 Million7 Marks
 - Rs. 40 to Rs. 100 Million.....5 Marks
 - Less than Rs. 40 Million... ..0 Mark

6. Marking for Detail Work understanding and approach 20 Marks

1. SITE ORGANIZATION 4 Marks

- i. Team Organization chart (1 Marks)
- ii. Staff Duty Matrix (1 Marks)
- iii. Staffing Schedule (1 Marks)
- iv. Communication & Reporting Lines (1 Marks)

2. METHOD STATEMENT 4 Marks

- i. Sequence of Construction Activities (1 Marks)
- ii. Safety plan (1 Marks)
- iii. QA / QC Procedures (1 Marks)
- iv. Sub-contractors & Machinery Management (1 Marks)

3. MOBILIZATION SCHEDULE 4 Marks

- i. Resource Mobilization with Timeframe (1 Marks)
- ii. Machinery & Equipment Mobilization (1 Marks)
- iii. Site Setup & Utilities (1 Marks)

iv. Risk mitigation (1 Marks)

4. CONSTRUCTION SCHEDULE

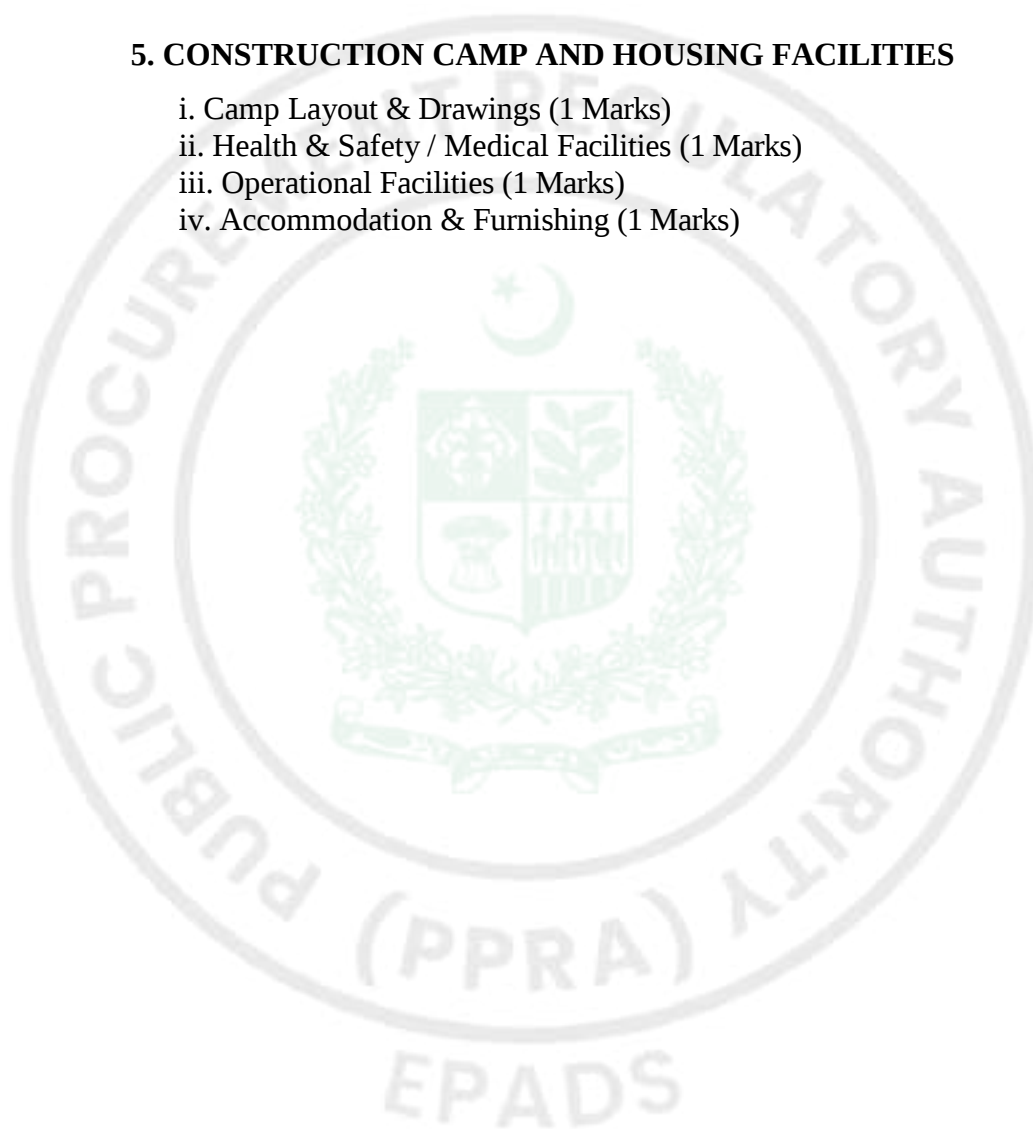
4 Marks

- i. Project timeline (Gantt chart) (1 Marks)
- ii. Block-wise Work Plan (1 Marks)
- iii. Phasing & Scheduling (1 Marks)
- iv. Progress Monitoring & Updating (using IT tools) (1 Marks)

5. CONSTRUCTION CAMP AND HOUSING FACILITIES

4 Marks

- i. Camp Layout & Drawings (1 Marks)
- ii. Health & Safety / Medical Facilities (1 Marks)
- iii. Operational Facilities (1 Marks)
- iv. Accommodation & Furnishing (1 Marks)



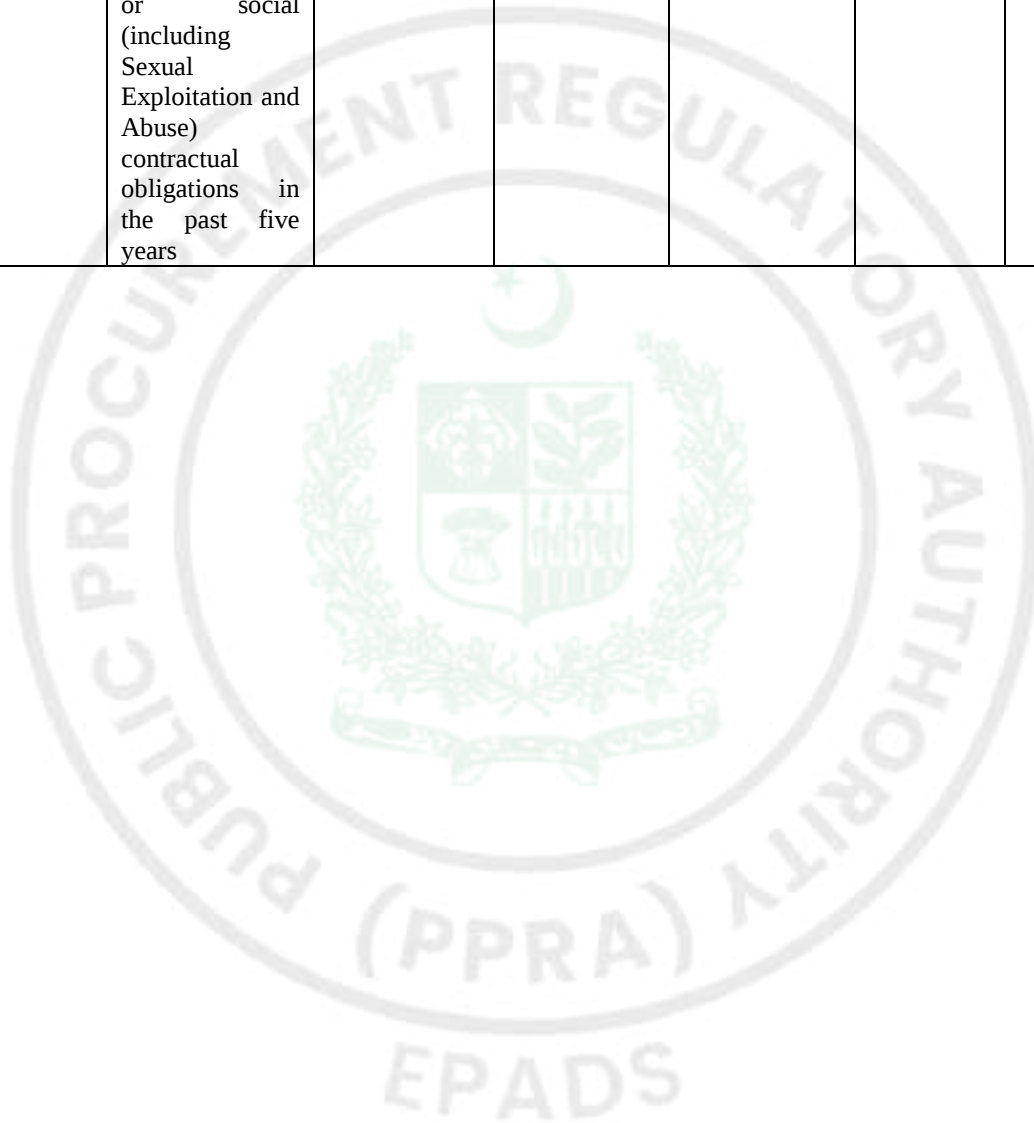
Qualification

The Procuring agency/Employer may utilize this criteria if the pre-qualification process is not carried out separately prior to the bidding process.

Eligibility and Qualification Criteria				Compliance Requirements			Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	Lead Member	
1. Eligibility							
1.1	Nationality	Nationality in accordance with Section 4	Must meet requirement	N/A	N/A	N/A	Forms ELI – 1.1 and 1.2, with attachments
1.2	Conflict of Interest	No conflicts of interest in accordance with	Must meet requirement	N/A	N/A	N/A	Letter of Bid
1.3	Blacklisting/Debarment	Not having been blacklisted/debarred in accordance with ITB 3.4.	Must meet requirement	N/A	N/A	N/A	Undertaking on EPADS

Eligibility and Qualification Criteria				Compliance Requirements			Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	Lead Member	
Historical Contract Non-Performance							
2.1	History of Non-Performing Contracts	Non-performance of a contract did not occur as a result of contractor default since 2010.	Must meet requirement	Must meet requirements	Must meet requirement	N/A	Form CON-2
2.2	Suspension based on Execution of Bid Securing Declaration by the Employer or withdrawal of the Bid within Bid validity	Not under suspension based on execution of a Bid Securing Declaration pursuant to ITB 17.8 or withdrawal of the Bid pursuant ITB 18.	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Bid Submission Form
2.3	Pending Litigation	Bidder's financial position and prospective long term profitability sound according to criteria established in 3.1 below and assuming that all pending litigation will be resolved against the Bidder	Must meet requirement	N/A	Must meet requirement	N/A	Form CON – 2
2.4	Litigation History	No consistent history of court/arbitral award decisions against the Bidder since 2010	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Form CON – 2
2.5	Declaration: Environmental and Social (ES) past performance	Declare any civil work contracts that have been suspended or terminated and/or performance security called	Must make the declaration. Where there are Specialized Subcontractor / s, the	N/A	Each must make the declaration. Where there are Specialized Subcontractor/s, the Specialized	N/A	Form CON-3

Eligibility and Qualification Criteria				Compliance Requirements			Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	Lead Member	
		by an employer for reasons of breach of environmental, or social (including Sexual Exploitation and Abuse) contractual obligations in the past five years	Specialized Subcontractor /s must also make the declaration.		Subcontractor/s must also make the declaration.		



Eligibility and Qualification Criteria				Compliance Requirements			Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	Lead Member	
3. Financial Situation and Performance							
3.1	Financial Capabilities	(i) The Bidder shall demonstrate that it has access to, or has available, liquid assets, unencumbered real assets, lines of credit, and other financial means (independent of any contractual advance payment) sufficient to meet the construction cash flow requirements estimated as PKR 250 million for the subject contract(s) net of the Bidders other commitments	Must meet requirement	Must meet requirement	N/A	N/A	Form FIN – 3.1, with attachments
		(ii) The Bidders shall also demonstrate, to the satisfaction of the Procuring agency/Employer, that it has adequate sources of finance to meet the cash flow requirements on works currently in progress and for future contract commitments.	Must meet requirement	Must meet requirement	N/A	N/A	
		(iii) The audited balance sheets or, if not required by the	Must meet requirement	N/A	Must meet requirement	N/A	

Eligibility and Qualification Criteria				Compliance Requirements			Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	Lead Member	
		laws of the Bidder's country, other financial statements acceptable to the Procuring agency/Employer for the last 3 years shall be submitted and must demonstrate the current soundness of the Bidder's financial position and indicate its prospective long-term profitability.					
3.2	Average Annual Construction Turnover	Minimum average annual construction turnover of PKR 250 million, calculated as total certified payments received for contracts in progress and/or completed within the last 3 years, divided by _____ year RS	Must meet requirement	Must meet requirement	Must meet _____%, _____ of the requirement	Must meet _____%, _____ of the requirement	Form FIN – 3.2

Eligibility and Qualification Criteria				Compliance Requirements			Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	Lead Member	
4. Experience							
4.1 (a)	General Construction Experience	Experience under construction contracts in the role of prime contractor, JV member, sub-contractor, or management contractor for at least the last 7 years.	Must meet requirement	N/A	Must meet requirement	N/A	Form EXP – 4.1
4.2 (a)	Specific Construction & Contract Management Experience	(i) A minimum number of similar contracts specified below that have been satisfactorily and substantially completed as a prime contractor, JV member, management contractor or sub-contractor during last 7 years: (i) 3 contracts, each of minimum value 100 million; Or (ii) Less than or equal to 3 contracts, each of minimum value 80 million, but with total value of all contracts equal or more than 50 million .	Must meet requirement	Must meet requirement	N/A	N/A	Form EXP 4.2(a)
		[Add the following if specialized sub-contractor is permitted and describe nature	“Must meet requirement for one contract (Requirement can be met	Must meet requirement	N/A	N/A	

Eligibility and Qualification Criteria				Compliance Requirements			Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	Lead Member	
		and characteristics of specialized works:] “(ii) For the following specialized works, the Procuring agency/Employer permits specialized sub-contractors as per ITB 34”	through a Specialized Sub-contractor)”				
4.2 (b)		For the above and any other contracts completed and under implementation as prime contractor, joint venture member, management contractor or sub-contractor on or after the first day of the calendar year during the period stipulated in 4.2 (a) above, a minimum construction experience in the following key activities successfully completed: Building works and infrastructure development	Must meet requirements	N/A	N/A	N/A	Form EXP – 4.2 (b)
4.2 (c)	Specific Experience in managing ESS aspects	For the contracts in 4.2 (a) above and/or any other contracts [substantially completed and	Must meet requirements	Must meet requirement	N/A	N/A	Form EXP – 4.2 (c)

Eligibility and Qualification Criteria				Compliance Requirements			Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	Lead Member	
		under implementation] as prime contractor, joint venture member, or Subcontractor between 1st January 2019 and Application submission deadline, experience in managing ES risks and impacts in the following aspects: <i>Academic buildings</i> <i>Or</i> <i>infrastructure establishment</i>					

Note: [For Multiple lots (contracts) specify financial and experience criteria for each lot under 3.1, 3.2, 4.2]

Contractor's Representative and Key Personnel

The Bidder must demonstrate that it will have a suitably qualified Contractor's Representative and suitably qualified (and in adequate numbers) Key Personnel, as described in the Specification.

The Bidder shall provide details of the Representative and Key Personnel and such other Key Personnel that the Bidder considers appropriate to perform the Contract, together with their academic qualifications and work experience. The Bidder shall complete the relevant Forms in the Section VII, Bidding Forms.

Equipment

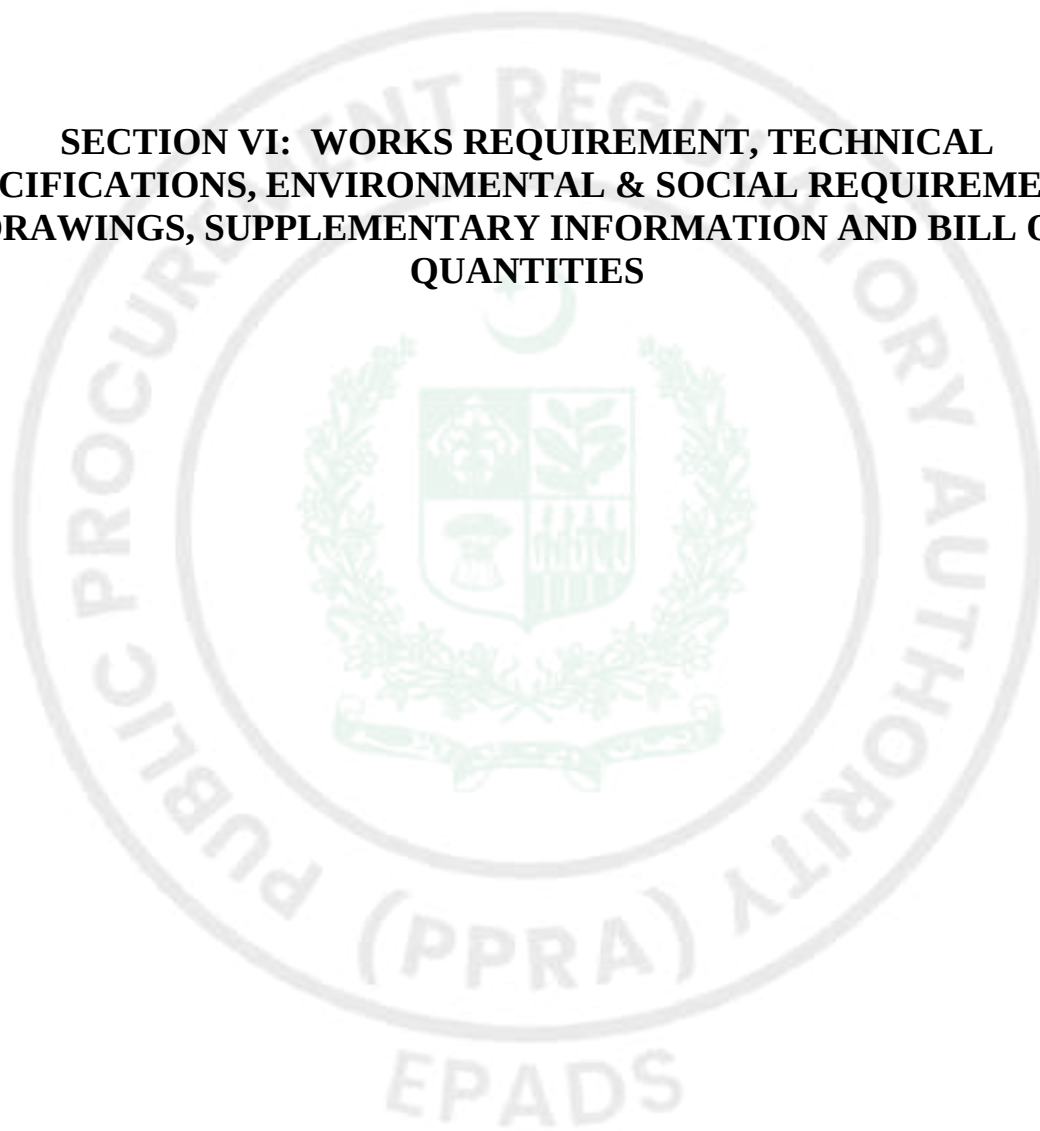
The Bidder must demonstrate that it has access to the key equipment listed hereafter:

[Specify requirements for each lot as applicable]

No.	Equipment Type and Characteristics	Minimum Number required
1		
2		
3		
4		
5		

The Bidder shall provide further details of proposed items of equipment using Form EQU in Section V.

**SECTION VI: WORKS REQUIREMENT, TECHNICAL
SPECIFICATIONS, ENVIRONMENTAL & SOCIAL REQUIREMENTS,
DRAWINGS, SUPPLEMENTARY INFORMATION AND BILL OF
QUANTITIES**



Scope of Works

Construction of New Building for PEL Examination Center Karachi

The Pakistan Civil Aviation Authority (PCAA) intends to construct a purpose-built, technologically advanced, and secure Personnel Licensing (PEL) Examination Centre at its Regulatory Block premises, HQCAA, Karachi. The proposed facility is to be developed as a two-storey reinforced concrete building with an approximate covered footprint area of 2,473 square feet, designed and constructed in accordance with UKCAAi Guidance on Examination Venue and IT Specifications, applicable ICAO requirements, Pakistan Building Code, and all relevant international engineering and safety standards. The scope of works shall include, but not necessarily be limited to, the following:

1. Civil & Structural Works

- Construction of a two-storey reinforced concrete (RCC) building comprising foundations, columns, beams, slabs, staircases, and roofing system in accordance with approved structural drawings and Pakistan Building Code.
- Masonry, plastering, waterproofing, and all associated civil works including earthworks, excavation, backfilling, and compaction.

2. Architectural & Finishing Works

- Complete architectural fit-out of all functional spaces including examination halls, reception, waiting lounge, invigilator rooms, server room, administrative offices, cafeteria, and male/female/accessible toilet blocks.
- Internal and external finishes comprising flooring, wall finishes, false ceilings, acoustic treatment, doors, windows, glazing, joinery, signage, and furniture as per approved finish schedule and interior design drawings.

3. HVAC & Mechanical Works

- Supply, installation, and commissioning of centralized or split-type air conditioning, ventilation, and exhaust systems throughout the building including dedicated precision cooling for the server room.

4. Electrical Works

- Complete internal power distribution system including main panel, DBs, wiring, energy-efficient LED lighting, earthing, and lightning protection.
- Supply and installation of emergency power systems comprising diesel generator and UPS with automatic changeover facility.

5. Plumbing, Drainage & Sanitary Works

- Complete water supply, distribution, sanitary, soil, waste, and grey water drainage systems including underground and overhead storage tanks, sanitary fixtures, and connection to existing campus infrastructure.

6. Fire Protection & Life Safety Works

- Supply, installation, and commissioning of addressable fire alarm, smoke detection, fire suppression, emergency exit lighting and fire extinguisher systems in compliance with applicable safety standards.

7. ICT, Security & Surveillance Works

- Supply, installation, and commissioning of structured cabling (LAN/WAN), IP CCTV surveillance, biometric access control, audio-visual examination monitoring systems, server room fit-out, and physical security measures including secure doors and turnstiles.

8. External Development Works

- Paved parking, driveways and pedestrian pathways.

9. Health, Safety & Environmental (HSE) Compliance

- Implementation of all HSE standard practices, site safety measures, dust/noise/waste management, and compliance with PCAA campus security and operational protocols throughout the construction period.



Technical Specifications

The Technical section of CSR - Sindh shall be used separate volume of Technical specification also attached

Complete Technical Specifications (Volume-II) are attached in the end of this Document



Environmental and Social Safeguard (ESS) requirements

The procuring agency/Employer while preparing the bidding documents shall take due account of environmental and social safeguard requirements of the contract. These requirements, inter alia, shall include environmental and social safeguards, occupational health and safety, labor conditions, gender equality, Sexual Exploitation & Abuse and Sexual Harassment (SEAH), climate adaptation, land acquisition and resettlement of indigenous people in accordance with the relevant state laws. The procuring agency shall also clearly prescribe in the bidding documents, the monitoring, reporting and compliance mechanism for all such requirements.

As a minimum, the policy is set out to the commitments to:

1. Adhere with the relevant laws of Pakistan to protect and conserve the natural environment and to minimize unavoidable impacts;
2. provide and maintain a healthy and safe work environment and safe systems of work;
3. protect the health and safety of local communities and users, with particular concern for those who are disabled, elderly, or otherwise vulnerable;
4. be intolerant of, and enforce disciplinary measures for illegal activities. To be intolerant of, and enforce disciplinary measures for gender-based violence, inhumane treatment, sexual exploitation, rape, sexual abuse, sexual activity with children, and sexual harassment;
5. incorporate a gender perspective and provide an enabling environment where women and men have equal opportunity to participate in, and benefit from, planning and development of the Works;
6. work co-operatively, including with end users of the Works, relevant authorities, contractors and local communities;
7. engage with and listen to affected persons and organizations and be responsive to their concerns, with special regard for vulnerable, disabled, and elderly people;
8. provide an environment that fosters the exchange of information, views, and ideas that is free of any fear of retaliation, and protects whistleblowers;
9. minimize the risk of communicable diseases and to mitigate the effects of communicable diseases associated with the execution of the Works.

PAYMENT FOR ESS REQUIREMENTS

The Employer's ESS and procurement specialists shall consider how the Contractor will cost the delivery of the ESS requirements. In the majority of cases, the payment for the delivery of ESS requirements shall be a subsidiary obligation of the Contractor covered under the prices quoted for other Bill of Quantity items. For example, normally the cost of implementing work place safe systems of work, including the measures necessary for ensuring traffic and road safety, shall be covered by the Bidder's rates for the relevant works. Alternatively, provisional sums could be set aside for discrete activities for example for HIV counselling service, and, *SEA and SH awareness and sensitization or to encourage the contractor to deliver additional ESS outcomes beyond the requirement of the Contract.*

Drawings

Complete Tender Drawings (Volume-VI) are attached in the end of this Document



Supplementary Information

No supplementary information



Bill of Quantities

Detail BOQ (Volume-III) is attached in the end of this Document



Daywork Schedule

[Note to the Procuring agency/Employer:

- (i) *A “Daywork Schedule” is commonly found in contracts where the likely incidence of unforeseen work cannot be covered by definitive descriptions and approximate quantities in the Bill of Quantities. The preferred alternative is to value the additional work in accordance with the Conditions of Contract. A Daywork Schedule normally has the disadvantage of not being competitive among bidders, who may therefore load the rates assigned to some or all the items. If a Daywork Schedule is to be included at all in the bidding documents, it is preferable to include nominal quantities against the items most likely to be used, and to carry the sum of the extended amounts forward into the Bid Summary in order to make the basic Schedule of Daywork Rates competitive.*
- (ii) *The total amount assigned to such competitive daywork is normally 3–5 percent of the estimated base Contract Price and is regarded as a Provisional Sum for contingencies to be expended under the direction and at the discretion of the Engineer.*

General

1. Reference should be made to Sub-Clause 13.5 of the General Conditions. Work shall not be executed on a daywork basis except by written order of the Engineer. Bidders shall enter basic rates for daywork items in the Schedules, which rates shall apply to any quantity of daywork ordered by the Engineer. Nominal quantities have been indicated against each item of daywork, and the extended total for Daywork shall be carried forward as a Provisional Sum to the Summary Total Bid Price. Unless otherwise adjusted, payments for daywork shall be subject to price adjustment in accordance with the provisions in the Conditions of Contract.

Daywork Labour

2. In calculating payments due to the Contractor for the execution of daywork, the hours for labour will be reckoned from the time of arrival of the labour at the job site to execute the particular item of daywork to the time of return to the original place of departure, but excluding meal breaks and rest periods. Only the time of classes of labour directly doing work ordered by the Engineer and for which they are competent to perform will be measured. The time of gangers (charge hands) actually doing work with the gangs will also be measured but not the time of foremen or other supervisory personnel.
3. The Contractor shall be entitled to payment in respect of the total time that labour is employed on daywork, calculated at the basic rates entered by the Contractor in the **Schedule of Daywork Rates: 1. Labour**, together with an additional percentage payment on basic rates representing the Contractor's profit, overheads, etc., as described below:
 - (a) The basic rates for labour shall cover all direct costs to the Contractor, including (but not limited to) the amount of wages paid to such labour, transportation time, overtime, subsistence allowances, and any sums paid to or on behalf of such labour for social benefits in accordance with law of the land. The basic rates will be payable in PKR only.
 - (b) The additional percentage payment to be quoted by the bidder and applied to costs incurred under (a) above shall be deemed to cover the Contractor's profit, overheads, superintendence, liabilities, and insurances and allowances to labour, timekeeping, and clerical and office work, the use of

consumable stores, water, lighting, and power; the use and repair of stagings, scaffolding, workshops, and stores, portable power tools, manual plant, and tools; supervision by the Contractor's staff, foremen, and other supervisory personnel; and charges incidental to the foregoing. Payments under this item shall be made in the Pakistani Rupee:

[Note to the Procuring agency/Employer:

This method of indicating profit and overheads separately facilitates the addition of further items of daywork, if needed, the basic costs of which can then be checked more easily. An alternative is to make Daywork rates all-inclusive of the Contractor's overhead and profit, etc., in which case this paragraph and the relevant Daywork Schedule should be modified accordingly.

Daywork Materials

4. The Contractor shall be entitled to payment in respect of materials used for daywork (except for materials for which the cost is included in the percentage addition to labour costs as detailed heretofore), at the basic rates entered by the Contractor in the **Schedule of Daywork Rates: 2. Materials**, together with an additional percentage payment on the basic rates to cover overhead charges and profit, as follows:
 - (a) the basic rates for materials shall be calculated on the basis of the invoiced price, freight, insurance, handling expenses, damage, losses, etc., and shall provide for delivery to store for stockpiling at the Site. The basic rates shall be quoted in the currency specified in the BDS.
 - (b) the additional percentage payment shall also be made in the currency specified in BDS:
 - (c) the cost of hauling materials for use on work ordered to be carried out as daywork from the store or stockpile on the Site to the place where it is to be used will be paid in accordance with the terms for Labour and Construction in this schedule.

Daywork Contractor's Equipment

5. The Contractor shall be entitled to payments in respect of Contractor's Equipment already on Site and employed on daywork at the basic rental rates entered by the Contractor in the **Schedule of Daywork Rates, Contractor's Equipment**. Said rates shall be deemed to include due and complete allowance for depreciation, interest, indemnity, and insurance, repairs, maintenance, supplies, fuel, lubricants, and other consumables, and all overhead, profit, and administrative costs related to the use of such equipment.

[Note to the Procuring agency/Employer: *This is an example of wording to include overhead and profit, etc., in the daywork rates. A separate percentage addition could be used as for labour and materials.]* The cost of drivers, operators, and assistants will be paid for separately as described under the section on Daywork Labour. *An alternative, sometimes adopted for administrative convenience, is to include the cost of drivers, operators, and assistants in the basic rates for Contractor's Equipment. The last sentence of this paragraph 5 should then be modified accordingly.]*

6. In calculating the payment due to the Contractor for Contractor's Equipment employed on daywork, only the actual number of working hours will be eligible for payment, except that where applicable and agreed with the Engineer, the travelling time from the part of the Site where the Contractor's Equipment was located when ordered by the Engineer to be employed on daywork and the time for return journey thereto shall be included for payment.

(a) The basic rental rates for Contractor's Equipment employed on daywork shall be stated in the currency specified in the BDS and the payment to the Contractor will be made in the currency specified in BDS.



Schedule of Daywork Rates: 1. Labour

[illegible]

[illegible]

Schedule of Daywork Rates: 3. Contractor's Equipment

[illegible]

¹ To be entered by the bidder.

Daywork Summary

	<i>Amount</i> ()
1. Total for Daywork: Labour	
2. Total for Daywork: Materials	
3. Total for Daywork: Contractor's Equipment	
Total for Daywork (Provisional Sum) (carried forward to Bid Summary, p. ____)	_____

Summary of Specified Provisional Sums

<i>Bill no.</i>	<i>Item no.</i>	<i>Description</i>	<i>Amount</i>
1			
2			
3			
4			
		[To be entered by the Procuring agency/Employer; Delete if not applicable:] provisional sums for additional ES outcomes.	
etc.			
Total for Specified Provisional Sums (carried forward to Grand Summary (B), p. _)			

Grand Summary

Contract Name:

Contract No.:

<i>General Summary</i>	<i>Page</i>	<i>Amount</i>
Bill No. 1:		
Bill No. 2:		
Bill No. 3:		
— etc. —		
<i>Subtotal of Bills</i>	(A)	
<i>Total for Daywork (Provisional Sum)²</i>	(B)	
<i>Specified Provisional Sums included in subtotal of bills</i>	(C)	[sum]
<i>Total of Bills Plus Provisional Sums (A + B + C)³</i>	(D)	
<i>Add Provisional Sum for Contingency Allowance (if any)⁴</i>	(E)	[sum]
<i>Bid Price (D + E) (Carried forward to Letter of Bid)⁵</i>	(F)	

² For evaluation purposes, Provisional Sum, other than Daywork will be excluded

³ All Provisional Sums are to be expended in whole or in part at the direction and discretion of the Engineer in accordance with Sub-Clauses 13.4 and 13.5 of the General Conditions except with respect to DAAB Fees and Expenses for which Sub-Clause 13.4 of the Particular Conditions – Part B shall apply.

⁴ To be entered by the Employer to provide for unforeseen physical quantities of work (usually 5%–15% of base cost, i.e., of the subtotal of bills); and, if included in the contract, for price escalation adjustments (commonly 6%–12% per annum on estimated annual payments).

⁵ The Bid Price is inclusive of all Environmental, Health, and Safety management and compliance costs.

Technical Proposal

- **Site Organization**
- **Method Statement**
- **Mobilization Schedule**
- **Construction Schedule**
- **Equipment**



Site Organization

Organization Chart:

Shall indicate head office and field office personnel involved in management and supervision, engineering, equipment maintenance and purchasing.

Mobilization:

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



Method Statement

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

1. Organization Chart indicating head office and field office personnel involved in management and supervision, engineering, equipment maintenance and purchasing.
2. The method of executing the Works, the procedures for installation of equipment and machinery and transportation of equipment and materials to the site



Mobilization Schedule

In accordance with the Particular Conditions, Sub-Clause 4.1, the Contractor shall not carry out mobilization to Site unless the Engineer gives consent.



Construction Schedule

Bidders shall set out a work program for construction of the Works to be undertaken, including the mobilization phase, showing identification of major milestones, and critical path. Detailed timetables may be submitted (as appropriate) for the following aspects:

- (a) Processes and deliverables needed to commence the Works;
- (b) Execution of the Works within the Time for Completion, highlighting activities imposing constraints on the construction sequence;
- (c) Testing, commissioning and handing over of the completed Works; and
- (d) [include any other relevant information as may be appropriate]

Work programs shall be submitted through EPADS in a PDF format compatible with known computer programs, such as, for example, PRIMAVERA, TILOS, CAD, or MS Project (GANTT graphics), or similar programs.

Programs must include milestones, when they are applicable, and the specific personnel designation and/or labor outlines, planned for the fulfillment of each program and phase or program activity:

General work program with an outline of designated personnel and tables of theoretical duration of tasks or activities; graphic displays of the work progress in flowcharts to show daily production for each activity and the critical path.

Form EQU: Equipment

The Bidder shall provide adequate information to demonstrate clearly that it has the capability to meet the requirements for the key equipment listed in Section III, Evaluation and Qualification Criteria. A separate Form shall be prepared for each item of equipment listed, or for alternative equipment proposed by the Bidder.

Item of equipment		
Equipment information	Name of manufacturer	Model and power rating
	Capacity	Year of manufacture
Current status	Current location	
	Details of current commitments	
Source	Indicate source of the equipment ☐ Owned ☐ Rented ☐ Leased ☐ Specially manufactured	

Omit the following information for equipment owned by the Bidder.

Owner	Name of owner	
	Address of owner	
	Telephone	Contact name and title
	Fax	Telex
Agreements	Details of rental / lease / manufacture agreements specific to the project	

SECTION VII: STANDARD BIDDING FORMS

Table of Forms

Letter of Bid – Technical Proposal.....	73
Letter of Bid - Financial Proposal	75
FORM ELI-1.1.....	77
Bidder Information Form	77
Form ELI-1.2.....	78
Bidder’s JV Members Information Form	78
Personnel.....	79
EXPERIENCE	93
Form of Bid Security	99
Appendix-B.....	101
Form of Bid-Securing Declaration.....	101
Appendix-C.....	102
.....	

Letter of Bid – Technical Proposal

INSTRUCTIONS TO BIDDERS: DELETE THIS BOX ONCE YOU HAVE COMPLETED THE DOCUMENT

Place this Letter of Bid in the first envelope “TECHNICAL PROPOSAL”.

The Bidder must prepare the Letter of Bid on stationery with its letterhead clearly showing the Bidder’s complete name and business address.

Note: All italicized text in black font is to help Bidders in preparing this form and Bidders shall delete it from the final document.

Date of this Bid submission: [insert date (as day, month and year) of Bid submission]

RFB No.: [insert number of Bidding process]

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

To: [insert complete name of Procuring agency/Employer]

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 to the bidding document, including addenda issued in accordance with Instructions to Bidders (**ITB 7**);
- (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/Employer based on execution of a Bid Securing Declaration or Bid Securing Declaration in the Procuring agency/Employer’s country in accordance with **ITB 17**;
- (d) **Conformity:** We offer to execute works in conformity with the bidding document and in accordance with the works requirements: [insert a brief description of the WORKS];
- (e) **Bid Validity Period:** Our Bid shall be valid for the period specified in **BDS 10** (as amended, if applicable) from the date fixed for the Bid submission deadline specified in **BDS 13** (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 a 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.
- (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/Employer. Further, we are not ineligible under Pakistan laws;

- (i) **State-owned enterprise or institution:** *[select the appropriate option and delete the other] [We are not a state-owned enterprise or institution] / [We are a state-owned enterprise or institution];*
- (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.

Name of the Bidder: *[insert complete name of Bidder]*

Country of Origin of the Bidder: *[insert country of origin]*

Name of the person duly authorized to sign the Bid on behalf of the Bidder: * *[insert complete name of person duly authorized to sign the Bid]*

Title of the person signing the Bid: *[insert complete title of the person signing the Bid]*

Signature of the person named above: *[insert signature of person whose name and capacity are shown above]*

Date signed *[insert date of signing]* **day of** *[insert month]*, *[insert year]*

*: Person signing the Bid shall have the power of attorney given by the Bidder. The power of attorney shall be attached with the Bid Schedules.

Letter of Bid - Financial Proposal

INSTRUCTIONS TO BIDDERS: DELETE THIS BOX ONCE YOU HAVE COMPLETED THE DOCUMENT

Place this Letter of Bid - Financial Proposal in the second envelope marked "FINANCIAL PROPOSAL".

The Bidder must prepare the Letter of Bid - Financial Proposal on stationery with its letterhead clearly showing the Bidder's complete name and business address.

Note: All italicized text is to help Bidders in preparing this form.

Date of this Bid submission: [insert date (as day, month and year) of Bid submission]

Request for Bid No.: [insert number of bidding process]

Name of Project.: [insert identification]

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

To: [insert complete name of Procuring agency/Employer]

We, the undersigned Bidder, hereby submit the second part of our Bid, the Financial Proposal

In submitting our Financial Proposal we make the following additional declarations:

- (a) **Bid Validity Period:** Our Bid shall be valid for the period specified in **BDS 10** (as amended, if applicable) from the date fixed for the bid submission deadline specified in **BDS 13** (as amended, if applicable), and it shall remain binding upon us and may be accepted at any time before the expiration of that period;
- (b) **Total Price:** The total price of our Bid is:

In case of only one lot, the total price of the Bid is [insert the total price of the bid in words and figures, indicating the various amounts and the respective currencies];

In case of multiple lots, the total price of each lot is [insert the total price of each lot in words and figures, indicating the various amounts and the respective currencies];

In case of multiple lots, total price of all lots (sum of all lots) [insert the total price of all lots in words and figures, indicating the various amounts and the respective currencies];

- (c) **Commissions, gratuities and fees:** We have paid, or will pay the following commissions, gratuities, or fees with respect to the bidding process or execution of the Contract: [insert complete name of each Recipient, its full address, the reason for which each commission or gratuity was paid and the amount and currency of each such commission or gratuity].

Name of Recipient	Address	Reason	Amount

(If none has been paid or is to be paid, indicate “none.”)

- (d) **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.

Name of the Bidder: *[insert complete name of the Bidder]*

Name of the person duly authorized to sign the Bid on behalf of the Bidder: * *[insert complete name of person duly authorized to sign the Bid]*

Title of the person signing the Bid: *[insert complete title of the person signing the Bid]*

Signature of the person named above: *[insert signature of person whose name and capacity are shown above]*

Date signed *[insert date of signing]* **day of** *[insert month]*, *[insert year]*

*: Person signing the Bid shall have the power of attorney given by the Bidder. The power of attorney shall be attached with the Bid Schedules.

FORM ELI-1.1

Bidder Information Form

[The Bidder shall fill in this Form in accordance with the instructions indicated below. No alterations to its format shall be permitted and no substitutions shall be accepted.]

Date: *[insert date (as day, month and year) of Bid submission]*

RFB No.: *[insert number of Bidding process]*

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

Page _____ of _____ pages

1. Bidder's Name <i>[insert Bidder's legal name]</i>
2. In case of JV, legal name of each member : <i>[insert legal name of each member in JV]</i> N/A
3. Bidder's actual or intended country of registration: <i>[insert actual or intended country of registration]</i>
4. Bidder's year of registration: <i>[insert Bidder's year of registration]</i>
5. Bidder's Address in country of registration: <i>[insert Bidder's legal address in country of registration]</i>
6. Bidder's Authorized Representative Information Name: <i>[insert Authorized Representative's name]</i> Address: <i>[insert Authorized Representative's Address]</i> Telephone/Fax numbers: <i>[insert Authorized Representative's telephone/fax numbers]</i> Email Address: <i>[insert Authorized Representative's email address]</i>
7. Attached are copies of original documents of <i>[check the box(es) of the attached original documents]</i> ☐ Articles of Incorporation (or equivalent documents of constitution or association), and/or documents of registration of the legal entity named above. ☐ Establishing that the Bidder is not under the supervision of the Procuring agency/Employer[in case of subsidiaries]
8. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.

Form ELI-1.2

Bidder's JV Members Information Form

[The Bidder shall fill in this Form in accordance with the instructions indicated below. The following table shall be filled in for the Bidder and for each member of a Joint Venture]].

Date: *[insert date (as day, month and year) of Bid submission]*

RFB No.: *[insert number of RFB process]*

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

Page _____ of _____ pages

1. Bidder's Name: <i>[insert Bidder's legal name]</i>
2. Bidder's JV Member's name: <i>[insert JV's Member's name]</i>
3. Bidder's JV Member's country of registration: <i>[insert JV's Member country of registration]</i>
4. Bidder's JV Member's year of registration: <i>[insert JV's Member year of registration]</i>
5. Bidder's JV Member's legal address: <i>[insert JV's Member legal address in country of registration]</i>
6. Bidder's JV Member's authorized representative information Name: <i>[insert name of JV's Member authorized representative]</i> Address: <i>[insert address of JV's Member authorized representative]</i> Telephone/Fax numbers: <i>[insert telephone/fax numbers of JV's Member authorized representative]</i> Email Address: <i>[insert email address of JV's Member authorized representative]</i>
7. Attached are copies of original documents of <i>[check the box(es) of the attached original documents]</i> ☐ Articles of Incorporation (or equivalent documents of constitution or association), and/or registration documents of the legal entity named above.
8. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.

Personnel

Form PER -1

Contractor's Representative and Key Personnel Schedule

Bidders should provide the names and details of the suitably qualified Contractor's Representative and Key Personnel to perform the Contract. The data on their experience should be supplied using the Form PER-2 below for each candidate.

Contractor' Representative and Key Personnel

1.	Title of position:	
	Name of candidate:	
	Duration of appointment:	[insert the whole period (start and end dates) for which this position will be engaged]
	Time commitment: for this position:	[insert the number of days/week/months/ that has been scheduled for this position]
	Expected time schedule for this position:	[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]
2.	Title of position:	
	Name of candidate:	
	Duration of appointment:	[insert the whole period (start and end dates) for which this position will be engaged]
	Time commitment: for this position:	[insert the number of days/week/months/ that has been scheduled for this position]
	Expected time schedule for this position:	[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]
3.	Title of position:	
	Name of candidate:	
	Duration of appointment:	[insert the whole period (start and end dates) for which this position will be engaged]
	Time commitment: for this position:	[insert the number of days/week/months/ that has been scheduled for this position]
	Expected time schedule for this position:	[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]

4.	Title of position:	
	Name of candidate:	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment: for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>
5.	Title of position:	
	Name of candidate	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment: for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>
6.	Title of position: <i>[insert title]</i>	
	Name of candidate	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment: for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>

Form PER-2
Resume and Declaration

Contractor Representative and Key Personnel

Name of Bidder:	
------------------------	--

Proposed Position:	
Name of Staff:	
Profession:	
Date of Birth:	
Years with present Employer :	
Nationality:	
Cell Number:	
Memberships of Professional Associations:	

Education:

Degree	Major / Minor	Institution	Date

Employment Record and Experience:

Summarize professional experience in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.

Work Undertaken That Best Illustrates Capability To Handle The Tasks Assigned:
Employer Name: Name of assignment or project: Year: (From - To) Location: Client: Position Held: Activities performed:.
Employer Name: Name of assignment or project: Year: (From - To) Location: Client: Position Held: Activities performed:.
Employer Name: Name of assignment or project: Year: (From - To) Location:

Work Undertaken That Best Illustrates Capability To Handle The Tasks Assigned:
Client:
Position Held:
Activities performed:

Languages:

	Speaking	Writing	Reading

Declaration

I, the undersigned [insert either <Contractor's Representative= or <Key Personnel= as applicable] , certify that to the best of my knowledge and belief, the information contained in this Form PER-2 correctly describes myself, my qualifications and my experience. I confirm that I am available as certified in the following table and throughout the expected time schedule for this position as provided in the Bid:

Commitment	Details
Commitment to duration of contract	Available for the entire contract period, from [Contract Start Date] to [Contract Completion Date] , including any approved extension, if required.
Time commitment:	Available on a full-time basis for [insert number] person-months, from [Mobilization Date] to [Demobilization Date], in accordance with the approved staffing schedule.

I understand that any misrepresentation or omission in this Form may:

- (a) be taken into consideration during Bid evaluation;
- (b) result in my disqualification from participating in the Bid;
- (c) result in my dismissal from the contract.

_____ **Date :** _____
 [Signature of Authorized Representative]
 (Day/Month/Year)

Form CON – 2

Historical Contract Non-Performance, Pending Litigation and Litigation History

Bidder's Name: _____

Date: _____

ICB/NCB No. and title: _____

Page _____ of _____ pages

Non-Performed Contracts in accordance with Qualification Criteria			
☐ Contract non-performance did not occur January [insert year]			
☐ Contract(s) not performed since [insert year]			
Year	Non-performed portion of contract	Contract Identification	Total Contract Amount (current value, currency, exchange rate and PKR equivalent)
		Contract Identification: Name of Procuring agency/Employer(PA): Address of PA: Reason(s) for nonperformance:	
Pending Litigation, in accordance with Qualification Criteria			
☐ No pending litigation			
☐ Pending litigation			

Year of dispute	Amount in dispute (currency)	Contract Identification	Total Contract Amount
		Contract Identification: _____ Name of PA: _____ Address of PA: _____ Matter in dispute: _____ Party who initiated the dispute: _____ Status of dispute: _____	
Litigation History in accordance with Section III, Evaluation and Qualification Criteria of the Prequalification document			
No Litigation History Litigation History			
Year of award	Outcome as percentage of Net Worth	Contract Identification	Total Contract Amount (currency), PKR Equivalent (exchange rate)
[insert year]	[insert percentage]	Contract Identification: [indicate complete contract name, number, and any other identification] Name of PA: [insert full name] Address of PA: [insert street/city/country] Matter in dispute: [indicate main issues in dispute] Party who initiated the dispute: [indicate "Procuring agency/Employer" or "Contractor"] Reason(s) for Litigation and award decision [indicate main reason(s)]	[insert amount]

Form CON – 3

Environmental and Social (ES) Performance Declaration

[The following table shall be filled in for the Bidder]

Bidder's Name: *[insert full name]*

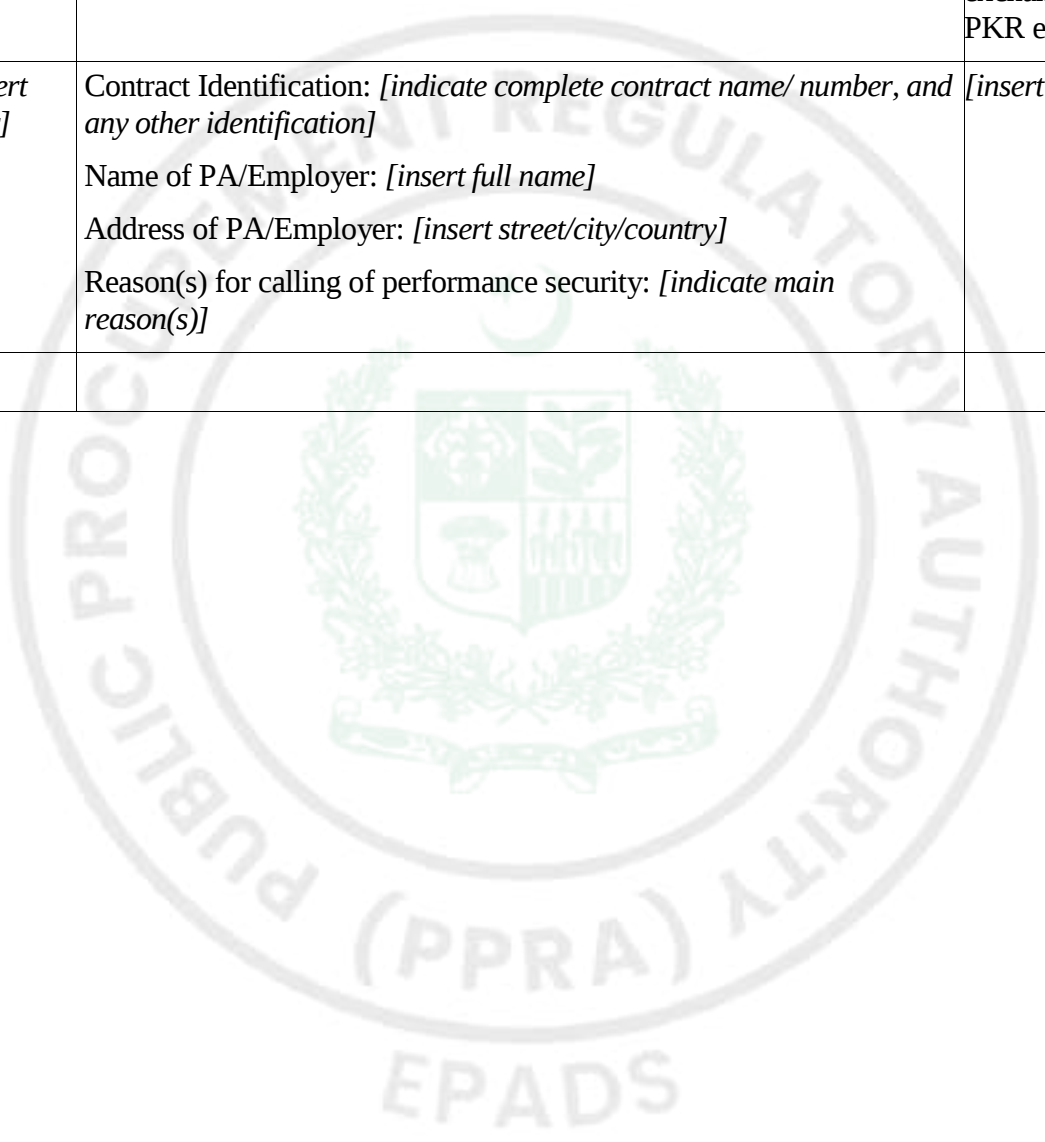
Date: *[insert day, month, year]*

ICB/NCB No. and title: *[insert ICB/NCB number and title]*

Page *[insert page number]* **of** *[insert total number]* **pages**

Environmental and Social (ES) Performance Declaration in accordance with Section III, Evaluation and Qualification Criteria			
☐ No suspension or termination of contract: A procuring agency (PA)/employer has not suspended or terminated a contract and/or called the performance security for a contract for reasons related to Environmental and Social (ES) performance since the date specified in Section III, Evaluation and Qualification Criteria, Sub-Factor 2.5.			
☐ Declaration of suspension or termination of contract: The following contract(s) has/have been suspended or terminated and/or Performance Security called by a PA(s)/employer(s) for reasons related to Environmental and Social (ES) performance since the date specified in Section III, Evaluation and Qualification Criteria, Sub-Factor 2.5. Details are described below:			
Year	Suspended or terminated portion of contract	Contract Identification	Total Contract Amount (current value, currency, exchange rate and US\$ equivalent)
<i>[insert year]</i>	<i>[insert amount and percentage]</i>	Contract Identification: <i>[indicate complete contract name/ number, and any other identification]</i> Name of PA/Employer: <i>[insert full name]</i> Address of PA/Employer: <i>[insert street/city/country]</i> Reason(s) for suspension or termination: <i>[indicate main reason(s)]</i>	<i>[insert amount]</i>
<i>[insert year]</i>	<i>[insert amount and percentage]</i>	Contract Identification: <i>[indicate complete contract name/ number, and any other identification]</i> Name of PA/Employer: <i>[insert full name]</i> Address of PA/Employer: <i>[insert street/city/country]</i> Reason(s) for suspension or termination: <i>[indicate</i>	<i>[insert amount]</i>

		<i>main reason(s)]</i>	
...	...	<i>[list all applicable contracts]</i>	...
Performance Security called by an employer(s) for reasons related to ES performance			
Year	Contract Identification		Total Contract Amount (current value, currency, exchange rate and PKR equivalent)
<i>[insert year]</i>	Contract Identification: <i>[indicate complete contract name/ number, and any other identification]</i> Name of PA/Employer: <i>[insert full name]</i> Address of PA/Employer: <i>[insert street/city/country]</i> Reason(s) for calling of performance security: <i>[indicate main reason(s)]</i>		<i>[insert amount]</i>



Financial Situation

Form FIN – 3.1:

Financial Situation and Performance

Bidder's Name: _____

Date: _____

ICB/NCB No. and title: _____

Page _____ of _____ pages

1. Financial data

Type of Financial information in (currency)	Historic information for previous _____ years, (amount in currency, currency, exchange rate*, PKR equivalent)				
	Year 1	Year 2	Year 3	Year4	Year 5
Statement of Financial Position (Information from Balance Sheet)					
Total Assets (TA)					
Total Liabilities (TL)					
Total Equity/Net Worth (NW)					
Current Assets (CA)					
Current Liabilities (CL)					
Working Capital (WC)					
Information from Income Statement					
Total Revenue (TR)					
Profits Before Taxes (PBT)					
Cash Flow Information					
Cash Flow from Operating Activities					

*Refer to ITB 29 for the exchange rate

2. Sources of Finance

Specify sources of finance to meet the cash flow requirements on works currently in progress and for future contract commitments.

No.	Source of finance	Amount (PKR)
1		
2		
3		

2. Financial documents

The Bidder and its parties shall provide copies of financial statements for _____ years pursuant to Evaluation and Qualifications Criteria, Sub-factor 3.1. The financial statements shall:

- (a) reflect the financial situation of the Bidder.
- (b) be independently audited or certified in accordance with local legislation.
- (c) be complete, including all notes to the financial statements.
- (d) correspond to accounting periods already completed and audited.

☐ Attached are copies of financial statements for the _____ years required above; and complying with the requirements

Form FIN – 3.2:

Average Annual Construction Turnover

Bidder's Name: _____

Date: _____

ICB/NCB No. and title: _____

Page _____ of _____ pages

		Annual turnover data (construction only)	
Year	Amount Currency	Exchange rate	PKR equivalent
<i>[indicate year]</i>	<i>[insert amount and indicate currency]</i>		
Average Annual Construction Turnover *			

* See Section V, Evaluation and Qualification Criteria, Sub-Factor 3.2.

Form FIN – 3.3:

Financial Resources

Specify proposed sources of financing, such as liquid assets, unencumbered real assets, lines of credit, and other financial means, net of current commitments, available to meet the total construction cash flow demands of the subject contract or contracts as specified in Section V (Evaluation and Qualification Criteria)

Financial Resources		
No.	Source of financing	Amount (PKR)
1		
2		
3		

Form FIN – 3.4:

Current Contract Commitments / Works in Progress

Bidders should provide information on their current commitments on all contracts that have been awarded, or for which a letter of intent or acceptance has been received, or for contracts approaching completion, but for which an unqualified, full completion certificate has yet to be issued.

Current Contract Commitments					
No.	Name of Contract	Procuring agency/Employer's Contact Address, Tel, Fax	Value of Outstanding Work [PKR Equivalent]	Estimated Completion Date	Average Monthly Invoicing Over Last Six Months [PKR/month]
1					
2					
3					
4					
5					

Form FIN - 5:

Self-Assessment Tool for Bidder's Compliance to Financial Resources (Criterion 2.1 of Section 3)

This form requires the same information submitted in Forms FIN – 3.3 and FIN -3.4. All conditions of “Available Financial Resources Net of CCC $\geq$ Requirement for the Subject Contract” must be satisfied to qualify.

Form FIN - 5: For Single Entities

For Single Entities: (A)	Total Available Financial Resources from FIN – 3.3 (B)	Total Monthly Financial Requirement for Current Contract Commitments (CCC) from FIN – 3.4 (C)	Available Financial Resources Net of CCC $D = (B - C)$	Requirement for the Subject Contract (E)	Results: Yes or No [<i>D must be greater than or equal to E</i>] (F)
_____ (Name of Bidder)					

Form FIN – 5 is made available for use by the bidder as a self-assessment tool, and by the employer as an evaluation work sheet, to determine compliance with the financial resources requirement as stated in 2.3.3. Failure to submit Form FIN - 5 by the Bidder shall not lead to bid rejection.

EXPERIENCE

Form EXP - 4.1

General Construction Experience

Bidder's Name: _____

Date: _____

CB/NCB No. and title: _____

Page _____ of _____ pages

Starting Year	Ending Year	Contract Identification	Role of Bidder
		Contract name: _____ Brief Description of the Works performed by the Bidder: _____ Amount of contract: _____ Name of PA/employer: _____ Address: _____	
		Contract name: _____ Brief Description of the Works performed by the Bidder: _____ Amount of contract: _____ Name of PA/employer: _____ Address: _____	
		Contract name: _____ Brief Description of the Works performed by the Bidder: _____ Amount of contract: _____ Name of PA/employer: _____ Address: _____	

Form EXP - 4.2(a)

**Specific Construction and Contract Management
Experience**

Bidder's Name: _____

Date: _____

ICB/NCB No. and title: _____

Page _____ of _____ pages

Similar Contract No.	Information			
Contract Identification				
Award date				
Completion date				
Role in Contract	Prime Contractor ☐	Member in JV ☐	Management Contractor ☐	Sub-contractor ☐
Total Contract Amount	PKR equivalent			
If member in a JV or sub-contractor, specify participation in total Contract amount				
PA/employer's Name:				
Address:				
Telephone/fax number				
E-mail:				

Form EXP - 4.2(a) (cont.)
Specific Construction and Contract Management
Experience (cont.)

Similar Contract No.	Information
Description of the similarity in accordance with Sub-Factor 4.2(a) of Section III:	
1. Amount	
2. Physical size of required works items	
3. Complexity	
4. Methods/Technology	
5. Construction rate for key activities	
6. Other Characteristics	

Form EXP - 4.2(b)

Construction Experience in Key Activities

Bidder's Name: _____

Date: _____

Sub-contractor's Name⁵ (as per ITB 34): _____

ICB/NCB No. and title: _____

Page _____ of _____ pages

All Sub-contractors for key activities must complete the information in this form as per ITB 34 and Qualification Criteria and Requirements, Sub-Factor 4.2.

1. Key Activity No One: _____

	Information			
Contract Identification				
Award date				
Completion date				
Role in Contract	Prime Contractor ☐	Member in JV ☐	Management Contractor ☐	Sub-contractor ☐
Total Contract Amount	PKR equivalent			
Quantity (Volume, number or rate of production, as applicable) performed under the contract per year or part of the year	Total quantity in the contract (i)	Percentage participation (ii)		Actual Quantity Performed (i) x (ii)
Year 1				
Year 2				
Year 3				
Year 4				

⁵ If applicable

	Information
PA/employer's Name:	
Address:	
Telephone/fax number	
E-mail:	

2. Activity No. Two

3.

	Information
Description of the key activities in accordance with Section III:	

Form EXP - 4.2 (c)

Specific Experience in Managing ES aspects

[The following table shall be filled in for contracts performed by the Bidder]

Bidder's Name: [insert full name]

Date: [insert day, month, year]

ICB/NCB No. and title: [insert ICB/NCB number and title]

Page [insert page number] of [insert total number] pages

1. Key Requirement no 1 in accordance with 4.2 (c): _____

Contract Identification				
Award date				
Completion date				
Role in Contract	Prime Contractor ☐	Member in JV ☐	Management Contractor ☐	Subcontractor ☐
Total Contract Amount			PKR	
Details of relevant experience				

2. Key Requirement no 2 in accordance with 4.2 (c): _____

3. Key Requirement no 3 in accordance with 4.2 (c): _____

4. ...

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]* (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.]

Date: *[date (as day, month and year)]*

No.: *[number of bidding process]*

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

To: *[complete name of Procuring agency/Employer]*

We, the undersigned, declare that:

We understand that, according to your conditions, Bids must be supported by a Bid-Securing Declaration.

We accept that we will be blacklisted and henceforth cross debarred for participating in respective category of public procurement proceedings for a period of (not more than) six months, if fail to abide with a bid securing declaration, however without indulging in corrupt and fraudulent practices, if we are in breach of our obligation(s) under the Bid conditions, because we:

- (a) have withdrawn our Bid during the period of Bid validity specified in the Letter of Bid; or
- (b) having been notified of the acceptance of our Bid by the Procuring agency/Employer during the period of Bid validity, (i) fail or refuse to sign the Contract; or (ii) fail or refuse to furnish the Performance Security (or guarantee), if required, in accordance with the ITB.

We understand this Bid Securing Declaration shall expire if we are not the successful Bidder, upon the earlier of (i) our receipt of your notification to us of the name of the successful Bidder; or (ii) twenty-eight days after the expiration of our Bid.

Name of the Bidder _____

Name of the person duly authorized to sign the Bid on behalf of the Bidder* _____

Title of the person signing the Bid _____

Signature of the person named above _____

Date signed _____ day of _____, _____

*: Person signing the Bid shall have the power of attorney given by the Bidder attached to the Bid

Appendix-C

Formula for Price Adjustment

[Note to Procuring agency/Employer: It is recommended that in the case of very large and/or complex works contracts, it may be necessary to specify several families of price adjustment formulae corresponding to the different works involved. **When finalizing the contract document, ensure that the finalized Schedule of Cost Indexation is attached to the Contract Agreement.]**

- a) Price Adjustment/ escalation shall not be applicable on Civil, Mechanical and Electrical projects /contracts having contract life less than 365 days from the date of the signing of the contract.
- b) Procuring Agency/Employer is advised not to change any provisions hereof unless otherwise stated by the Authority.
- c) No method, other than given in this formula will be applicable to compute the price adjustment.
- d) This document will be applicable only for Price Adjustment in local currency (Pak. Rs.). Price Adjustment in foreign currency is not allowed.
- e) Price Adjustment formula and corresponding weightages to be inferred for price adjustment shall be agreed and firmed up by the Procuring agency and contractor shall firm up the weightages and co-efficient for respective items before signing of the contract. There shall be no change permissible in the weightages after signing of the contract.
- f) For imported plant/ equipment and materials quoted in local currency (Pak. Rs.), foreign currency, exchange rates shall be fixed at the respective interbank currency exchange rates, prevailing on the tender opening date. The change in foreign currency exchange rates shall be applicable to the foreign currency component stated in the Letter of Intent issued by the Contractor or his Vendor.
- g) This document is to assist the Procuring agency/Employer and bidder for the preparation of provisions for price adjustment in their bidding / contract documents. All the coefficients of the price adjustment formula shall be specified in the bidding document at the time of advertisement.

[The formulae for price adjustment shall be of the following general type:]

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

where,

“P_n” is the Price Adjustment factor for the work carried out in the period “n”.

“A” is a constant or the Non-Adjustable Portion of the Price Adjustment Factor to be specified in Appendix-C to Bid, representing the Non-Adjustable Portion of the Contract Price.

“b, c, d…….” are Coefficients or weightages of the order of 0.xx (i.e., fractions rounded off to two decimals) for each specified element of adjustment in the Contract. The sum of A, b, c, d, etc., shall be one.

“L_n”, “E_n”, “M_n”, ... are the current cost indices or reference prices for period “n”, expressed in the relevant currency of payment, each of which is applicable to the relevant tabulated cost element on the date 28 days prior to the last day of the period (to which the particular Payment Certificate relates); and

“L₀”, “E₀”, “M₀”, ... are the base cost indices or reference prices, expressed in the relevant currency of payment, each of which is applicable to the relevant tabulated cost element on the Base Date.

1. Construction schedule should be provided by the contractor as required in the Contract. Price Adjustment shall be applicable as payable in full for the actual scheduled completion period.
2. In the event the completion of contract exceeds the scheduled period:
 - 2.1 In case of default on the part of the contractor causing delay in original scheduled completion, the rate of Price Adjustment will be frozen at the original scheduled date of completion. Price Adjustment will be applicable till actual completion. While the rate of Price Adjustment beyond the scheduled completion period, in case the rate is reduced, then that reduced rate will be applied.
3. The Price Adjustment shall be payable in full for the extended period if the contractor has been granted an extension of time for no fault on the part of the contractor, duly approved by the Employer.
4. Unless stated otherwise in the contract, the basis for compensation will be on the basis of elements, which are specifically listed as specified items in the tender documents. This list will specify the elements for Civil, Electrical, Mechanical, Sanitary, HVAC, etc., separately.
5. Formula for Price Adjustment provided herein will be applicable for all the contracts such as Civil, Electrical, Mechanical, etc.
6. There shall be no Price Adjustment for the elements which the Employer has either supplied free of cost or at fixed prices as well as for those elements for which an umbrella *ex gratia* or escalation cover is provided by the Government through an Executive Order or Statutory Regulatory Order (SRO).

The Contract shall be on Fixed Price Basis and no price adjustment / escalation shall be admissible during the currency of the Contract.

Weightages of Specified Items

Each of the cost elements, having cost impact of five (05) percent or higher can be selected for adjustment.

In determining the weightages, the following procedure shall be adopted:

- a) Base Date Price alone of an element based on market rate shall be considered excluding cost of construction/ installation, overheads and profit.
- b) Engineer's Estimate shall be prepared for complete project.
- c) Appropriate Rate Analysis of the Engineer's Estimate shall be made to determine costs of the basic elements.
- d) For such cost elements having various types of a particular element, individual cost of such family of the element used in the project to be determined and added to work out the element cost. (Grade-40 and Grade-60 steel shall be treated under same category).
- e) Each cost element determined as above, shall be divided by the total amount of Engineer's Estimate to determine various weightages.

Weightage of Fixed Portion

Weightage of fixed portion (Non-adjustable portion of the estimated cost of the contract), shall be determined as under:

- a) First the weightage of cost elements having value of five (5) percent or more to be added. If the total is 75 percent or less. In that case the total is to be divided by one (01) to determine the weightage of the fixed portion,
- b) If the weightage of the cost elements including HSD and labour exceeds 75 percent, then the element(s) having lowest weightage(s) other than HSD and labour shall be excluded in considering the adjustable costs elements.
- c) The fixed portion shall be 25 percent and in case the fixed portion even less than 25 percent it shall be supported by calculations attached with the bidding.
- d) Sum of fixed portion and weightages b, c, d,etc., of the adjustable portion shall always be one (01).

Base Date Price

The base date price (or base date index) of any element shall be the price of the element for the month on the day falling 28 days prior to the last day for submission of bids.

Current Date Price

The current date price (or current date index) of any element shall be the price of the element for the month falling on the day 28 days prior to the last day of the period to which the particular Payment Certificate relates.

Section VIII. General Conditions (GC)

Red Book:

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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 successful Bidder, upon contract award, shall be required to furnish two (02) copies of aforementioned “General Conditions” for incorporation in the Works Contract.

International Federation of Consulting Engineers (FIDIC)

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

Fax: +41 22 799 49 054

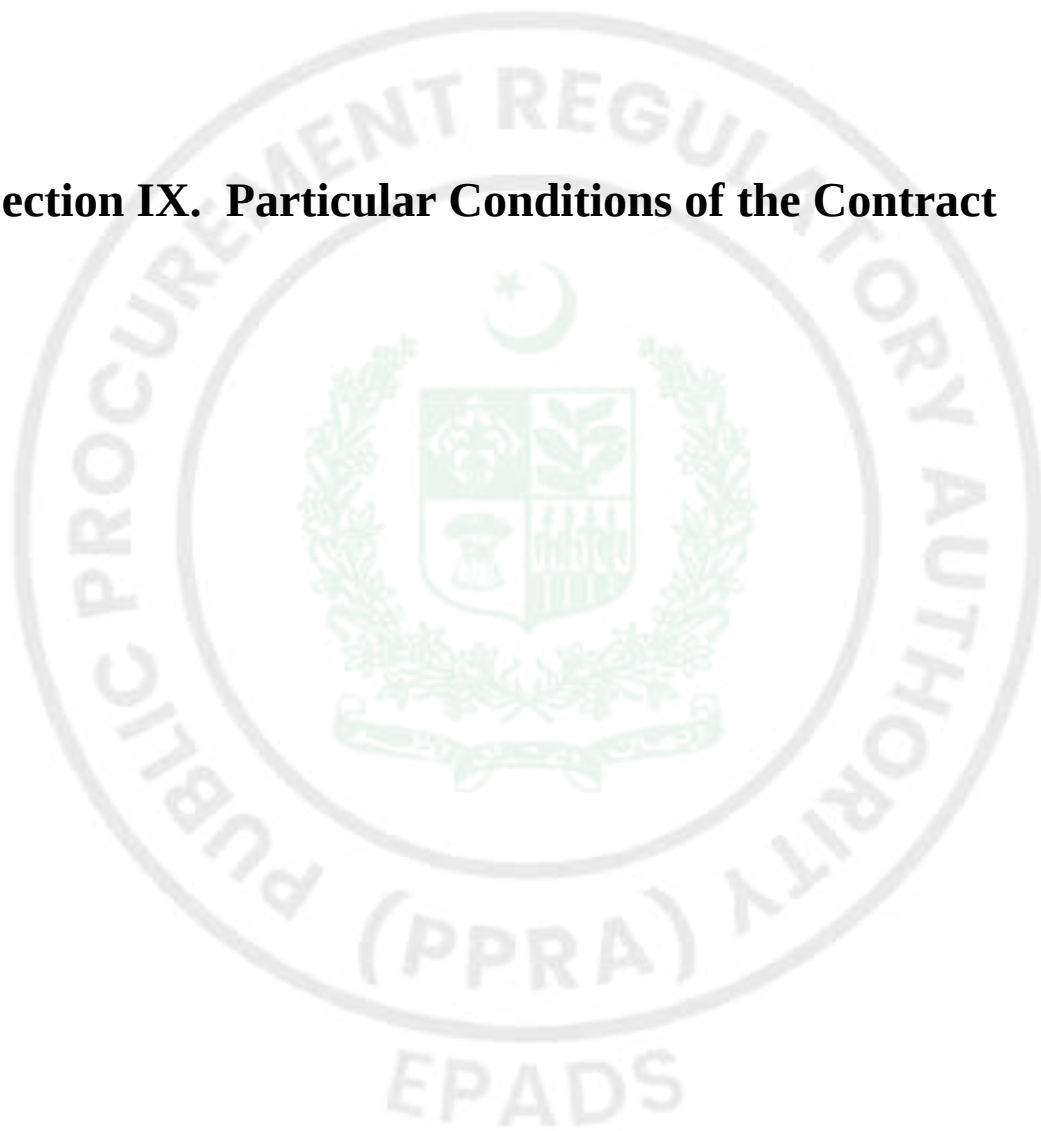
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Section IX. Particular Conditions of the Contract



Particular Conditions of the Contract

The Particular Conditions (PC) complement the General Conditions (GC) to specify dates, contractual requirements, and special circumstances related to the Works. The PC consists of two parts, Part A - Contract Data and Part B - Special Provisions. The provisions to be found in the Special Provisions (Particular Conditions - Part B) take precedence over the equivalent provisions found under the same Sub-Clause number(s) in the General Conditions, and the provisions of the Contract Data (Particular Conditions - Part A) take precedence over the Special Provisions (Particular Conditions - Part B).

Part A - Contract Data

Sub-Clause	Data to be Given	Data
1.1.27	Defects Notification Period (DNP):	180 days
1.1.31	Employer's name and address:	Pakistan Civil Aviation Authority Headquarter, PCAA B-6, KDA Scheme No. 01, Karsaz, Karachi.
1.1.35	Engineer's name and address:	<i>To be Nominated later</i>
1.1.73	Sections:	<i>None</i>
1.1.84	Time for Completion:	7 months for Construction of Work
1.3(a)	Agreed Method of Electronic Communication	<i>E-Pak Acquisition & Disposal System (EPADS) at (www.eprocure.gov.pk)</i>
1.3(d)	address of Employer for communications:	Additional Director Admin Pakistan Civil Aviation Authority Headquarter, PCAA B-6, KDA Scheme No. 01, Karsaz, Karachi
	address of Engineer for communications:	<i>to be Nominated later</i>
	address of Contractor for communications:	<i>to be Nominated later</i>
1.4	Contract shall be governed by the law of:	Governing Law; The Applicable Law shall be: Laws of the land i.e. Islamic Republic of Pakistan
	ruling language:	English

	language for communications:	English
1.6	Time for the Parties to sign a Contract Agreement	15 days after receipt of the Letter of Acceptance
1.8	number of additional paper copies of Contractor's Documents:	Three (03)
1.15	Total liability of the Contractor to the Employer under or in connection with the Contract	<i>As per provision of the Contract</i>
2.1	after receiving the Letter of Acceptance, the Contractor shall be given right of access to all or part of the Site within:	03 days after Commencement Date
2.4	Employer's financial arrangements	PCAA Own Funds
3.2 (e)(ii)	Engineer's Duties and Authority	The Engineer shall obtain the specific approval of the Employer before carrying out his duties in accordance with the following Clauses: (i) Consenting to the sub-letting of any part of the Works under Sub-Clause "Subcontracting". (ii) Certifying additional cost for "Not Foreseeable Physical Obstructions or Conditions". (iii) Any action under "Performance Security" and "Insurance" of sorts. (iv) Certifying additional Cost (v) Any action under "Suspension". (vi) Certifying additional Cost (vii) Any action under "Extension of Time for Completion". (viii) Any action under "Liquidated Damages for Delay" or payment of Bonus for Early Completion of Works, (ix) Issuance of "Taking Over Certificate". (x) Issuing a Variation Order, except: a) in an emergency* situation, as stated here below, or b) if such variation would increase the Contract Price (xi) Fixing rates or prices. (xii) Extra payment as a result of Contractor's claims. (xiii) Release of Retention Money to the

		Contractor “Payment of Retention Money”. (xiv) Issuance of “Final Payment Certificate”. (xv) Issuance of “Defect Liability Certificate”. (xvi) Hiring of Engineer Representative * (If in the opinion of the Engineer an emergency occurs affecting the safety of life or of the Works or of adjoining property, the Engineer may, without relieving the Contractor of any of his duties and responsibilities under the Contract, instruct the Contractor to execute all such work or to do all such things as may, in the opinion of the Engineer, be necessary to abate or reduce the risk. The Contractor shall forthwith comply with any such instruction of the Engineer. The Engineer shall determine an addition to the Contract Price, in respect of such instruction, and shall notify the Contractor accordingly, with a copy to the Employer.) Engineer’s Duties and Authority: Variation resulting in an increase of the Accepted Contract Amount in excess of One percent (1%) subject to accumulative Variations not exceeding five percent (5%) of the Accepted Contract Amount.
4.2	Performance Security (as percentage of the Accepted Contract Amount in Currencies) percent: currency:	The Contractor shall provide Performance Security to the Employer in the prescribed form. The Performance Security shall be furnished by the Contractor within 14 days after the receipt of the Letter of Acceptance. Performance guarantee/ security will be in the form of an un-conditional and irrevocable bank guarantee from a scheduled bank in Pakistan in the amount of 10% of the accepted contract price. In case of a foreign bank, the guarantee shall be counter-signed and counter-guaranteed by a scheduled bank in Pakistan.
4.2.1	List of Insurance Companies	Having AA rating as rated by PACRA/VIS is acceptable operating in Pakistan
4.7.2	period for notification of errors in the items of reference	Twenty Eight (28) days
4.19	period of payment for temporary utilities	each month

4.20	number of additional paper copies of progress reports	03 copies
5.1(a)	maximum allowable accumulated value of work subcontracted (as a percentage of the Accepted Contract Amount)	Thirty percent (30%)
5.1(b)	parts of the Works for which subcontracting is not permitted	The details of subcontracting shall be provided by the contractor for consent of the Engineer and Employer
6.5	Normal working hours on the Site	The normal working hours has to be around the clock Maximum in three shifts the contractor has to provide detail schedule of completion in 8 months
8.3	number of additional paper copies of programmes	03 copies
8.8 & 14.15(b)	Delay Damages payable for each day of delay	Delay Damages shall be payable at the rate of zero point one percent (0.10%) of the Accepted Contract Amount for each day of delay, in the currencies and proportions in which the Contract Price is payable.
8.8	maximum amount of Delay Damages	Ten percent (10%) of the Accepted Contract Amount
8.14	Applicability of Incentives for Early Completion	No
12.3	Percentage profit	Ten percent (10%)
13.4.(b)(ii)	percentage rate to be applied to Provisional Sums for overhead charges and profit	Twenty Five percent (25%)
14.2	total Advance Payment	Not Applicable
14.2.1	List of Insurance Companies	Having AA rating as rated by PACRA/VIS is acceptable operating in Pakistan
14.2.3	percentage deductions for the repayment of the Advance Payment	Not Applicable
14.3	period of payment	one month
14.3(b)	number of additional paper copies	03 copies

	of Statements	
14.3 (iii)	percentage of retention	Five percent (5%)
14.3 (iii)	limit of Retention Money (as a percentage of the Contract Price)	Five percent (5%)
14.5(b)(i)	Plant and Materials for payment when shipped	Not Applicable
14.5(c)(i)	Plant and Materials for payment when delivered to the Site	Not Applicable
14.6.2	minimum amount of Interim Payment Certificate (IPC)	The minimum amount of an Interim Payment Certificate to be certified by The Engineer shall be Pakistani Rupees: Two Million Five Hundred Thousand (PKR 2,500,000).
14.7(a)	period of payment of Advance Payment to the Contractor	N/A
14.7b(i)	period for the Employer to make interim payments to the Contractor under Sub-Clause 14.6 [Interim Payment]	28 Days
14.7b(ii)	period for the Employer to make interim payments to the Contractor under Sub-Clause 14.13 (Final Payment)	60 days
14.7(c)	period for the Employer to make final payment to the Contractor	60 Days
14.8	financing charges for delayed payment	Not applicable / Not Claimable in any form.
14.11.1(b)	number of additional paper copies of draft Final Statements	03 copies
14.15	currencies of payment of Contract Price	PKR Payments only
14.15(a)(i)	Proportions or amounts of Local and Foreign currencies	PKR Payments only
14.15(c)	currencies and proportions for payment of Delay Damages	PKR Payments only
14.15(f)	rates of exchange	Not Applicable / Not Claimable in any form

17.2(d)	forces of nature, the risks of which are allocated to the Contractor	Nil
19.1	permitted deductible limits: insurance required for the Works insurance required for Goods insurance required for liability for breach of professional duty insurance required against liability for fitness for purpose (if any is required) insurance required for injury to persons and damage to property insurance required for injury to employees other insurances required by Laws and by local practice	i) Ten percent (10%) of loss amount on each & every loss ii) Nil iii) Nil iv) Nil v) Nil vi) Nil vii) Nil
19.1	Periods for submission of insurance: evidence of insurance relevant policies	Not later than the Commencement Date Within twenty eight (28) day from the Commencement Date
19.2.1(b)	additional amount to be insured (as a percentage of the replacement value)	15% of the replacement value (Accepted Contract Amount)
19.2.2	extent of insurance required for Goods amount of insurance required for Goods	from Ex-Works (i.e., works, factory, warehouse, etc) to delivery at the Site Full replacement value
19.2.3(a)	amount of insurance required for liability for breach of professional duty	Full replacement value of the Works to be designed by the Contractor
19.2.3(b)	insurance required against liability for fitness for purpose	Yes
19.2.3	period of insurance required for liability for breach of professional duty	Until the date of issuance of Performance Certificate

19.2.4	amount of insurance required for injury to persons and damage to property	Injury to person and Fatal case: in accordance with Workmen Compensation Act Damage to Property: 5 million without limit to the number of incidents
19.2.6	other insurances required by Laws and by local practice	All insurances as applicable, to the extent of execution of the project, under Federal and Provincial laws of Islamic Republic of Pakistan
21.1	time for appointment of the DAAB	Within 28 days from the Commencement Date. In case the Accepted Contract Amount is lesser than PKR one (01) billion, appointment of the DAAB shall be made when Dispute arises between the Parties.
21.1	the DAAB shall comprise	Three (03) Members
21.1	List of proposed members of DAAB - proposed by Employer - proposed by Contractor	To be nominated later at the time of signing of the Contract
21.2	Appointing entity (official) for DAAB members	Appointing Authority for Arbitrator shall be Chief Justice Islamabad High Court or Managing Director Public Procurement Regulatory Authority (PPRA) or Secretary (Ministry of Law and Justice)
21.6	Rules of Arbitration	Rules of Arbitration PEC Rules of Conciliation and Arbitration or Pakistan Arbitration Act of 1940, if the former is inactive. The place of Arbitration shall be in the Employer's country: Karachi Pakistan

Summary of Sections of the Works

Section Name/Description of parts of the Works that shall be designated a Section for the purposes of the Contract (Sub-Clause 1.1.73)	Value: Percentage* of Accepted Contract Amount (Sub-Clause 14.9)	Time for Completion (Sub-Clause 1.1.84)	Delay Damages (Sub-Clause 8.8)
A			
B			
C			

* These percentages shall also be applied to each half of the Retention Money under Sub-Clause 14.9.

Section Name/Description (Sub-Clause 1.1.73)	Time for Completion (Sub-Clause 1.1.84)	Incentives for Early Completion (Sub-Clause 8.14)
A		
B		
C		

PARTICULAR CONDITIONS OF CONTRACT
PART B “SPECIAL PROVISIONS”

1.1 Definitions	<u>1.1.76 “Specification”</u> Following is added at the end: “and consists of two parts i.e., i) “Part A - Specific Provisions”; and ii) “Part B - Technical Provisions”.”
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 “employer” is synonymous with “procuring agency”, the word “tenderer with “bid”, the word “tenderer” with “bidder”, the words “tender documents” with “bidding documents” and “Schedule of Prices” with “Bill of Quantities”, as applicable.”
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 Particular Conditions Part A - Contract Data; (e) the Particular Conditions Part B – Special Provisions; (f) the General Conditions; (g) the Specification Part A – Specific Provisions; (h) the Specification Part B- Technical Provisions; (i) the Drawings; (j) the completed Schedules to Bid including Bill of Quantities; (k) 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.
1.6 Contract Agreement	In the last line of the 1st paragraph the text “shall be borne by the Employer” is substituted by “shall be reimbursed by the Employer to the Contractor”.
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”.
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) Consenting to the subcontracting of any part of the Works under Sub-Clause 5.1 [Subcontractors] 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"
4.2 Performance Security	4.2.1 Contractor's Obligations The entity issuing the Performance Security and its form shall be as under: Performance guarantee/ security will be in the form of an un-conditional and irrevocable bank guarantee from a scheduled bank in Pakistan in the amount of 10% of the accepted contract price. In

	case of a foreign bank, the guarantee shall be counter-signed and counter-guaranteed by a scheduled bank in Pakistan Following paragraph is added at the end of this Sub-Clause: “The amount of Performance Security shall be reduced to 50% following issue of the Taking-Over Certificate for the whole of the Works under Clause 10 of Conditions of Contract.”
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 license 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 the 3rd paragraph the words “28 days” are substituted by “14 days”. 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”
4.4 Contractor’s Documents	<u>4.4.2 As-Built Records</u> 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.
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.
4.20 Progress Reports	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 summary of daily job record indicating weather conditions, deployment of Contractor's Equipment, labour employment, local material procurement and material import, if any; and (k) salient contractual and project information.
5.2 Nominated Subcontractors	<u>5.2.2 Objection to Nomination</u> 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]."
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 (not less than 50%) and labour (not less than 85%) with appropriate qualifications and experience from sources within the Islamic Republic of Pakistan unless impractical and unreasonable, subject to justifiable measures have been taken for the identification of relevant human resources."
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."
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."
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:	
6.13 Foreign Personnel	The Contractor may bring in to the Country any foreign personnel who are necessary for the execution of the Works to the extent allowed by the applicable Laws. The Contractor shall ensure that these personnel are provided with the required residence visas and work permits. The Employer will, if requested by the Contractor, use all reasonable endeavours in a timely and expeditious manner to assist the Contractor in obtaining any local, state, national, or government permission required for bringing in the Contractor’s personnel. The Contractor shall be responsible for the return of these personnel to the place where they were recruited or to their domicile. In the event of the death in the Country of any of these personnel or members of their families, the Contractor shall similarly be responsible for making the appropriate arrangements for their return or burial.
6.14 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.
6.15 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.
6.16 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.
6.17 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.
6.18 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.
6.19 Festivals and Religious Customs	The Contractor shall respect the Country’s recognized festivals, days of rest and religious or other customs.
6.20 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.
6.21 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.
6.22 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.
6.23 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 [<i>Contractor's Records</i>].
6.24 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.
6.25 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 nondiscrimination 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).
6.26 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.
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."
The following Sub-Clause 7.9 is added after Sub Clause 7.8:	
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.
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".
8.3 Number of additional paper copies of programmes	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 summary of daily job record indicating weather conditions, deployment of Contractor's Equipment, labour employment, local material procurement and material import, if any; and (k) salient contractual and project information.
8.5 Extension of Time for Completion	The following is added after paragraph (c): "for last five years".
The following Sub-Clause 8.14 is added after Sub-Clause 8.13:	
8.14 Incentives For Early Completion	If Contract Data does not state applicability of incentives for early completion, this Sub-Clause shall not apply. The Contractor shall be entitled subject to Sub-Clause 20.2 [<i>Claims for Payment and/or EOT</i>] to bonus payment if the Works and/or each Section is completed earlier than the Time for Completion for the Works or Section (as the case may be). The amount of bonus for early completion of the Works and/or each Section shall be upto a limit and at a rate to 50% of the relevant limit and rate of delay damages prescribed in Contract Data and shall be paid for every day which shall elapse between the relevant Date of Completion of the Works or Section and the relevant Time for Completion. For the purposes of calculating any bonus payment, the applicable Time for Completion stated in the Contract Data is fixed and no adjustments of this time by reason of granting an EOT will be allowed.
The following Sub-Clause 11.12 is added after Sub-Clause 11.11:	
11.12 Supervisory	If provided under the Schedule of Prices, the Contractor shall

Assistance During DNP	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.
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 headsnamely; “Schedule of Prices Quantity”, “Quantity Executed To-date”, “Quantity Certified Previously” and “Net Quantity Executed under this Certificate”.
12.3 Valuation of the Works	The following text is added at the end of fifth paragraph of the Sub-Clause: “Sum of overhead charges and profit for sub-paragraph (a) shall be Twenty Five percent (25%)”.
13.4 Provisional Sums	The following paragraph is inserted as the penultimate paragraph: “The Provisional Sum shall be used to cover the Employer’s share of the DAAB members’ fees and expenses, in accordance with Clause 21. No prior instruction of the Engineer shall be required with respect to the work of the DAAB. The Contractor shall submit the DAAB members’ invoices and the satisfactory evidence of having paid 100% of such invoices as part of the substantiation of those Statements submitted under Sub-Clause 14.3.
13.6 Adjustments for Changes in Laws	The following paragraphs are added at the end of the Sub-Clause: If, after the date 28 days prior to the latest date for submission of tenders for the Contract there occur in the country in which the Works are being or are to be executed changes to any National or State Statute, Ordinance, Decree or other Law or any regulation or bye-law of any local or other duly constituted authority, or the introduction of any such State Statute, Ordinance, Decree, Law, regulation or bye-law which causes additional or reduced cost to the Contractor, other than under Sub-Clause 13.7, in the execution of the Contract, such additional or reduced cost shall, after due consultation with the Employer and the Contractor, be determined by the Engineer and shall be added to or deducted from the Contract Price and the Engineer shall notify the Contractor accordingly, with a copy to the Employer.
14.1 The Contract Price	The following is added at the end of the Sub-Clause: “Notwithstanding the provisions of subparagraph (b), Contractor's Equipment, including essential spare parts, imported by the Contractor for the sole purpose of executing the Contract shall be temporarily exempt from the payment of import duties and taxes upon initial importation, provided the Contractor shall post with the customs authorities at the port of entry an approved re-export bond or bank guarantee, valid until the Time for Completion plus six months, in an amount equal to the full import duties and taxes which would be payable on the assessed imported value of such Contractor's Equipment and spare parts, and callable in the event the Contractor's Equipment is not re-exported from the Country on completion of the Contract. A copy of the bond or bank guarantee endorsed by the customs authorities shall be

	provided by the Contractor to the Employer upon the importation of individual items of Contractor's Equipment and spare parts. Upon re-export of individual items of Contractor's Equipment or spare parts, or upon the completion of the Contract, the Contractor shall prepare, for approval by the customs authorities, an assessment of the residual value of the Contractor's Equipment and spare part to be re-exported, based on the depreciation scale(s) and other criteria used by the customs authorities for such purposes under the provisions of the applicable Laws. Import duties and taxes shall be due and payable to the customs authorities by the Contractor on (a) the difference between the initial imported value and the residual value of the Contractor's Equipment and spare parts to re-exported; and (b) on the initial imported value of the Contractor's Equipment and spare parts remaining in the Country after completion of the Contract. Upon payment of such dues within 28 days of being invoiced, the bond or bank guarantee shall be reduced or released accordingly; otherwise the security shall be called in the full amount remaining.”
14.2 Advance Payment	Not Applicable in this Case
14.6 Issue of IPC	<u>14.6.1 The IPC</u> In the first line of the 1st paragraph the words “28 days” are substituted by “14 days”.
14.7 Payment	The words “or through crossed cheque in favour of the Contractor.
14.8 Delayed Payment	In the first paragraph, third line, the words “compounded monthly” are deleted. The text of 2nd paragraph is deleted and substituted with the following: “The Employer shall pay to the Contractor compensation at the rate stated in the Contract Data.”
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>15.2.3 After Termination</u> The word “and” at the end of sub-paragraph (ii) of paragraph (b) is deleted the following paragraph is added after sub-paragraph (iii): “(iv) all Employer-Supplied Materials and/or Employer's Equipment made available to the Contractor in accordance with Sub-Clause 2.6 [Employer-Supplied Materials and Employer's Equipment], and”

15.4 Payment after Termination	The following text is added at the end of this Sub-Clause: “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 including any outstanding payments to the Subcontractors
16.2 Termination by Contractor	16.2.1 Notice The sub-paragraph (j) is deleted in its entirety. At the end of sub-paragraph (i) “; or” is replaced with “.” and at the end of sub-paragraph (h) “;” is replaced with “; or”. In sub-paragraph (f) “84 days” are replaced with “180 days” and text “for reasons not attributable to the Contractor” is added at the end.
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 [<i>Employer-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.”
17.1 Responsibility for Care of the Works	After the two instances of “Goods” in the last paragraph, the words “Employer-Supplied Materials and/or Employer’s Equipment” are added.
The following Sub-Clause 17.7 is added after Sub-Clause 17.6:	
17.7 Use of Employer’s Accommodation/ Facilities	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 a 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.
18.1 Exceptional Events	The words “or disorder” are replaced with “disorder or sabotage” in sub-paragraph (c) of the Clause.
18.4 Consequences of an Exceptional Event	The following is added at the end of sub-paragraph (b) after deleting the “.”: “, including the costs of rectifying or replacing the Works and/or Goods damaged or destroyed by Exceptional Events, to the extent they are not indemnified through the insurance policy referred to in Sub-Clause 19.2 [<i>Insurance to be provided by the Contractor</i>].”
18.5 Optional Termination	In sub-paragraph (c), the words “and necessarily” are added after the words “was reasonably”.
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.”						
19.2 Insurance to be provided by the Contractor	<u>19.2.5 Injury to employees</u> The words “sickness, disease” are deleted in the third line of first paragraph. The following Sub-Clause is added after Sub-Clause 19.2.6: <u>19.2.7 Insurance Company</u> “The Contractor shall be obliged to place all insurances described in this Clause with insurers listed in the Contract Data and rated by PACRA/VIS of rating as provided in Table below: <table border="1"> <tr> <th>Accepted Contract Amount (In Eq. million PKR)</th><th>Minimum Rating of Insurance Companies</th></tr> <tr> <td>Up to 1000</td><td>A (+)</td></tr> <tr> <td>1001 to no limit</td><td>AA</td></tr> </table>	Accepted Contract Amount (In Eq. million PKR)	Minimum Rating of Insurance Companies	Up to 1000	A (+)	1001 to no limit	AA
Accepted Contract Amount (In Eq. million PKR)	Minimum Rating of Insurance Companies						
Up to 1000	A (+)						
1001 to no limit	AA						
21.6 Arbitration	The word “international” is deleted in the sixth line of first paragraph. The text of sub-paragraph (a) is substituted with the following: “the Dispute shall be finally settled under the Rules of Arbitration, specified in the Contract Data;”						
The following Clauses are added after Clause 21							
22 Taxes	The Contractor, Subcontractors and their employees shall be liable to pay income tax, withholding tax, super tax and other taxes on income arising out of the Contract. The rates and prices as stated in the contract shall be deemed to cover all such taxes.						
23 Integrity Part	If it is found and established at any stage that the Contractor or any of his Subcontractors, agents or servants have violated or involved in violation of the Integrity Pact signed by the Contractor then the Employer shall be entitled to: (a) recover from the Contractor an amount equivalent to ten times the sum of any commission, gratification, bribe, finder’s fee or kickback given by the Contractor or any of his Subcontractors, agent or servants; (b) terminate the Contract; and (c) recover from the Contractor any loss or damage to the Employer as a result of such termination or of any other corrupt business practices of the Contractor or any of his Subcontractors, agent or servants. The termination under sub-paragraph(b) of this Sub-Clause shall proceed in the manner prescribed under Sub-Clause 15.1 to 15.4 and the payment under Sub-Clause 15.4 shall be made after having deducted the amounts due to the Employer under sub-paragraph(a) and (c) of this Sub-Clause.						

SECTION X: CONTRACT FORMS

Notification of Award

(On Procuring Agency/Employer's letterhead)

Letter of Acceptance

[Date].

To:[Name and address of the contractor]

Subject:[Notification of Award Contract No.]

This is to notify you that your Bid dated[date]. for execution of the[name of the contract and identification number, as given in the Bid Data Sheet] for the Accepted Contract Amount of the equivalent of [amount in words and figures and name of currency]., as corrected and modified in accordance with the Instructions to Bidders, is hereby accepted by our Agency.

You are requested to furnish the Performance Security within 28 days in accordance with the Conditions of Contract, using for that purpose the Performance Security Form included in Section 9 (Contract Forms) of the Bidding Document.

Authorized Signature:

Name and Title of Signatory:

Name of Agency:

Attachment: Contract Agreement

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) The letter of Acceptance;
 - (c) The Letter of Bid;
 - (d) The Particular Conditions Part A - Contract Data;
 - (e) The Particular Conditions Part B - Special Provisions;
 - (f) The General Conditions;
 - (g) The Works Requirements;
 - (h) The Technical Specifications;
 - (i) The Drawings;
 - (j) The Completed Schedules to Bid including Schedule of Prices
 - (k) *[Procuring Agency to insert any other documents forming part of the Contract]*

The addenda/corrigenda, if any, (Excluding part relating to Instructions to Bidders alongwith Bidding Data) shall be deemed to have been incorporated at the appropriate places in the “Documents forming the Contract”.

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



DAAB Agreement

[All italicised text and any text within square brackets (except sub-clause headings) in this form of agreement is for use in preparing the form and should be deleted from the final product].

Name and details of the Contract _____

This Agreement made the _____ day of _____ [month], _____ [year], between

Name and contact details of the _____ (name)
Procuring Agency(PA)/Employer _____ (address)
_____ (telephone)
_____ (email / other contact details);

Name and contact details of the _____ (name)
Contractor _____ (address)
_____ (telephone)
_____ (email / other contact details);

Name and contact details of the _____ (name)
DAAB Member _____ (address)
_____ (telephone)
_____ (email / other contact details);

Whereas:

- A. the PA/Employer and the Contractor have entered (or intend to enter) into the Contract;
- B. under the Contract, the “**DAAB**” or “**Dispute Avoidance/Adjudication Board**” means the sole member or three members (as stated in the Contract Data of the Contract) so named in the Contract, or appointed under Sub-Clause 21.1 [*Constitution of the DAAB*] or Sub-Clause 21.2 [*Failure to Appoint DAAB Members*] of the Conditions of Contract;
- C. the PA/Employer and the Contractor desire jointly to appoint the above-named DAAB Member to act on the DAAB as:
 - a. the sole member of the DAAB, and where this is the case, all references to the “Other Members” do not apply; or
 - b. one of three members / chairman [*delete the one which is not applicable*] of the DAAB and, where this is the case, the other two persons are:

_____ (name)
_____ (address)

_____ (name)
_____ (address)

_____(telephone)
_____(email/ other contact details)

_____(telephone)
_____(email/ other contact details)



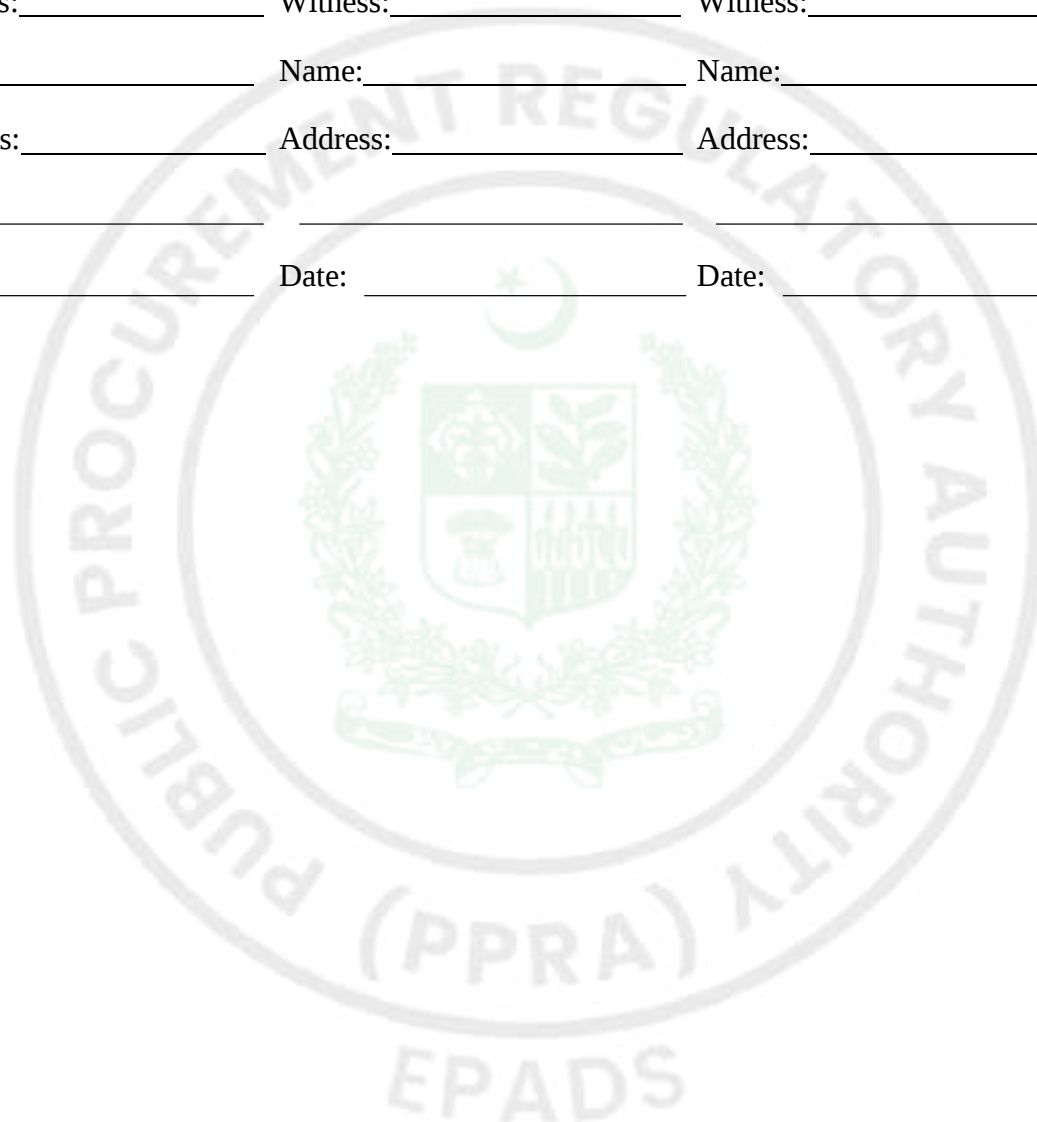
the “Other Members”; and

D. the DAAB Member accepts this appointment.

The Employer, Contractor and DAAB Member jointly agree as follows:

1. The conditions of this DAAB Agreement comprise:
 - (a) Clause 21 [*Disputes and Arbitration*] of the Conditions of Contract, and any other provisions of the Contract that are applicable to the DAAB’s Activities; and
 - (b) the “General Conditions of Dispute Avoidance/Adjudication Agreement”, which is appended to the General Conditions of the “Conditions of Contract for Construction” Second Edition 2017 published by FIDIC (“GCs”), as amended and/or added to by the following provisions.
2. [Details of amendments to the GCs, if any. For example:
In the procedural rules annexed to the GCs, Rule _ is deleted and replaced by: “ ... “]
3. The DAAB Member shall be paid in accordance with Clause 9 of the GCs. The currency of payment shall be _____.
In respect of Sub-Clauses 9.1 and 9.2 of the GCs, the amounts of the DAAB Member’s monthly fee and daily fee shall be:
monthly fee _____ per month, and
daily fee of _____ per day
(or as otherwise set under Sub-Clause 9.3 of the GCs).
4. In consideration of the above fees, and other payments to be made to the DAAB Member in accordance with the GCs, the DAAB Member undertakes to act as DAAB Member in accordance with the terms of this DAAB Agreement.
5. The Employer and the Contractor shall be jointly and severally liable for the DAAB Member’s fees and other payments to be made to the DAAB Member in accordance with the GCs.
6. This DAAB Agreement shall be governed by the law of _____ (if not stated, the law that governs the Contract under Sub-Clause 1.4 of the Conditions of Contract).

SIGNED by:_____	SIGNED by:_____	SIGNED by:_____
Print name:_____	Print name:_____	DAAB Member
Title:_____	Title:_____	Title:_____
for and on behalf of the P A/Employer	for and on behalf of the Contractor	
in the presence of	in the presence of	in the presence of
Witness:_____	Witness:_____	Witness:_____
Name:_____	Name:_____	Name:_____
Address:_____	Address:_____	Address:_____
_____	_____	_____
Date: _____	Date: _____	Date: _____



Performance Guarantee Form

To: [name of Procuring agency/Employer]

WHEREAS [name of Contractor] (hereinafter called “the contractor”) has undertaken, in pursuance of Contract No. [reference number of the contract] dated [insert date] for the execution of [insert name of the works and its brief description] (hereinafter called “the Contract”).

AND WHEREAS it has been stipulated by you in the said Contract that the contractor shall furnish you with a Bank Guarantee by a reputable bank for the sum specified therein as security for compliance with the Contractor’s performance obligations in accordance with the Contract.

AND WHEREAS we have agreed to give the Contractor a guarantee:

THEREFORE, WE hereby affirm that we are Guarantors and responsible to you, on behalf of the Contractor, up to a total of [amount of the guarantee in words and figures]¹, and we undertake to pay you, upon your first written demand declaring the Contractor 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: [insert date]²

Signature and seal of the Guarantors

[name of bank or financial institution]

[address]

¹ The Guarantor shall insert an amount representing the percentage of the Accepted Contract Amount specified in the Letter of Acceptance, less provisional sums, if any, and denominated either in the currency(cies) of the Contract or a freely convertible currency acceptable to the Beneficiary.

² Insert the date twenty-eight days after the expected completion date as described in GC Clause 11.9. The Employer should note that in the event of an extension of this date for completion of the Contract, the Employer would need to request an extension of this guarantee from the Guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee. In preparing this guarantee, the Employer might consider adding the following text to the form, at the end of the penultimate paragraph: “The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed [six months][one year], in response to the Beneficiary’s written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee.”

Environmental and Social Safeguard (ESS) Performance Security

ESS Demand Guarantee

[Guarantor letterhead or SWIFT identifier code]

Beneficiary: *[insert name and Address of Procuring Agency/Employer]*

Date: *_ [Insert date of issue]*

ES PERFORMANCE 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 _____ (hereinafter called "the Applicant") has entered into Contract No. _____ dated _____ with the Beneficiary, for the execution of _____ (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required.

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 _____ (_____),¹ such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of the Beneficiary'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 Environmental and/or Social Safeguard, (ESS) obligation(s) under the Contract, without the Beneficiary needing to prove or to show grounds for your demand or the sum specified therein.

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

¹ The Guarantor shall insert an amount representing the percentage of the Accepted Contract Amount specified in the Letter of Acceptance, less provisional sums, if any, and denominated either in the currency(cies) of the Contract or PKR.

² Insert the date twenty-eight days after the expected completion date as described in GC Clause 11.9. The Employer should note that in the event of an extension of this date for completion of the Contract, the Employer would need to request an extension of this guarantee from the Guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee. In preparing this guarantee, the Employer might consider adding the following text to the form, at the end of the penultimate paragraph: "The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed [six months] [one year], in response to the Beneficiary's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."

[signature(s)]

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



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, a payment in the sum _____ (_____) is to be made against an advance payment of _____.

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 the amount of _____ upon receipt by us of the Procuring agency/Employer's certificate and supported by the Procuring agency/Employer's statement, whether in the form of _____ or in a separate signed document accompanying or identifying the demand, stating 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 shall 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 paid 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] (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: _____

Dated: _____

Contract Value: _____

Contract Title: _____

[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]



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PAKISTAN CIVIL AVIATION AUTHORITY

B-6, KDA Scheme-1, Karsaz Karachi, Pakistan.



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TABLE OF CONTENTS

I.	GENERAL PREAMBLE	1
II.	GENERAL REQUIREMENTS	3
1.	EXCAVATION	12
2.	CONCRETE	17
3.	BRICK MASONRY / FAIR FACE BRICKWORK	43
4.	CONCRETE BLOCK MASONRY.....	45
5.	TILE WORK PORCELAIN / CERAMIC TILES	50
6.	SURFACE RENDERING (PLASTERING).....	53
7.	STEEL / ALUMINUM DOORS, WINDOWS & GLAZING WORKS.....	55
8.	FLOORING.....	59
9.	TUFF - PAVERS	61
10.	WOOD WORK AND GLAZING	63
11.	WATER PROOFING & ROOF PROTECTION.....	65
12.	PAINTING DISTEMPERING WHITE WASHING & POLISHING	68
13.	PUBLIC HEALTH WORKS INTERNAL & EXTERNAL FOR BUILDINGS.....	73
14.	ELECTRICAL WORKS	82
15.	DEMOLITION WORKS	134
16.	CLEARING AND GRUBBING	136
17.	SEPTIC TANK.....	137
18.	SOAKAGE PIT	138
19.	TERMITE CONTROL TREATMENT	139
20.	DAMPA FALSE CEILING	142
21.	ROAD WORKS – ASPHALT.....	144
22.	COLD STORAGE	167
23.	FIRE FIGHTING SCOPE.....	168

- ABBREVIATIONS

- LIST OF MANUFACTURERS / SUPPLIERS



I. GENERAL PREAMBLE

- 1.01 The Technical Specifications should be read in conjunction with Bills of Quantities, Drawings and all other related documents.
- 1.02 The detailed Technical Specifications given in the Tender Documents generally describe the quality of materials and workmanship required under the Subcontract Agreement. Any difference regarding the thickness and ratios / strengths etc., of materials etc., and the description of items, method of measurement and payment provided here in the Bills of Quantities will be understood to mean the ones provided here in the Bills of Quantities/ Drawings.
- 1.03 A rate or price shall be inserted against each item in the Bills of Quantities. Items against which no rate or price has been entered shall be deemed to be covered by other rates or prices in the Bills of Quantities. The rates should be written both in words and figures.
- 1.04 No Price adjustment on any materials during the currency of Subcontract Agreement will be made.
- 1.05 The quantity of each and every item of work in the Bills of Quantities executed by the SUBCONTRACTOR in accordance with the Subcontract Agreement shall be measured NET in the units of the B.O.Q. relating to such quantity.
- 1.06 Some of the manufactured goods are being produced in Metric System in which case nearest dimensions in inches will be acceptable.
- 1.07 The SUBCONTRACTOR may employ the subcontractor for specified works. That subcontractor will be approved in writing by the EMPLOYER before starting such works. They will also be required to prepare shop drawings in consultation with the EMPLOYER.
- 1.08 The rates and prices inserted in the bills of Quantities shall include, interalia, the following works duties liabilities and expenses of the SUBCONTRACTOR whether they are separately itemized or specifically referred to in the Bills of Quantities or not, that is to say:
- (a) All the liabilities, obligations, contingencies and risks imposed by each and every one of the Subcontract Agreement documents.
 - (b) Strict compliance with the Technical Specifications general directions and descriptions of work, materials and workmanship.
 - (c) The cost and expense of all works and of all services necessary for the due execution, completion of and maintenance of the WORK including temporary works, if any, erection, supply and use of plant and provision of appliances materials, transport, labour and supervision, water and electricity, surveying and setting out and for cleaning roads within and adjacent to the site etc..
 - (d) The Temporary diversion of mains, services and apparatus, if any;
 - (e) Making due allowance for the effect on the phasing of the WORK of diversions and alterations to the satisfaction of the Services Authorities.



- (f) Protecting and supporting during the progress of the WORK all pipes, ducts, mains, cables, overhead lines and other apparatus whether shown on the Drawings or not, which may be endangered by the Constructional operations.
- (g) Testing, including
 - (i) charges made by an independent testing laboratory for tests ordered by the EMPLOYER.
 - (ii) tests ordered by the EMPLOYER as part of the Confirmatory Site Investigations.
- (h) Preparing and supplying two copies of Record Drawings/Completion Drawings and one set of reproduces.
 - (i) All the other provisions under the Subcontract Agreement and the provisions made in the next section entitled "General Requirements".

1.09 The following abbreviations are generally used in the Technical Specifications, which are explicitly intended to mean as under:-

'	...	for foot/feet
"	...	for inch/inches
Dia	...	for diameter
Cft	...	for cubic foot/feet
Sft	...	for Square foot/feet
Rft	...	for running foot/feet
%	...	for per hundred/percent
i/d	...	for internal dia
Cwt	...	for one hundred weight (112 lbs.)
M	...	for Metre Length
mm	...	for millimetre
Ton	...	for 20 Cwts/2240 lbs.
P.S.I. or psi	...	for pounds per square inch
Lb	...	for imperial pound weight



II. GENERAL REQUIREMENTS

Standards

- 2.01 Where no reference is made to a code, standard or Specifications in Section "B" Specifications of the Contract Documents, the Standard Specifications of the American Society of Testing Materials, (ASTM), British Standard Codes of Practice (BSCP) or any other relevant standard as approved by the EMPLOYER shall govern.

Drawings

- 2.02 The WORK shall agree in all particulars with the Drawings or any approved modifications of them or such other drawings as may be issued during the Subcontract Agreement.

The EMPLOYER will supply one set of approved construction drawings to the SUBCONTRACTOR free of charge.

The SUBCONTRACTOR will make any further copies required by him at his own expense.

The SUBCONTRACTOR will keep one set of all drawings duly mounted with muslin cloth and hanged on the wooden drawings stand when not in use.

SUBCONTRACTOR's Drawings & Documents

- 2.03 The SUBCONTRACTOR shall submit three prints/copies of all drawings, documents and schedules to be prepared by him. These will be of a standard size and format acceptable to the EMPLOYER. All such submission by the SUBCONTRACTOR shall be accompanied by a letter of submittal.

Record Drawings

- 2.04 The SUBCONTRACTOR shall prepare during the progress of the Subcontract Agreement, drawings showing the WORK "as built" including the positions of all services, plant and equipment. The drawings shall be prepared to a form & detail to the satisfaction of the EMPLOYER and prints shall be submitted to the EMPLOYER for his approval as the WORKS proceed. At the completion of the Subcontract Agreement, the SUBCONTRACTOR shall supply to the EMPLOYER reproducible of each drawing.

Supply of Water and Electricity

- 2.05 The SUBCONTRACTOR shall make his own arrangements for the provision of water & electricity whether for use in the execution and construction of the WORK or otherwise. In the event of the source of water being from any existing piped supply the SUBCONTRACTOR shall comply with any regulations laid down by the Water Authority and shall pay for such supply, stand-pipe connections, meter rents and all other charges as required all at his own expense. Similarly he will be responsible for all costs in providing electricity. Where electricity is not available for 24 hours, diesel/petrol driven electricity generators in good and reliable condition and of sufficient capacity to meet the requirements of construction equipment and lighting and other facilities at Site will be used by the SUBCONTRACTOR.



Disposal of Wastes

- 2.06 The SUBCONTRACTOR shall make adequate arrangements to the satisfaction of the EMPLOYER for disposal of all sewage, rubbish and all other waste material arising from or connected with the execution of the WORK.

Other Services

- 2.07 The SUBCONTRACTOR shall make his own arrangements for and shall provide any service (including telephone) which may require in addition to the foregoing.

Bench Marks and Control Points

- 2.08 All levels, lines, grades and measurements shown on the Drawings shall be measured from a Bench Mark and points to be established by the EMPLOYER within the Points Site of the WORK. The SUBCONTRACTOR shall be responsible for ensuring the levels of all parts of the work are accurately related to this Bench Mark which shall be notified to the SUBCONTRACTOR by the EMPLOYER immediately after commencement of the WORK.

Survey

- 2.09 The SUBCONTRACTOR shall furnish and maintain at his own expense survey instruments stakes and other such materials and give such assistance, including qualified staff as may be required by the EMPLOYER who will establish Bench Marks base lines, grades and other principal control points. The SUBCONTRACTOR shall, however, call the EMPLOYER 'S attention to any inaccuracies and discrepancies of such controlling points etc., before proceeding with the work. The SUBCONTRACTOR shall at his own expense, establish working or construction lines and grades as required, which shall be frequently checked by the EMPLOYER but the SUBCONTRACTOR shall be solely responsible for the accuracy thereof.

Safeguarding Bench Marks & Control Points

- 2.10 The SUBCONTRACTOR shall safeguard all points, stakes, grade marks and bench marks made or established on the work. If disturbed he shall bear the cost of re-establishing them and also the entire points expense of rectifying the work rendered defective due to such disturbance.

Progress Photograph

- 2.11 The SUBCONTRACTOR shall, throughout the construction of the WORK use digital camera for photography and provide the progress photographs in color to the EMPLOYER. He will also submit three prints each of size 5"x7" along with the recorded data at two week intervals. All such photographs will be taken under the direction of the EMPLOYER.

Materials and Workmanship

- 2.12 As soon as possible after the Subcontract Agreement has been awarded, the SUBCONTRACTOR shall submit to EMPLOYER list of suppliers from whom he proposes to purchase the materials necessary for the execution of the WORK. The information regarding the names of suppliers may be submitted at different times, as may be convenient, but no approved source of supply shall be changed without the prior permission of the EMPLOYER.



Preference shall be given to the use of materials and fittings manufactured in Pakistan which comply with the Subcontract Agreement and are competitive in price. Foreign materials shall only be used with the consent of the EMPLOYER.

All materials incorporated in the WORK shall be new and of the best quality and description of their respective kinds and shall comply with all relevant specifications. Similarly the workmanship in every case shall be of the best character, and the whole shall be subject to the approval of the EMPLOYER.

Materials whose quality and construction are not covered by the Technical Specifications shall be of equal or better quality than the relevant sample accepted by the EMPLOYER.

Samples

- 2.13 In addition to any special provisions herein for the sampling and testing of materials, the SUBCONTRACTOR shall submit to the EMPLOYER as he may require samples of all materials and goods which he proposes to use or employ in or for the WORK. Such samples, if approved, will be retained by the EMPLOYER, and no materials or goods of which samples have been submitted shall be used on the Works unless and until such samples have been approved in writing by the EMPLOYER.

The EMPLOYER may reject any materials and goods which in his opinion are inferior to the samples thereof previously approved and the SUBCONTRACTOR shall promptly remove such materials and goods from the Site.

The cost of supplying all such samples and of conveying same to such place of inspection or testing as the EMPLOYER may designate within the country of origin shall be deemed to be included in the tendered rates and prices.

Samples will be retained by the EMPLOYER and when directed by the EMPLOYER the SUBCONTRACTOR shall dispose of the samples. Except for those which may be incorporated into the works after approval, such as plumbing and electric fixtures.

Tests Generally, Access to Premises

- 2.14 The EMPLOYER may examine and may require to be tested any materials or goods required in or for the WORK such as he may decide from time to time and shall have unrestricted access to the SUBCONTRACTOR'S and supplier's premises for such purpose at all times and the SUBCONTRACTOR shall specify this requirement when placing all orders.

The EMPLOYER will notify the SUBCONTRACTOR whether materials and goods will be inspected at the manufacturer's or supplier's premises or at the Site. No materials or goods shall be dispatched from such premises until such notification is given and, if appropriate, inspection is complete and a release certificate is given to this effect. In both cases the SUBCONTRACTOR is to notify the EMPLOYER when materials and good will be ready for inspection and shall do so adequately in advance for him to make the necessary arrangement for inspection.

The SUBCONTRACTOR shall afford the EMPLOYER all facilities, assistance, labour and appliances necessary for the convenient examination, testing weighing or analysis of all such



materials or goods. The SUBCONTRACTOR shall provide and prepare such test pieces of any such materials or goods as the EMPLOYER may require.

Notwithstanding any tests which may have been carried out off the Site the EMPLOYER shall be empowered to order further tests of any materials or goods to be made on the Site and to reject such materials or goods should they fail to pass such test on the Site.

The full cost of providing all facilities, labour, consumable stores and appliances required in connection with all testing on the Site shall be deemed to be included in the tendered rates and prices.

Test Certificates

- 2.15 Should the EMPLOYER not inspect any materials or goods at the place of manufacture, the SUBCONTRACTOR shall, if required, obtain certificates of test from the suppliers of such materials or goods and shall send such certificates to the EMPLOYER. Such certificates shall certify that the materials or goods concerned have been tested in accordance with the requirements of the Technical Specifications and shall show the results of all the tests carried out. The SUBCONTRACTOR shall provide adequate means of identifying the materials & goods delivered to the Site with the corresponding certificates.

Testing at an independent Laboratory

- 2.16 Where tests are specified or directed by the EMPLOYER to be carried out in an independent testing laboratory, the SUBCONTRACTOR shall supply and deliver the samples and shall arrange for the relevant tests to be carried out. The independent testing laboratory shall be nominated by the SUBCONTRACTOR and acceptable to the EMPLOYER. Unless otherwise specified the SUBCONTRACTOR shall arrange for one copy each of the independent testing laboratory's test certificates to be delivered to the EMPLOYER and to the EMPLOYER not less than 3 working days before the materials covered by the relevant test certificates are to be incorporated in the WORK. Each test certificate shall be relatable to the materials from which the sample was taken.

Site Testing

- 2.17 The SUBCONTRACTOR shall carry out such laboratory and field test (including tests to check the accuracy of testing equipment and methods but excluding tests specified to be carried out in an independent testing laboratory) as specified or as can reasonably be inferred from herein, as may be necessary to ensure and satisfy the EMPLOYER that the requirements of the Technical Specifications are met. The type and frequency of testing shall be in accordance with the relevant standards except as otherwise specified herein or directed by the EMPLOYER.

The SUBCONTRACTOR'S attention is drawn to the fact that the frequencies of testing specified in the relevant clauses are intended to represent only a general guide. The EMPLOYER shall be empowered to vary the frequencies at which tests are conducted should he deem this necessary for the proper control of the quality of the WORK. Should the EMPLOYER'S Representative vary the frequencies stated in the relevant clauses of the Technical Specifications, the SUBCONTRACTOR shall not be entitled to extra payments thereof.



Unless otherwise agreed or directed by the EMPLOYER methods of sampling and test procedures shall be in accordance with the relevant Standard Methods of ASTM, British Standard Codes of Practice or any other relevant standard approved by the EMPLOYER. Sample will be selected by the EMPLOYER.

The SUBCONTRACTOR shall keep clear, accurate and up-to-date records of tests and immediately any test is completed shall supply two copies and summaries of the results thereof to the EMPLOYER in such form as he may require. Testing equipment operations and records shall be available for inspection by the EMPLOYER at all times.

Removal of Condemned Materials

- 2.18 The EMPLOYER may require the SUBCONTRACTOR to remove and dispose-off any materials employed of the EMPLOYER, are unsuitable or have been incorrectly deposited or have suffered damage by exposure to the weather or otherwise are not in accordance with the specified requirements for such materials. The SUBCONTRACTOR shall be entitled to no payment whatsoever in respect of such materials.

Site Office

- 2.19 The SUBCONTRACTOR shall provide, erect and maintain in good repair, service and light a substantial weatherproof temporary building, as site office having a floor area of about 120 square feet or equal in rental space adjacent to the site.

The room shall be day lighted and ventilated by windows which shall have an area of not less than 20 square feet.

The building shall be erected, fully equipped, furnished and serviced within 15 days of the receipt by the SUBCONTRACTOR of the Letter of Intent from the EMPLOYER.

When instructed by the EMPLOYER the SUBCONTRACTOR shall remove and dispose of the building, fittings and floor and make good any damage to the site and leave it clean and tidy.

Furniture, Equipment etc. for Site Office

- 2.20 The SUBCONTRACTOR shall provide, install, maintain in good repair and on completion take away, all at for the direction of the EMPLOYER, the following furniture, equipment and fittings for the site office of the EMPLOYER:

Furniture

1 No.	Table Approx. 5' x 4'
4 Nos.	Chairs with Arm rests.
1 No.	Drawings Stand for holding 30 drawings.

Miscellaneous Items



- 1 No. First Aid Box suitably equipped for a site work force of about 20 people.

The foregoing furniture, equipment and miscellaneous items shall be provided and installed by the SUBCONTRACTOR within 15 days of the Letter of Intent from the EMPLOYER.

Sanitary Accommodation for Site

- 2.21 The SUBCONTRACTOR shall also maintain and service a suitable sanitary accommodation facility and provide consumable stores including soap, etc.

Surveying Equipment

- 2.22 The SUBCONTRACTOR shall provide & maintain in an accurate and serviceable condition the following new surveying equipment at Site at all times during the execution of the Works:

- 1 No. theodolite to read to 20 seconds complete with tripod and accessories.
- 1 No. reversible level complete with tripod and accessories.
- 1 No. 14 ft. telescopic leveling staff graduated in feet.
- 1 No. 100 ft. steel tapes.
- 1 No. 50 ft. steel tapes.
- 1 No. 12 Ft. flexible steel tapes.
- 1 No. Steel tape repair kit.
- 2 Nos. Plumb bobs.

The foregoing equipment shall be inspected at the Site of Works by the EMPLOYER within 15 days of the receipt by the SUBCONTRACTOR of the Notice to Proceed from the EMPLOYER.

In addition to the specified list of equipment, the SUBCONTRACTOR shall also provide and renew from time to time such miscellaneous materials and equipment as might reasonably be required at the Site.

Traffic Routes to be Maintained

- 2.23 The SUBCONTRACTOR shall not cause unnecessary obstruction of roads, footpaths or waterway at any time during the course of the WORK and in no circumstances shall closure, in whole or in part, of these or any other "right of way" be permitted except with the prior permission of the EMPLOYER in writing and the concurrence of the EMPLOYER. All disturbances to be negotiated with the affected community in advance.

The SUBCONTRACTOR shall maintain adequate, through safe traffic routes for vehicles and pedestrians on public highways within and adjacent to the Site of the WORKS, including such diversions of highways as may be required, and make arrangement for watching, signaling,



and control of traffic by day and night and for adequate lighting all to the satisfaction of the EMPLOYER.

All temporary diversions shall be constructed to adequate widths and maintained in good condition at all time by the SUBCONTRACTOR to the satisfaction of the EMPLOYER and on completion of the Subcontract Agreement all such road shall be left in a condition approved by the EMPLOYER. The temporary diversions shall be removed and reinstated to the satisfaction of the EMPLOYER when no longer required.

The SUBCONTRACTOR shall make arrangements and co- operate with all other subcontractors working in the area for directing, routing, marshalling, controlling and circulating the traffic connected with the WORK in accordance with the EMPLOYER requirements in order that the flow of all traffic may be facilitated, that all obstruction, inconvenience & delay may be minimized and that the interest of all concerned including the general public may be promoted.

The EMPLOYER shall, before commencing work affect any public highway or right of way, submit to the EMPLOYER his proposals for the control of traffic, access for residents & diversions in respect of the area in which he proposes to work..

The SUBCONTRACTOR shall pay all cost and expenses attendant upon the employment of any Police, which the Local Magistrate/Government may appoint for the preservation of peace, or the prevention of trespass and theft, or for any other purpose on or near the site of the WORKS.

Protection of Livestock

- 2.24 The SUBCONTRACTOR shall be responsible for protection of livestock against damage or accidents because of the WORKS, during day and night. All gaps made in fences and hedges etc. to be closed when WORKS are not in progress and all trenches and excavations to be suitably protected.

Haulage Routes

- 2.25 The SUBCONTRACTOR shall submit to the EMPLOYER as soon as possible after the acceptance of the Tender and from time to time thereafter as required, proposals for the routing of traffic in connection with the execution of WORKS being the traffic of the SUBCONTRACTOR, his subcontractors and suppliers in the movement or haulage of heavy loads, construction plant, materials and spoil (hereinafter referred to as "the construction traffic") including particulars of the public roads of the public roads which he, the SUBCONTRACTOR, proposes to select as routes to be used by the construction traffic.

The EMPLOYER will comment on all such proposal as may be submitted by the SUBCONTRACTOR.

Support

- 2.26 The SUBCONTRACTOR shall provide ample shoring to all poles, buildings, walls, roads, railings and structures etc., adjacent to the trenches and shall carry out the trench work in close-timbered lengths near such property at his own expense.

Protection Mains, Services & Apparatus



- 2.27 The information given on the Drawings relating to existing services is given for general guidance only and is not guaranteed and no responsibility & Apparatus whatsoever is accepted by the EMPLOYER or the EMPLOYER for the accuracy thereof. The SUBCONTRACTOR shall refer directly to the concerned authorities for more detailed information on any of the services within the working spaces of the site.

The SUBCONTRACTOR shall not cause or permit interference with mains, services or apparatus whether indicated on the Drawings or not & shall be responsible for their protection. He shall give notice and provide reasonable facilities in accordance with Clause 3.31 of the Conditions of Subcontract Agreement to the owners and/or their servants to enable them to do alterations, repairs or maintenance works if so required.

If during the course of the WORKS underground services are uncovered they shall be carefully protected and shall be immediately referred to the EMPLOYER

Diversion of Mains, Services & Apparatus

- 2.28 The SUBCONTRACTOR shall make arrangements with the appropriate owners/authorities and pay all costs for any temporary diversions of mains, services and apparatus which may be required in carrying out the WORK.

Dealing with Water

- 2.29 The SUBCONTRACTOR shall take all necessary measures to prevent water from the Site causing a nuisance on or in any neighboring land or property either by causing flooding or by depositing sediment on the surface of the ground or in drains or water-courses. Wherever necessary to prevent this, the SUBCONTRACTOR shall construct temporary drainage channels, layers, sumps and traps in addition to those shown on the Drawings discharging into existing drains, ditches or water-courses. The SUBCONTRACTOR shall remove all sediment which may accumulate on any land or in any drains, ditches or water-courses or in any other property as a result of his operations.

All WORK including those below subsoil standing water level shall be carried out in the dry unless specified otherwise. The SUBCONTRACTOR'S arrangements for controlling the inflow of water into the parts of the excavation being worked and during the placing of concrete and other WORK therein and for the collection and disposal of water shall be to the EMPLOYER'S approval. All costs and charges in dealing with water in anyway whatsoever and effects thereof will be deemed to be included in the several rates in the Bills of Quantities.

Water flowing into excavations shall be carried by trenches, drainage layers or open jointed drains to sumps from which it shall be pumped. Such trenches, drains or sumps shall generally be clear of the Works unless approved otherwise by the EMPLOYER.

The SUBCONTRACTOR shall keep all surfaces upon or against which concrete is to be deposited free from running water and no concrete shall be placed until such surfaces are properly drained. Suitable precautions shall be taken to prevent running water from washing out cement or concrete while it is setting or from injuring the WORKS in any other way.



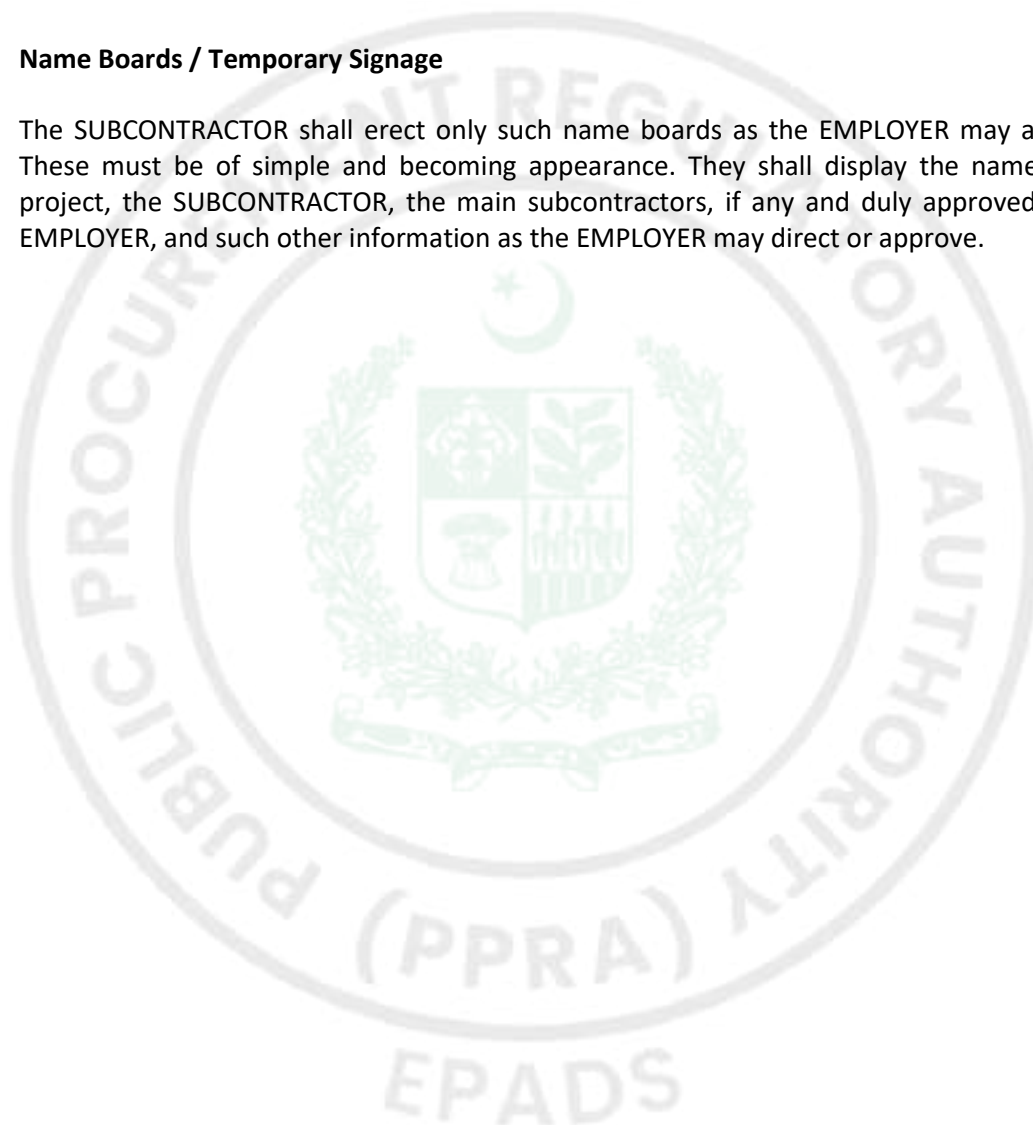
Notwithstanding the approval by the EMPLOYER of the SUBCONTRACTOR'S methods of dealing with water, the SUBCONTRACTOR shall be responsible for and accept all the risks and liabilities of dealing with water from whatever source and of all effects thereof.

Works to be Water-tight

- 2.30 All WORKS, intended to retain or exclude water or through which water is to be passed shall be absolute water-tight, so as not only entirely to prevent loss of water from the WORKS, but also so as entirely to prevent the percolation of water into any part or parts of the WORKS.

Name Boards / Temporary Signage

- 2.31 The SUBCONTRACTOR shall erect only such name boards as the EMPLOYER may approve. These must be of simple and becoming appearance. They shall display the name of the project, the SUBCONTRACTOR, the main subcontractors, if any and duly approved by the EMPLOYER, and such other information as the EMPLOYER may direct or approve.



1. EXCAVATION

1.1 Scope:

The work covered by this section of the specification consists in furnishing all plant, labor, equipment, appliances and materials, and in performing all operations in connection with excavation, trenching and backfilling, in strict accordance with this section of specification and the applicable drawings, and subject to the terms and conditions of the Subcontract Agreement.

1.2 Clearing and Grubbing-up:

The sites of all excavation shall be cleared of all shrubs, plants, bushes, large roots, rubbish and other surface materials. All such materials shall be removed and disposed of in a manner satisfactory to the EMPLOYER. All trees and shrubbery that are designated by the EMPLOYER to remain shall be adequately protected and preserved in an approved manner.

1.3 Excavation:

All excavation, in any kind of soil encountered (except rock), shall be performed to the depths and widths indicated or as otherwise specified. During excavation, material suitable for backfilling shall be stockpiled in an orderly manner at a sufficient distance from the banks of the excavation to avoid overloading and to prevent sides from caving. Topsoil shall be stockpiled separately, for subsequent re-use as necessary. All excavated material unsuitable or not required for backfilling shall be removed and collected at a location approved by the EMPLOYER. Grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulated therein shall be removed by pumping or by other approved methods. Unless otherwise indicated or approved by the EMPLOYER, excavation shall be open cut.

It is anticipated that all excavation work under this Subcontract Agreement will be earth excavation. The term "earth" as used herein shall include all materials, which do not, in the opinion of the EMPLOYER, require blasting, barring or wedging of material for removal from its original bed.

The SUBCONTRACTOR shall provide adequate timbering or sheeting for excavation where necessary, as part of the excavation work, to hold up the sides and ends of all excavations. Should the sides and ends of any excavation give way, the SUBCONTRACTOR shall, at no extra cost to the EMPLOYER reinstate all disturbed ground.

The SUBCONTRACTOR shall adopt all measures to make it sure that safety and integrity of adjoining structures and foundations is ensured. SUBCONTRACTOR shall submit a detailed methodology before doing any excavation work along the existing structures. The SUBCONTRACTOR will be responsible for any damage/loss to the existing structures resulting due to inappropriate excavation.

Any excavation carried beyond the limits shown on the drawings and specified herein as the payment limits, shall be treated as excess excavation and dealt with in the manner stated hereinafter.

When foundation level is reached, the EMPLOYER will inspect the exposed bottom and give directions as to what further excavation, if any, he considers necessary. The excavation shall be done in such a manner as to ensure that the work rests on a solid and perfectly clean foundation. Where excavation is to be covered subsequently by permanent construction, the SUBCONTRACTOR shall, immediately after exposing the specified satisfactory foundation proceed with the construction on that foundation. If the SUBCONTRACTOR allows any por-



tion of such foundation to deteriorate due to exposure, he shall make good the foundations at no extra cost to the EMPLOYER and to the satisfaction of the EMPLOYER.

- 1.4** As part of the work, under the excavation items, the SUBCONTRACTOR shall shore up all buildings, walls poles and other structures, the stability of which is liable to be endangered by the execution of the work and shall be fully responsible for all damages to life or property resulting from any default of the SUBCONTRACTOR.
- 1.5** If ordinary open-cut excavation is not possible or advisable, sheeting and bracing shall be furnished and installed in excavations generally in accordance with the details shown on drawings to provide safe working conditions. The SUBCONTRACTOR shall furnish and place all sheeting walls, braces, timbers, and similar items, necessary for the safety of the work, the general public and adjacent property. Sheeting and bracing shall be removed, as the work progresses in such manner as to prevent damage to finished work and adjacent structures and property. As soon as it is withdrawn, all voids left by the sheeting and bracing shall be carefully filled with selected material and compacted. The SUBCONTRACTOR shall be fully responsible for the safety of work in progress, for the finished work, the workmen, and the public and adjacent property. All sheeting and bracing shall be at the SUBCONTRACTOR'S expense, as part of the work under the excavation items and at no extra cost to the EMPLOYER.
- 1.6** All excavations made hereunder shall be properly maintained while they are open and exposed. Sufficient suitable barricades, warning lights, signs and similar items shall be provided by the SUBCONTRACTOR. The SUBCONTRACTOR shall be responsible for any personnel injury or property damage due to his negligence.
- 1.7** As part of the work under the excavation items, and at no extra cost to the EMPLOYER, the SUBCONTRACTOR shall build all drains and do ditching, pumping, well pointing, bailing and other work necessary to keep the excavation clear of ground, sewage or storm water during the progress of the work and until the finished work is safe from injury. The SUBCONTRACTOR shall provide all necessary pumping equipment for the dewatering works as well as operating personnel, maintenance, power, etc. all at no extra cost to the EMPLOYER. All water pumped or drained from the work shall be disposed of in a manner satisfactory to the EMPLOYER and the relevant authority. Necessary precautions against flooding shall be taken.
- 1.8** The EMPLOYER may order, in writing, any or all shoring, sheeting and piling to be left in place for safety reasons, whether such sheeting was shown on drawings or not. If left in place, such sheeting shall be cut-off at the elevation approved by the EMPLOYER, and shall be driven tight and it's cost shall be considered included in the tendered rates.
- 1.9** The SUBCONTRACTOR shall take special precautionary and protective measures with existing subsurface facilities likely to be encountered during the execution of works such as sewers, drain pipes, water mains, conduits, electric cables, communication cables and the foundations of adjacent structures. The SUBCONTRACTOR shall be responsible for damage to any such facility and shall repair the same at his expense whether or not this facility has been shown on the drawings.
- 1.10** All surplus material excavated by the SUBCONTRACTOR shall be disposed of at locations approved by the EMPLOYER. The method of disposal shall not interfere with other works and shall not damage or spoil other material. When it is necessary to haul earth material over streets or pavements, the SUBCONTRACTOR shall prevent such material from falling on the



streets or pavements. All waste material shall be disposed off properly as determined by the EMPLOYER.

- 1.11** After the completion of water lines, sewer lines, drainage facilities, foundations, walls and other structures below the elevation of the final grade, all voids shall be backfilled with suitable materials, as specified below.

- 1.12** Backfilling operations for structures shall be performed as part of the SUBCONTRACTOR'S work under the payment items for earth excavation, and at no extra cost to the EMPLOYER. Backfill material for foundations, walls and other structures shall consist of excavated soil which is free from stones and hard clods, larger than 3 inches in any dimension and also free from trash, lumber and other debris. Backfill material shall have enough moisture for proper compaction, and shall be compacted in an approved manner to 95 percent of maximum standard proctor density for cohesive soil and 98 to 100 percent of maximum standard proctor density for cohesionless soil. Backfill shall not be placed against foundation walls earlier than 4 days after the placing of concrete or brick-work. After compaction and satisfactory completion of backfilling the SUBCONTRACTOR shall carry out the finished grading of the Site to such grades and elevations as may be shown on the drawings or required for proper drainage of the Site.

Fill above NSL with suitable excavated material shall be measured and paid under a separate item.

- 1.13** The trenches for sewers shall be backfilled to the specified level with selected excavated material or other approved material that is suitable for proper compaction. Trenches improperly backfilled shall be reopened to the depth required for proper compaction, then refilled and compacted to the specified density.

Normal backfilling operations in trenches shall be performed as part of the SUBCONTRACTOR'S work under the payment items for earth excavation and at no extra cost to the EMPLOYER.

- 1.14** Special sand backfill is to be provided when specifically required by the drawings or when ordered in writing by the EMPLOYER. This work shall consist of removal of the excavated material to waste and provision in lieu of graded clean and fill, free of all foreign matter, such that 100% passes a 3/8" screen with not more than 5% passing a No.4 sieve. This shall be compacted to 95% of maximum density.

- 1.15** The maximum density of soil shall be determined in accordance with AASHTO T 99 method D.

- 1.16** The EMPLOYER will take tests using the calibrated sand cone method to determine the density of soil in place. If soil in place fails to meet the specified degree of compaction it shall be removed, replaced with approved material and compacted to the specified density in the manner directed by the EMPLOYER, in the areas represented by the failing tests at no additional cost to the EMPLOYER.

- 1.17** Where satisfactory materials for backfill are not available in sufficient quantity from required excavations, "Earth Borrow" shall be obtained from suitable sources at the SUBCONTRACTOR'S responsibility as a separate payment item. The necessary clearing and grubbing of borrow areas, disposal and burning of debris there from the developing of sources including



any access roads for hauling and the necessary right-of-way, and the satisfactory drainage of the borrow areas, shall be considered as incidental items to borrow excavation. "Earth Borrow" under this separate payment item shall be furnished and placed by the SUBCONTRACTOR only where specifically called for by means of notes on the Subcontract Agreement Drawings or by written order of the EMPLOYER

1.18 GRADING BACKFILL

Granular backfill material shall meet the following requirements.

a. Grading Requirement

mm		
25	1"	100
19	3 / 4"	60-100
4.75	No.4	50-85
2.0	No.10	40-70
0.425	No.40	25-45
0.075	No.200	0-15

- b. Material satisfying the requirements of coarse sand falling under soil classification A-3 (AASHTO). In case, coarse sand is utilised for granular fill it shall be ensured that the same is confined properly with approved material.
- c. The material shall have a Plasticity Index of not more than size (6) as determined by AASHTO T-89 and T-90.

Common backfill

Use of excavated material as backfill may be allowed under this item. Use of borrow material for common backfill shall be allowed subject to approval of borrow material by the EMPLOYER.

GENERAL REQUIREMENT

- a. Granular backfill where-ever directed shall be placed in the position and in the required depth, shown on the drawings or where and as required in writing by the EMPLOYER and it shall be well compacted in layers not exceeding 20 cm (8 in) in thickness to 100 percent of Max. dry density as per AASHTO T-180 (D). In case of water logged areas the thickness of the layer shall not exceed 50 cm (20 in) or as directed by the EMPLOYER. Volume of granular fill around structures shall be calculated within the vertical limits of approved excavation for such a structure, where as the horizontal limits shall be those as specified on drawings.
- b. Common backfill shall consist of earth free from large lumps, wood and other organic materials and of a quality acceptable to the EMPLOYER. It shall be placed in the position and to the required depths shown on the Drawings and / or as required in writing by the EMPLOYER. Where ever specified in drawings it shall be well compacted in layers not to exceed twenty 20 cm (8 in) in depth to the density, 95 percent of maximum dry density, as per AASHTO T- 80 (D).
- c. All spaces excavated and not occupied by any permanent work shall be refilled with earth or granular fill as approved by the EMPLOYER up to the surface of the surrounding ground, with a sufficient allowance for settlement. All such backfill shall be thor-



oughly compacted and, in general, its top surface shall be neatly graded.

- d. Fill placed around retaining walls, footings etc shall be deposited on both sides to approximately the same elevation at the same time. Where the SUBCONTRACTOR does not have.



2. CONCRETE

2.1 GENERAL

2.1.1 Scope:

This section of Specification shall cover the materials for the production of all Concrete and Mortar to be used under this Subcontract Agreement, unless expressly provided for elsewhere. It shall also cover mixing, transportation, placing, compaction and curing of concrete, and formwork, finishes, reinforcement and joints.

2.2 CEMENT

2.2.1 Permissible Types of Cement

- a. The cement to be used in the WORK shall comply in all respects with the requirements of one of the following Standard Specifications:

Type of Cement Specifications	Standard
Ordinary Portland Cement Sulphate resisting Portland cementsubject to the sulphate content in soil and recommendation of the Geotech	ASTM C-150

- b. Where White Cement is called for it shall be a Portland Cement complying with the requirements of ASTM C-150. No other types of cement shall be used in the WORKS without the prior approval of the EMPLOYER and this approval will normally be withheld unless specific justification can be shown for use of the alternative. In particular, the use of High Alumina Cement or Super Sulphated Cement shall not be allowed.

2.2.2 Approval of Cement Supply

- a. Before any cement is ordered in quantity or brought on to the Site, the SUBCONTRACTOR shall submit to the EMPLOYER for approval a detailed list of the sources and manufacturer's brand name of all types of cement which he proposes to use.
- b. The EMPLOYER may require the SUBCONTRACTOR to supply typical samples of cement and may order tests to be carried out at the SUBCONTRACTOR'S expense, for the purpose of establishing the true quality of the cements and the concretes produced by them under actual site conditions with the aggregates proposed by the SUBCONTRACTOR, before giving the approval to any cement.
- c. The EMPLOYER may require the SUBCONTRACTOR to put forward primary and secondary sources of the required cement.
- d. The approval of the EMPLOYER to any type of cement shall not in any way lessen his power to order the removal of any consignment of cement from the Site at the SUBCONTRACTOR'S expense if such consignment does not in any way comply with the requirements of this Specifications.



2.2.3 Variation of Cement Supply

- a. Once the approval of the EMPLOYER for any type of cement has been given, the SUBCONTRACTOR shall not vary the source, manufacturer of that particular type of cement without the further approval of the EMPLOYER in each and every case in writing, even when the substitute material purports to be of equal or superior quality to the cement originally approved by the EMPLOYER.
- b. If for any reason the SUBCONTRACTOR wishes to vary the source, manufacturer in respect of any type of cement already approved by the EMPLOYER at any time during the Subcontract Agreement, he shall give adequate notice of every such intended variation, provide information concerning the source, manufacturer, brand names, composition and properties of the proposed substitute cement, as required above, and carry out all tests called for by the EMPLOYER, and shall obtain written approval of the variation before ordering any substitute material.

2.2.4 Tests on Cement Delivered to the Site

- a. Cement delivered to Site may be subject to further testing if required by the EMPLOYER. All expenses involved in such testing shall be deemed to be included in the rates for the Subcontract Agreement.
- b. Should the EMPLOYER be of the opinion that any cement has deteriorated in storage he may order further confirmatory tests on the quality of such cements all at the SUBCONTRACTOR'S expense.
- c. Should the results of any of the tests show that any sample fails to meet the minimum requirements of this Specification; the whole consignment to which the sample refers shall be rejected and be removed from the Site at the SUBCONTRACTOR'S expense.
- d. The EMPLOYER may also cancel previously given approval to any source, country or manufacturer of any cement which may be shown by these tests to fail to reach the minimum requirements of this Specification.
- e. Cement supplier should provide a certificate at the time of material delivery to ensure the product quality.

2.2.5 Delivery of Cement

- a. The cement shall be delivered to the Site of the WORK in such consignments as shall ensure satisfactory progress of the work.

2.2.6 Storage of Cement

- a. Cement storage arrangements shall be fully completed by the SUBCONTRACTOR and approved by the EMPLOYER before any cement is delivered to Site.
- b. Cement in storage shall be protected against damage from ground water or soluble salts and, if so required by the EMPLOYER, the SUBCONTRACTOR shall from time to time take any special precautions needed to protect the contents of the store from climatic hazards such as airborne dust or sand or periods of low temperature by extra coverings.
- c. Each different type of cement approved for use and brought to Site shall be stored separately from one another.



- d. Different consignments of any type of cement shall be stored in such a way as to ensure use in sequence and to enable co-relation to be made between the consignment and the part of the WORK in which it was used.
- e. All cement shall be used in the order in which the consignments are delivered to their Site. In general, it shall be used as soon as possible after delivery and in any event it shall not be used more than 3 months after manufacture. In case of a 3-month older cement, proper testing to be done before any use in construction works
- f. Notwithstanding the above provision, any cement which the EMPLOYER considers has become stale or unsuitable through absorption of moisture from the atmosphere or for other reason shall be rejected and removed from the Site at the SUBCONTRACTOR'S expense. Any cement in containers damaged so as to allow the contents to spill or to be affected by atmospheric moisture prior to opening at the time of concrete or mortar mixing shall be rejected and removed from the Site at the SUBCONTRACTOR'S expense.
- g. Prior precautions shall be taken to prevent damage to or contamination of cement whilst it is in transit between the store and the Site of Work.

2.3 AGGREGATE

2.3.1 Definitions

The term "Aggregate" shall mean all solid constituents of the concrete mix, other than cement or approved cementitious additives, batched ready for charging into the mixers, whether such material is called "coarse aggregate" or "sand".

2.3.2 Standard Specification

Aggregates supplied to the Site shall be naturally occurring gravels, sands and/or crushed rock and shall generally comply with the requirements of ASTM C-33.

2.3.3 General Requirements

- a. All aggregates supplied to the Site shall be screened, washed and graded to comply with the limits laid down in and ASTM C-33.
- b. At the time of use they shall be free from organic impurities and shall contain silt clay and dust and mineral salts only within the limits laid down in ASTM C-33.
- c. Consignments of aggregate containing any appreciable quantity of friable, flaky, laminated or elongated particles will be rejected. In any event the percentage of such material contained in the coarse aggregate shall be as specified here, but notwithstanding this provision the acceptance or rejection of aggregates containing such material shall be at the discretion of the EMPLOYER, having regard to the performance of the material of the concrete mixes.

2.3.4 Source of Aggregate

- a. As soon as possible after the issuance of notice to proceed, the SUBCONTRACTOR shall supply the EMPLOYER with full details of his proposed sources of aggregates for the WORKS.



- b. These details shall include a full report on the SUBCONTRACTOR'S examination of potential sources and his sampling and testing programme. Examination of sources shall be carried out in full consultation with the EMPLOYER and sampling and testing shall be carried out under the EMPLOYER'S supervision, in an approved laboratory.
- c. The EMPLOYER may instruct alterations to the above procedures and may call for additional samples for separate testing at an alternative laboratory, in order to fully satisfy himself of the suitability of the proposed aggregates. All such separate testing shall be paid for by the SUBCONTRACTOR, at no additional expense to the EMPLOYER.
- d. No aggregate shall be used from any particular source before that source has been approved by the EMPLOYER.
- e. No change shall be made in any aggregate source without the prior approval of the EMPLOYER. The EMPLOYER shall have the power to withdraw approval for any source of aggregate if the aggregate from that source fails to meet this Specification or for other reasons fails to produce concrete to the standard required by this specification.

2.3.5 Grading of Aggregates

- a. Grading of aggregates is to comply with ASTM C-33.
- b. Coarse Aggregate: The grading of coarse aggregate, when analysed by the method given for sieve analysis in ASTM C-33 shall be within the limits given in Table No.1.
- c. Coarse aggregates shall be stored in single sizes and shall be combined on batching to provide a coarse aggregate grading as given in Table No.1 for graded aggregate.

TABLE NO.1.

COARSE AGGREGATE

Sieve Size	Percentage Passing
1"	100
3/4"	90-100
3/8"	20-55
No.4	0-10
No.8	0-5

- d. Fine Aggregate: The grading of a fine aggregate, when analysed by the method of sieve analysis as described in ASTM C-33 shall be within the limits of one of the grading zones given in Table No.2.



TABLE NO.2

FINE AGGREGATE

Sieve Size (Dry Weight)	Percentage Passing
3/8 inch	100
No.4	95-100
No.8	80-90
No.16	50-85
No.30	25-60
No.50	10-30
No.100	2-10

2.3.6 Mechanical Properties of Aggregates

- a. Coarse aggregate used in any part of the Works shall be sound and durable with an aggregate crushing value not exceeding 30% when tested in accordance with the requirements of ASTM C-33.

2.3.7 Physical Properties of Aggregates

- d. Aggregates for concrete shall comply with the following requirements when tested in accordance with ASTM C-33.

Specific Gravity
(Saturated surface dried) 2.5 minimum

Water Absorption
maximum 3.0%

2.3.8 Staining

- a. Aggregates shall not be composed of or contain inclusion of materials likely to cause staining or otherwise disfigure finished concrete surfaces.

2.3.9 Drying Shrinkage

- a. The properties of the aggregates shall be such that the initial Drying Shrinkage of all the proposed concrete mixes, prepared and tested, under approved conditions in an approved, independent laboratory, in accordance with ASTM C-33 shall not exceed 0.06%.

2.3.10 Sampling and Testing of Aggregate

- a. Regular sampling and testing shall be carried out on the aggregate on Site to ensure continued compliance with this Specification. All such testing shall be carried out at no extra expense to the EMPLOYER.
- b. Testing of aggregate stockpiles for moisture content shall be carried out at least one time a day and will normally be required more frequently, particularly during or following periods of rainfall or high evaporation or after water has been used to cool stockpiles.
- c. Other tests, including grading and tests for physical and mechanical properties and the presence of deleterious impurities, shall be carried out on a regular basis, as re-



quired by the EMPLOYER, in order to maintain a high standard for the aggregates and concrete production and to ensure the continued suitability of the sources of the aggregates.

2.3.11 Delivery of Aggregates

- a. Aggregates shall be delivered to the Site of the WORKS in such consignments as shall ensure satisfactory progress of the Work.

2.3.12 Storage and Handling of Aggregates

- a. Aggregates accepted for use in the WORKS shall be stored in approved containers or on hard paved areas with adequate dividing walls to prevent mixing of different types and sizes of aggregates. The surrounding areas where aggregates may be handled shall also be hard-paved.
- b. In order to satisfy the requirements of this Specification for limiting the temperature of fresh concrete the SUBCONTRACTOR may, subject to the prior approval of the EMPLOYER, employ methods to cool the aggregate stockpiles. It should be noted that water spraying to effect evaporative cooling is unlikely to be approved unless the SUBCONTRACTOR can provide a water supply of sufficient purity to prevent the build-up of harmful salts, particularly on the surface of aggregate stockpiles.
- c. If water cooling is allowed adequate time shall always be allowed for draining-off of surplus water before aggregates are batched for mixing. Testing for aggregate moisture content shall also be carried out before batching after water cooling has been used.
- d. Watering may be called for the area in the neighborhood of the aggregate stockpiles and batching plant to reduce the hazard of rising dust.
- e. Fine and coarse aggregates shall be stored separately so as to prevent the materials from becoming intermixed. Also coarse aggregates of different sizes shall be stored separately from one another.

All aggregates, on delivery to and handling from the stockpile, shall be handled in such a manner as to secure a typical grading of the material, care being taken to avoid crushing the aggregates and contamination with extraneous matter.

- f. The general or localized build-up of fines or segregation of sizes in aggregate stockpiles shall not be allowed. If the EMPLOYER is not satisfied that such segregation or build up of fines has been prevented, he may instruct the SUBCONTRACTOR to turn over the contents of any stockpile or to remove all or part of the contents of any stockpile and either re-process or dispose of such material, as provided for under the succeeding clause.

2.3.13 Rejected Material

- a. All rejected aggregates shall be taken off the Site or used as filling as directed by the EMPLOYER.



2.4 WATER

2.4.1 Water for Concreting

- a. All water used for mixing concrete, grouts or mortar shall be clean, fresh and free from organic or inorganic matter in solution or suspension in such amounts that they may impair the strength or durability of the concrete, grouts or mortar.
- b. Notwithstanding the above provision the EMPLOYER shall have the power to lay down such limits on the levels of organic or inorganic matter in the water as may prove necessary to maintain the strength or durability of the concrete, grouts or mortar.

2.4.2 Source of Water

- a. As soon as possible after issuance of notice to proceed, the SUBCONTRACTOR shall supply the EMPLOYER with full details of his proposed source or sources of water for use in the Works. These details shall include, if possible, results of full analyses of the water from these sources. In any event, the SUBCONTRACTOR shall, prior to approval of the source, take such samples and have carried out such tests as may be directed by the EMPLOYER.
- b. Once the EMPLOYER has approved any source of water this shall not be varied without his prior approval.
- c. The EMPLOYER shall have the power to withdraw approval for any source of water if the water from the source fails to meet this Specification.

2.4.3 Testing of Water

- a. Tests on the purity, soluble sulphate, chloride or other chemical content, sediment and pH value shall be carried out as the EMPLOYER may direct. The SUBCONTRACTOR shall supply all apparatus, labor and other facilities required for routine testing on Site and shall make available to the EMPLOYER the results of all testing within 24 hours. In the event that the EMPLOYER requires further independent testing of any water source or supply the SUBCONTRACTOR shall arrange for the dispatch of samples of water to an approved analytical laboratory and shall pay all expenses incurred during such further testing.
- b. In addition to the above, the SUBCONTRACTOR shall regularly carry out tests on the water used for concreting in accordance with ASTM D-596 and shall pay all expenses connected with such testing

2.4.4 Water for Washing and Cooling

- a. Water used for washing or evaporative cooling of aggregates or formwork shall be of equal purity to the water used for concreting. However, the SUBCONTRACTOR should note that satisfaction of this requirement will not necessarily be sufficient to satisfy the requirement to ensure that no excessive concentrations of salts are allowed to accumulate. This condition shall be applied in particular to the aggregate stockpiles where surface concentrations may develop when large volumes of water are used for cooling.
- b. Water used for washing on concrete joint surfaces or any concrete prior to application of finishes shall be of equal purity to the water used for concreting but again care must be taken to ensure that surface concentrations of salts do not accumulate.



2.4.5 Water for Curing

Water used for curing of concrete shall normally be of equal purity to the water used for concreting unless satisfactory measures, to be approved by the EMPLOYER, are taken to ensure that the impurities present in unsatisfactory water cannot become concentrated on the concrete surface.

2.5 CONCRETE MIXES

2.5.1 Characteristic Strength of Concrete

The term "characteristic strength" of a particular concrete grade as used in this Specification shall be defined as being that stress below which not more than 5% of a large number of 28 day works cylinder test results may be expected to fall.

2.5.2 Concrete Grades

- a. The concrete in the WORKS shall comply with the requirements for the following grades, given in Table No.3.

TABLE NO. 3

CLASS A	(as per mix design)
CLASS B	(as per mix design)
CLASS C	(1 : 3 : 6)
CLASS D	(1 : 4 : 8)

- b. Additional grades may be added at the direction of the EMPLOYER.
- c. The cement contents and water/cement ratios apply to concrete made without additives. In the event of the use of additives being permitted for any particular concrete grade, variation in the cement content or water/cement ratio limits may be permitted with the approval of the EMPLOYER.
- d. In the event of variations in cement content or water/ cement ratio limits being permitted for any particular use of concrete, this shall not be taken as a variation in the Specification for the particular grade of concrete when it is used elsewhere in the WORK.
- e. The water-cement ratio shall not be varied from the values which have been accepted by the EMPLOYER and shall be such so as to produce a sufficiently workable concrete of the specified strength when compacted in accordance with these Specifications.
- f. The concrete shall be proportioned for concrete cylinders strength of 4000 psi with water cement ratio varying from 0.35 to 0.40. The mix made each time shall be of same consistency. Slump test shall be used by the EMPLOYER at his will to check the consistency of concrete mix and he may direct the SUBCONTRACTOR to increase or decrease the amount of water for the next batch for comprehensive strength, the concrete specimen shall be cast and tested in cylinders of 6 x 12 inch as per ASTM C 192 and UBC Sec. 1905 as specified at cost of the SUBCONTRACTOR.

2.5.3 Concrete Strength

The concrete of four different grades shall develop the following minimum cylinder strength:



as per ASTM C 192, ASTM C 172 and ASTM C 31.

Concrete Grade	Characteristic Compressive Strength	
	At 7 days	At 28
	days psi	psi
"A as per drawing	2,500	4,000
"B as per drawing	2,000	3,000
"C 1: 3: 6		2,000
"D 1: 4: 8	No strength requirement.	
"E 1: 6:12	No strength requirement.	

2.5.4 Consistency

Frequent consistency tests shall be made with a slump cone as directed by the EMPLOYER in accordance with ASTM C 143 and the water in the mix shall be controlled and adjusted as necessary to maintain nearly the following consistencies throughout the parts of the works: ASTM C – 192 and UBC Section 1905 will be followed for maintenance of quality of concrete.

Type of Construction	Slump - inches
1. Mass concrete	1" - 1.1/2"
2. Reinforced foundations	1.1/2" - 2"
3. Beams & Slabs	1.1/2" - 2.1/2"
4. Walls	2" - 3"

2.5.5 Trial Mixes

Concrete shall be composed of Portland cement, fine aggregate and coarse aggregate, water and any admixtures to give concrete cylinder strength of 3000 psi according to the manual of concrete section ACI 211. The mix shall be designed by the SUBCONTRACTOR and got approved from the EMPLOYER. The mix shall be got tested for the required strength on the expense of the SUBCONTRACTOR. The proportions of concrete components once agreed upon would be changed only with the approval of the EMPLOYER or as directed by him during progress of the Work.

2.5.6 Workability

Notwithstanding any requirements laid down elsewhere for workability, the concrete shall be of such consistency that it can be readily worked into the corners and angles of the formwork and around reinforcement without segregation of the materials or bleeding of free water at the surface. On striking the formwork, it shall present a face which is uniform, free from honeycombing, surface crazing or subsequent excessive dusting, and which shall not be inferior to the standard required by the EMPLOYER in accordance with this Specification.

Plasticizers to increase the workability of concrete will be added to the concrete at the time of mixing. All admixtures shall be conforming to ASTM C 494, and shall be used as per direction of the EMPLOYER and the manufacturer's instructions regarding mixing and placing.

2.5.7 Temperature of Concrete



- a. The maximum and minimum temperatures of the concrete at the time of placing shall be 5°C and 30°C respectively as per ACI-305 and no concrete shall be placed with a temperature outside this range. Approved procedures shall be taken to ensure that the maximum concrete temperature or the lower limit referred to above, is not exceeded.
- b. The strengths specified to be reached at 28 days or other earlier stages refer to test cylinders cured and tested at the temperature specified in ASTM C-39.

2.6 CONCRETE BATCHING

2.6.1 Approval of Method

- a. The SUBCONTRACTOR'S arrangements for handling, batching, transporting and mixing of materials for concrete, together with all control procedures shall receive approval in principle from the EMPLOYER before any work commences on Site.
- b. Detailed arrangement and SUBCONTRACTOR'S personnel involved shall be approved by the EMPLOYER before any concrete is mixed for the Permanent Works.

2.6.2 Batching of Material

- a. The water to be added to any concrete mix batch shall be adjusted after making allowance for the water content of the aggregates which shall be determined as required for the Sampling and Testing of Aggregates under this Specification.
- b. The proportions of materials used for any concrete mix shall be those approved by the EMPLOYER, as provided for under this Specification, and these shall be maintained throughout the period of the Subcontract Agreement unless specific permission is given for variation.
- c. If cement is used directly from bags or individual containers the amounts of the various other materials in each batch of concrete shall be so arranged that one or more full bags or containers are used per batch. Bags or containers shall not be divided without the EMPLOYER'S permission. One bag of cement shall be taken as one hundred-weight (50 Kg.) or 1.25 cubic feet.
- d. Aggregates shall be stored in accordance with this Specification until they are required for batching, when they shall be batched and charged into the mixers in such proportions that the agreed gradings of aggregate for the different mixes are correctly maintained. The SUBCONTRACTOR shall not attempt to batch and grade large quantities of aggregate prior to charging into the mixers nor store aggregate in such manner that segregation of sizes can take place in any aggregate pile.

2.6.3 Rejection of Batched Materials

Notwithstanding his previously given approval of the contents of any storage areas, the EMPLOYER may order the removal of any batch of aggregates prepared for charging into the mixers if he has reason to believe that such batch is improperly graded or contaminated in any way. The cost of removal from the Site or of reprocessing of such rejected aggregated shall be borne by the SUBCONTRACTOR.

2.7 CONCRETE MIXING



2.7.1 Mixing Plant

- a. Concrete shall be mixed in mechanical mixers. The type and manufacture of these mixer together with all associated plant shall be subject to the approval of the EMPLOYER.
- b. Where small quantities of high grade concrete or mortar or cement grout are required the SUBCONTRACTOR shall, if the EMPLOYER shall be so requiring, provide small portable covered pan mixers or approved any other type for this particular work.
- c. Such covered pan mixers shall only be used as the EMPLOYER may direct and all the conditions covering the mixing of concrete for large scale concreting shall apply to any mixes prepared in pan mixers.
- d. Mixers shall be maintained within the manufacturer's tolerances with particular attention to mixing blade clearances and sizes, throughout the period of the Subcontract Agreement, and any mixer or plant which is not so maintained or is faulty in any respect shall be removed from the Site of Works.
- e. The capacity and siting of the main batching and mixing plants shall be such as to ensure a production rate sufficient for all the needs of the Works throughout the Subcontract Agreement.
- f. Before commencing concreting operations for any particular section of the Works, the SUBCONTRACTOR shall satisfy the EMPLOYER that sufficient plant in working order together with adequate stand-by equipment, is available to ensure the proper mixing of enough concrete for the aforesaid section of the Subcontract Agreement during the agreed period of placing.

2.7.2 Mixing Requirements

- a. The maximum size of the batch shall not exceed the maximum rated capacity of the mixer as stated by the manufacturer and as stamped on the mixer and the batch size shall not be less than 75% of such maximum.
- b. Mixing shall begin immediately after the cement has been added either to the water or aggregate and shall continue until there is a uniform distribution of the materials and the mass is uniform in colour and consistency.
- c. In any event concrete shall be mixed for at least the period and at the drum speed specified by the manufacturers of the mixer.
- d. The entire contents of the mixer shall be removed from the drum before materials for a succeeding batch are placed therein. The solid materials composing a batch shall be deposited in the mixer in accordance with the manufacturer's directions for use.
- e. Within 30 minutes after the introduction of the mixing water to the cement and aggregate, or the cement to the aggregate, the concrete shall be placed in its final position in the forms except that in hot weather or conditions contributing to quick stiffening of the concrete, the maximum allowable time may be reduced by the EMPLOYER.



- f. If any mixer is out of operation for more than 20 minutes, it shall be thoroughly cleaned out together with all the handling plant before any further concrete is mixed. All mixing and handling plant shall be thoroughly cleaned out before mixing concrete using a different type of cement.
- g. When recommended by the manufacturer or directed by the EMPLOYER when starting mixing with a clean mixer drum the first batch of concrete materials placed in the mixer shall contain a sufficient excess of cement, sand and water to coat the inside of the drum without reducing the required mortar content of the mix.
 - i) During windy weather efficient precautions shall be taken to prevent cement being blown away during the batching and mixing; airborne dust and sand shall not be allowed to contaminate the wet or dry mixes during batching and concreting and the SUBCONTRACTOR shall take whatever measure are necessary to prevent such contamination at his own expense.

2.7.3 Hand Mixing

- a. No hand mixing of the concrete shall be allowed. .

2.7.4 Control of Mix Proportions

- a. As an alternative to the above observational methods of control of mix proportions, the EMPLOYER may direct that assessment of mix proportions used shall be made by means of analysis of fresh concrete, in accordance with ACI 318-02 and UBC Section 1905.

2.8 TRANSPORTATION PLACING AND COMPACTION

2.8.1 Plant and Equipment

- a. The SUBCONTRACTOR shall provide adequate means of transporting and placing mixed concrete in sufficient quantities to meet the programme. Delivery ramps barrow ways, platforms, receiving hoppers, chutes, etc., shall be properly designed and constructed with regard to the efficient and rapid placing of the concrete and the safety of the WORKS and shall be approved by the EMPLOYER before being used.

2.8.2 Transportation of Concrete

- a. Whilst being transported from the mixer to the site of placing, all concrete shall be properly protected from contamination by dust or sand and from excessive moisture gain or loss from rainfall or high temperature and all equipment used shall be purpose-made for the correct transportation of concrete.

2.8.3 Preparation for Placing

- a. In preparation for the placing of concrete, all construction debris and extraneous matter shall be removed from the interior of forms.
- b. Deposition of concrete shall not be commenced until the EMPLOYER has inspected and approved the shuttering and any reinforcement etc., against which the concrete is to be placed. Any approval so given shall not relieve the SUBCONTRACTOR of any of his obligations under the Subcontract Agreement.



2.8.4 Placing of Concrete

- a. Concrete with a temperature greater than 30°C or 86°F shall not be placed in the forms. Where concrete is placed in slabs or walls greater than or equal to 1 metre or 3.3 feet thick the temperature of the concrete when placed shall not be greater than 25°C or 78°F.
- b. Concrete shall be placed in the shortest possible time after mixing is complete and before it has taken an initial set. It shall be placed as close as possible to its final position to avoid segregation of materials and displacement of reinforcement.
- c. Normally concrete may be deposited with a maximum free fall of 1.5 metres or 5 feet without the use of pipes, provided suitable measures are taken to prevent segregation and premature coating of upper reinforcing steel. When pipes are used they shall, as far as is practicable, be kept full of concrete during placing and their lower ends shall be kept buried in the newly placed concrete.
- d. If chutes are used they shall be kept clean and free from coatings, hardened concrete or other obstructions. Chutes shall be set at an angle to allow free movement of concrete under gravity without segregation.
- e. Concreting of any section or unit of the work shall be carried out in one continuous operation and no interruption of the concreting will be allowed without the approval of the EMPLOYER.
- f. Where delays of more than one hour occur between successive concreting or when, in the opinion of the EMPLOYER, the previously placed concrete has had ample time to harden, the resulting joint in the concrete shall be treated as a Construction Joint.

2.8.5 Compaction of Concrete

- a. After concrete has been placed it shall be thoroughly compacted by mechanical vibration applied by immersion vibrators or by equipment attached to the shutters. Vibrators shall only be used by competent operatives properly trained in the handling of the particular equipment in use on the Site.
- b. Immersion vibrators shall run at a frequency of not less than 7000 cycles per minute when immersed. The active part of the vibrator shall be fully immersed in use and vibration shall be of sufficient duration and intensity to thoroughly compact the concrete, but shall not be continued at any one point to the extent that localised areas of grout are formed.
- c. The vibrator shall be allowed to penetrate of its own accord and should be withdrawn slowly while still running, the intensity of vibration being such as to visibly affect a mass of concrete of compacting factor 0.85 over a radius of at least 0.5 meters or 1.5 feet.
- d. Application of vibrators shall be at points uniformly spaced and not farther apart than twice the radius over which the vibration is visibly effective.
- e. The SUBCONTRACTOR shall provide a sufficient number of vibrators to properly compact each batch immediately after it is placed in the forms, together with sufficient standby vibrators to cover all failures.



- f. Vibrators shall be manipulated so as to work the concrete thoroughly around the reinforcement and embedded fixture and into the corners and angles of the forms.
- g. Vibrators shall not be applied directly on or through the reinforcement to sections or layers of concrete, which have hardened to the degree that the concrete ceases to be plastic under vibration. It shall not be used to make concrete flow in the forms over distances so great as to cause segregation, and vibrators shall not be used to transport concrete in the forms.
- h. Every care shall be taken to see that reinforcement and fittings attached to the shutters are not disturbed and that no damage is caused to concrete that has already set or to the internal face of the shutters when using immersion type vibrators. All immersion vibrators to be used shall be in good working order and at least one spare vibrator of each size shall be available throughout the day's work.
- i. Vibration shall be supplemented by such spading as is necessary to ensure smooth surface and dense concrete along formed surface and in corners and locations impossible to reach with the vibrators.
- j. The SUBCONTRACTOR'S attention is drawn to the importance of achieving a high degree of compaction in order to produce as dense a concrete as possible. Details of the SUBCONTRACTOR'S proposed method of vibrating the concrete including the type, number and position of shutter vibrators, if used, must be submitted to the EMPLOYER for approval.

2.8.6 Strength of Structure

The strength of the structure in place will be considered potentially deficient if it fails to comply with any requirements, which control the strength of the structure, including but not necessarily limited to the following conditions.

Concrete strength requirements not considered to be satisfied in accordance with clause 6 hereof.

Reinforcing steel size, quantity, strength, position or arrangement at variance with the requirements as listed under specification of 'Reinforcement' or in the Subcontract Agreement Documents.

Concrete which differs from the required dimensions or location in such a manner as to reduce the strength.

Curing less than that specified.

Inadequate protection of concrete from extremes of temperature during early stages of hardening and strength development.

Mechanical injury, construction fires, accidents of premature removal of formwork likely to result in deficient strength.

Poor workmanship likely to result in deficient strength.



Structural analysis and / or additional testing may be required when the strength of the structure is considered potential deficient.

Core tests may be required when the strength of the concrete in place is considered potentially deficient.

If core tests are inconclusive or impractical to obtain or if structural analysis does not confirm the safety of the structure, load tests may be required and their result evaluated in accordance with British Standard BS 8110 or ACI Standard 318. Concrete work judged inadequate by structural analysis or by results of a load test shall be reinforced with additional construction if so directed by the EMPLOYER or shall be replaced, at the SUBCONTRACTOR'S expense.

The SUBCONTRACTOR shall pay all costs incurred in providing the additional testing and / or analysis required by this section.

The EMPLOYER will pay all costs of additional testing and / or analysis which are made at this request and which is not required by these Specifications, or by the Subcontract Agreement.

2.8.7 Setting Concrete

- a. After initial set of the concrete the forms shall not be jarred and no strain shall be placed on the ends of reinforcing bars which project.
- b. Adjacent works which may cause vibrations to be transmitted to any setting concrete, may be ordered to be stopped at the discretion of the EMPLOYER.
- c. Concrete which has initially set prior to placing shall not be utilized in the Works and reactivating by remixing or vibration will not be permitted.

2.8.8 Concreting in Hot Weather

- a. Specific arrangements shall be made with the EMPLOYER for any concreting that has to be carried out in very hot weather. These arrangements shall include night or early morning working, prior cooling and/or shading of reinforcement and forms and shading of the deposited concrete from direct rays of the sun.
- b. The SUBCONTRACTOR should further note that the times specified for mixing and placing and the frequency of cleaning of equipment may have to be modified in very hot weather. Covering or other protection of concrete during transport may also be necessary from time to time.
- c. If concreting is carried out when the ambient temperature is greater than 30 °C or 86 °F, the temperature of the concrete when placed shall not exceed 30 °C.

2.8.9 Concreting in Cold Weather

- a. Concrete shall not be placed with a temperature of less than 5 °C or 41 °F. It shall not be placed when the air temperature is below 3 °C or 37 °F on a falling thermometer or below 2 °C or 36 °F on a rising thermometer, unless special precautions are taken, to the satisfaction of the EMPLOYER, to maintain the minimum concrete temperatures specified herein.



2.9 CURING

2.9.1 General Requirements

- a. Full curing procedures shall be applied for a minimum period of seven days from the time of placing the concrete.
- b. This period may be varied at the direction of the EMPLOYER, for concrete which is likely to have faster or slower gain in strength or under other conditions affecting the strength or durability of the concrete but the SUBCONTRACTOR should note that this variation is unlikely to lead to a reduction in the curing period.
- c. The SUBCONTRACTOR'S attention is particularly drawn to the importance of starting curing as early as possible after placing concrete and maintaining full curing procedures throughout, as specified and directed.

2.9.2 Curing Methods

- a. All methods used for curing and protection of freshly placed concrete shall be subject to the prior approval of the EMPLOYER. Particular requirements for the various methods and conditions are laid down in the succeeding clauses and the EMPLOYER may instruct the use of particular methods, whether described here or not, in order to ensure full and satisfactory curing.

2.9.3 Curing of Concrete in Hot Weather

- a. When the air temperature is greater than 25 °C or 78 °F or at such other times as the EMPLOYER may direct, for example when there is a hot dry wind or low relative humidity curing shall proceed as follows:
 - i. As soon as possible without causing damage, curing of the concrete shall commence as agreed or instructed by the EMPLOYER. It is essential that such curing is applied at the earliest stage without delay and that it is continued without interruption for the minimum period specified above or as extended by the EMPLOYER.
 - ii. Curing to vertical surfaces, columns, beams etc., shall be achieved by shrouding the surface with hessian and constantly hosing to keep the hessian damp.

2.9.4 Curing of Concrete in Cold Weather

- a. Except where concrete is designed to have a rapid gain in strength after setting, all concrete shall be maintained at a temperature of at least 5°C or 41°F for 4 days after placing.
- b. This period may be reduced for concrete having a rapid gain in strength but only at the instructions or with the permission of the EMPLOYER. This permission shall be obtained in each and every case.

2.10 FORMWORK

2.10.1 Formwork Construction

- a. Steel formwork with MS scaffolding to be used for all types of structural concrete.



- b. Formwork shall be rigidly constructed and shall ensure that the finished concrete is true to the sizes and shapes and dimensions shown on the Drawings. Formwork shall be of suitable design and substantial construction to carry the loads due to the wet concrete and any incidental loads without excessive bulging, distortion, deflection, instability or grout loss. Special attention shall be paid to formwork where immersion type or shutter vibrators are to be used to ensure that the requirements of this Specification are met.
- c. Formwork for recesses, pockets, apertures and internal voids shall be accurately positioned and securely fixed such that they are not dislodged by the concreting operation.
- d. All formwork construction shall be subject to the approval of the EMPLOYER and details shall be submitted for his approval well in advance of construction commencing.
- e. Any charges or modifications to the formwork required by the EMPLOYER shall be at the expense of the SUBCONTRACTOR.

2.10.2 Internal Ties

Internal ties shall not be used without the EMPLOYER'S consent, and if used they shall be of metal and capable of either being removed without permanent injury to the concrete or of being left in place without any part being nearer than 75 mm or 3" to the finished surface of the concrete. Holes left by the removal of internal tie locking devices shall be neatly filled and finished to the satisfaction of the EMPLOYER.

2.10.3 Effects of Hot Weather on Formwork

- a. External faces of steel formwork subject to the action of the sun during the hot season or to hot winds, or other formwork as directed by the EMPLOYER, are to be insulated and painted a light colour to minimise heat absorption, all to the satisfaction of the EMPLOYER.
- b. The EMPLOYER may forbid altogether the placing of concrete in any mould which he judges to have become so hot and/or dry that concrete members in accordance with this Specification cannot be satisfactorily produced therefrom. No claim for extra payment for cooling or soaking formwork will be entertained.

2.10.4 Preparation of Forms and Formwork

- a. Before commencement of pouring concrete all forms shall be thoroughly cleaned out by approved means to the satisfaction of the EMPLOYER, as specified elsewhere herein.
- b. A coating of approved mould oil or other approved material shall be applied to all surfaces coming into contact with the concrete to allow easy removal of the forms without damage to the concrete. No mould oil or other lubricating medium shall be allowed to come into contact with the reinforcement. Any materials which will adhere to or discolour the concrete shall not be used.
- c. Any panels or parts of panels of formwork which are proposed to be used several times in succession shall be carefully cleaned and repaired between uses.

2.10.5 Removal of Formwork



- a. After the concrete has been poured, formwork shall not be stripped, unless otherwise approved, until the following times have elapsed:
- b. Vertical formwork to columns, wall and beams 48 hours Soffit formwork to slabs 15 days Props to slabs 15 days Soffit formwork to beams 15 days Props to beams 15 days
- c. Tolerances shall be as considered reasonable by the EMPLOYER.
- d. Soffit formwork should be so designed as to facilitate striking, if required, without removal of props being necessary until the times stipulated above have elapsed.
- e. No superimposed load shall be allowed on any part of the concrete work prior to the removal of the forms and props and/or until such loading is approved. Where concrete is to have filling placed against it the methods of backfilling shall be approved by the EMPLOYER.
- f. Where there is a particular requirement for the early removal of formwork a procedure for establishing whether or not the concrete has reached the required standard shall be agreed with the EMPLOYER beforehand. This may include early testing of concrete test.
- g. At all times the SUBCONTRACTOR shall delay the removal of the formwork if in the opinion of the EMPLOYER the concrete contained therein has not attained sufficient strength. Labour and materials used in rectifying damage arising from the premature removal of formwork shall be at the expense of the SUBCONTRACTOR.

2.10.6 Finishes for Formed Surfaces.

- a. Finished surface from formwork shall be as follows:
 - i. **Class 1**
This finish is for surfaces prominently exposed to view where a ribbed finish is required and good appearance and alignment are of special importance. The layout and size of the battens planted on to form the ribbed effect shall be as shown on the drawings. The finish shall be smooth and free from steps or boardmarks. Only very minor surface blemishes will be allowed and these shall be carefully filled immediately after the removal of the formwork. If necessary, after completion of curing, the surface shall be rubbed down. To achieve this finish formwork shall have a hard smooth surface, being faced with marine plywood or equivalent material in large panels with wrot battens planted on. The panels shall be arranged in an approved uniform pattern. Wherever possible, joints between panels shall be arranged to coincide with surface features or changes in direction, so as to disguise any possible irregularity. All joints between panels shall be vertical or horizontal unless otherwise instructed and the joints shall be carefully filled and designed to maintain accurate alignment in the plane of the panels.
 - ii. **Class 2**
This finish is for surfaces which are permanently exposed to view where a Class 1 finish is not required. The surface produced by the formwork shall be free from voids, honeycombing or other large blemishes. Any small blemishes shall be carefully filled immediately after the removal of the formwork and



other marked imperfections such as fins or steps shall be made good. To achieve this finish wrought timber boards, plywood sheets, steel panels or such other materials as is approved of uniform pattern with vertical or horizontal joints, unless otherwise directed. Joints shall be carefully filled before concreting.

iii. Class 3

This finish is for surfaces not permanently exposed to view. The surface produced shall be free from voids, honeycombing or other large blemishes, steps sharp protrusions or local hollows. The formwork may be sawn boards, metal panels or other approved suitable material.

- b.** The SUBCONTRACTOR should note that where timber faced forms are used to produce Class 1 or Class 2 finishes, the EMPLOYER may withdraw approval for the use of any particular panel after a number of successive uses. This approval may also be withdrawn from any other type of formwork panel if, in the opinion of the EMPLOYER, it has become unsuitable for the production of the required finish, whether through damage or normal wear and tear.

2.10.7 Sample Panels

- a.** Prior to starting the construction of the Permanent Works, the SUBCONTRACTOR shall produce sample panels of each of the specified finishes. Each panel is to include a construction joint with waterbar, a butt joint between shutters, internal nailing to shutters if constructed of timber, spacer blocks and an internal tie, if to be used, with cavity filled with matching mortar.
- b.** The panels shall be constructed at the site of WORKS in such a place that they will not suffer damage or demolition and after acceptance by the EMPLOYER shall be adopted as the standard of finish for the WORKS.
- c.** The construction of these panels and their demolition on completion of the WORKS or when directed, shall be at the SUBCONTRACTOR'S expense.

2.11 CONCRETE SURFACE FINISHES (FOR UNFORMED SURFACES)

2.11.1 Floated Finish

- a.** A floated finish shall be applied to all unformed surfaces of concrete except where other finishes are specified or indicated on the Drawings.

Steel floats shall be used unless otherwise approved or directed.

- b.** Floating shall be done as soon as the concrete has hardened sufficiently and may be by hand or machine. Care shall be taken that the concrete is worked no more than is necessary to produce a uniform surface free from screed marks which is finished level or to the falls specified on the Drawings.

2.11.2 Tamped Finish

- a.** Upper surfaces of concrete roadways and footways having no applied finish or special surface treatment shall be finished to the levels and falls shown on the Drawings and shall be fine tamped, as directed, to give a good running surface.



2.11.3 Surfaces Requiring Applied Finishes

- a. Where screeds or other bonded finishes are to be applied to concrete surfaces after casting, unless otherwise specified, surface laitence and fine aggregate shall be carefully removed to expose the coarse aggregate which must remain undisturbed and undamaged.

2.11.4 Sample Panels

- a. Prior to starting the construction of the permanent Works, the SUBCONTRACTOR shall produce sample panels of each of the specified finishes.
- b. The panels shall be constructed at the Site of the WORK in such a place that they will not suffer damage or demolition and after acceptance by the EMPLOYER shall be adopted as the standard finish for the WORK.
- c. The construction of these panels and their demolition on completion of the WORKS or when directed, shall be at the SUBCONTRACTOR'S expense.

2.12 REINFORCEMENT

2.12.1 Reinforcement Steel Specification

- a. Steel used for concrete reinforcement shall be new billet steel bars of the sizes and dimensions called for on the drawings, and shall conform to the ASTM A615-87 and A706 with minimum yield strength of 60,000 psi as required.
- b. Reinforcing steel shall be free from pitting, loose rust, mill scale, or any other deleterious materials. Neither the size nor the length of a bar shall be less than shown on the drawing.
- c. UBC – 97 Section 1921.5 will be followed strictly during all phases of work.

2.12.2 Testing of Reinforcement Steel

- a. A manufacturer's test certificate shall accompany each consignment, a copy of which shall be handed to the EMPLOYER before such reinforcement is incorporated in the Works.
- b. In addition to test certificate the samples of bars (and wire if required by EMPLOYER) shall be got tested by the SUBCONTRACTOR (at his own expense) at a Laboratory approved by the EMPLOYER for tensile Strength, cold bend, chemical analysis standard weight and elongation properties, and only the materials conforming to the Specification, and whose test reports are approved by the EMPLOYER shall be used in the works.

2.12.3 Storage of Reinforcement Steel

- a. Reinforcement shall be stored on racks, clear of the ground and shall be protected to prevent accumulation of dust and other harmful substances
- b. The separate types and sizes of bar reinforcement shall be stored in separate racks, the type and diameter being clearly marked in each case.

2.12.4 Bending Schedules

- a. All bending schedules shall be furnished by the SUBCONTRACTOR for the approval of



the EMPLOYER prior to the installation of the reinforcement. The approval of bending schedules by the EMPLOYER shall in no way relieve the SUBCONTRACTOR of responsibility for the correctness of the same.

- b. The SUBCONTRACTOR is responsible for developing rebar placement (shop) drawings. These drawings should be prepared in separate submittals for footings, columns shear walls, roof and floor slabs, retaining walls etc. and should be thoroughly reviewed and approved by SUBCONTRACTOR prior to sending them to office. The drawings should be prepared in such a way that it allows plenty of time for review, approval by the EMPLOYER and fabrication.

2.12.5 Cutting and Bending of Reinforcement

- a. Reinforcing bars shall be accurately cut and bent to the shapes and sizes shown on the Drawings. All bars shall be bent cold unless the written permission of the EMPLOYER is obtained for hot bending. Any reinforcing bar that has already been bent shall not be rebent at the place of the original bend.
- b. Reinforcement shall be bent by gradual and uniform application of pressure by suitable machines to the forms and dimensions shown on the drawings and in the approved bending schedules and in accordance with ASTM A 305 and A 615. Any bending of reinforcement left projecting from a construction joint for concreting later shall be done strictly in accordance with the drawings and without damaging the concrete.

2.12.6 Fixing of Reinforcement

- a. The SUBCONTRACTOR shall be responsible for maintaining the reinforcement in the correct position during concreting. Bar crossings shall be secured with No. 16 s.w.g annealed soft iron tying wire. The ends of the tie being twisted together and turned down into the work.
- b. Sufficient mild steel chairs shall be supplied to rigidly support the top reinforcement of all slabs.
- c. Subject to the EMPLOYER'S approval, spacer units fixed to the reinforcement shall be used in all reinforced concrete to give the cover specified herein, on the Drawings or as directed.
- d. No metal part of any device used for connecting bars or for maintaining reinforcement in the correct position shall remain within the specified minimum concrete cover to the reinforcement except where expressly instructed or provided for herein.
- e. Reinforcement temporarily projecting from the concrete at construction or other joints shall be adequately supported and shall not be bent out of position unless expressly permitted or directed.
- f. Welding of reinforcement is not allowed in any case.

2.12.7 Concrete Cover

- a. The minimum concrete cover to reinforcement excluding stirrups and binders, shall be as indicated on the Drawings (as shown in below table) unless otherwise directed.



	CONCRETE CLEAR COVER SCHEDULE	
	ABOVE GROUND INTERIOR ENVIRONMENT	ABOVE GROUND EXTERIOR ENVIRONMENT
COLUMNS (VERTICAL BARS)	1 ½"	2"
BEAMS (LONGITUDINAL BARS)	1 ½"	2"
WALLS	1"	1 ⅜"
GRADE SLAB	1"	1 ⅜"
SUSPENDED SLAB	¾"	1"
EQUIPMENT PAD	1"	1 ⅜"
WATER TANK	2"	2"

. The minimum cover will normally comply with the following requirements:

I. For Normal Construction

- i. On all external faces 2"~3"
- ii. On all other faces ¾"

Notwithstanding the above provision the cover to any bar shall be not less than the diameter of that bar.

II. For water retaining structures:

- Faces exposed to fresh water 40 mm or 1.5" (Potable)
- Faces exposed to effluent and other impure water 50 mm or 2.0"

III. For unscreeded ground-bearing 50 mm or 2.0" ground floor slabs

- b.** Provided always that the required minimum cover is maintained, the actual cover to any bar shall be that indicated on the Drawings with the following tolerances:

Plus or minus 5 mm or 1/4" on bars up to and including 12 mm or 1/2" diameter.

Plus 10 mm or 3/8" or minus 5 mm or 1/4" on bars over 12 mm or 1/2" up to and including 25 mm or 1" diameter.

Plus 16 mm or 5/8" or minus 5 mm or 1/4" on bars over 25 mm or 1" diameter.

2.12.8 Steel fixer in Attendance

- a.** During concreting a competent steel fixer shall be in attendance to adjust and correct the positioning of the reinforcement.

2.13 JOINTS



2.13.1 Construction Joints

- a. The position and form of construction joints, where not shown on the Drawings, shall be agreed with the EMPLOYER before concreting begins. Unless otherwise directed they will be made across planes of minimum shear, and include a suitably proportioned key recess. They shall be made only along a horizontal or vertical plane except that in the case of inclined or curved members they shall be at right angles to the principal axis of the member.
- b. Vertical construction joints must be made against properly constructed stop-ends firmly fixed with holes to permit the reinforcement to pass through.
- c. Stop-ends shall be carefully removed, without disturbing the concrete and reinforcement as soon as possible after concreting depending on the ambient temperature and curing conditions, as approved by the EMPLOYER. This will normally be within 9 hours of placing the concrete. Immediately on removal of the stop-end, all horizontal and vertical joints are to be blasted with an air/water jet in order to remove all excess laitance and fine aggregate. Coarse aggregate is to be left exposed but undisturbed.
- d. When necessary to prevent powdering of the surface at construction joints in hot weather water spraying on the exposed surface will be required. Any curing membrane used at or near a construction joint shall be completely removed before concreting is recommended.
- e. When concreting is resumed against a construction joint the surface of the previously placed concrete shall be hosed down and the surplus water allowed to drain away before placing the new concrete. In certain situations, particularly in hot weather, or where it has been possible for surface deposits to build up, it may prove necessary to repeat the air/water jet blast cleaning described above. This shall be at the discretion or with the approval of the EMPLOYER.
- f. All necessary steps shall be taken to ensure that good dense concrete is achieved against construction joints.
- g. Where watertight construction is indicated on the drawings approved waterstops shall be used to seal all construction joints.
- h. The SUBCONTRACTOR shall submit his proposals for concreting to the EMPLOYER well in advance of work commencing. In particular, adjacent sections are not to be concreted within 24 hours of each other. The SUBCONTRACTOR shall also demonstrate his method of treating construction joints to the satisfaction of the EMPLOYER.
- i. The SUBCONTRACTOR is reminded that full curing procedures are also to be applied to construction joints. This curing shall continue until the end of the normal curing period or until further concrete is placed against the joint, if earlier.

2.13.2 Movement Joints

- a. All movement joints shall be constructed to the details and at the spacings or locations indicated on the Drawings, unless instructed otherwise by the EMPLOYER.



- b. WHERE WATERTIGHT CONSTRUCTION IS INDICATED ON THE DRAWINGS APPROVED WATERSTOPS SHALL BE USED TO SEAL ALL MOVEMENT JOINTS.

2.13.3 Waterstops

- a. Where required by this Specification, indicated on the drawings or directed, waterstops shall be provided to seal expansion, contraction and construction joints. These shall normally be surface type P.V.C. waterstops of 240 mm or 10" wide "Rearguard" type and as approved by the EMPLOYER.
- b. Where detailed or directed centrally placed P.V.C. waterstops shall be used. These shall be of 240 mm or 10" wide "Eyeleted Hydrofoil" type for movement joints and 240 mm or 10" wide "Eyeleted Waterfoil" type for construction joints as approved by the EMPLOYER.
- c. Where detailed or directed centrally placed Rubber waterstops shall be used. These shall be 240 mm or 10" wide "Centre Bulb" type for use in movement joints as approved by the EMPLOYER.
- d. Any application for use of an alternative material shall be submitted to the EMPLOYER well in time with full details and manufacturer's specification indicating that the material is equal or superior to the material specified above. If required by the EMPLOYER samples of the material shall also be supplied and tested in an independent laboratory all at the expense of the SUBCONTRACTOR.
- e. Water stops shall be fabricated into the longest practical units at the supplier's works and shall be made continuous throughout the structure whether internal or external. Intersections and joints shall be factory made wherever possible in order to reduce site jointing but where site-made joints are necessary they shall be by heat-welding for P.V.C. material and by hot vulcanizing for Rubber materials, all carried out to the manufacturer's instructions and subject to the EMPLOYER'S approval. Where proprietary cold jointing systems for Rubber water stops are available and these are approved by the EMPLOYER such alternatives may be used, in accordance with the manufacturer's instructions.
- f. Water stops shall be stored so as to prevent damage to them and any waterstop which has been damaged in any way during delivery, storage or installation shall be rejected and removed from the Site. Special attention shall be paid to the protection of water stops during construction, before and during the completion of casting of concrete around the water stops due to the effects of direct sunlight.
- g. Water stops shall be carefully maintained in the position shown on the Drawings, or directed, being supported on accurately profiled stop-ends to create rigid conditions. Centrally placed "Eyeleted" water stops shall be securely fixed to the reinforcement with tie-wires.

2.13.4 Watertight Construction

Watertight construction shall consist of concrete construction designed to exclude or retain water or other liquid. Particular attention shall be directed to joints, in such construction which shall be provided with approved waterstops, as specified.

2.14 TEST OF CONCRETE QUALITY



The SUBCONTRACTOR shall provide samples of concrete for testing at the EMPLOYER's direction. Proper facilities shall be provided for making and curing „the test specimens. A competent person shall be employed by the SUBCONTRACTOR whose first duty shall be to supervise all stages in the preparation and placing of the concrete. All test specimens shall be made and site tests carried out under his direct supervision. All tests shall be carried out at laboratories approved by the EMPLOYER. The EMPLOYER may be present during testing.

2.14.1 Preliminary cylinder tests and works cylinder test shall be performed in accordance with the discretion of the EMPLOYER. The standard of acceptance for preliminary and works tests shall be as given below.

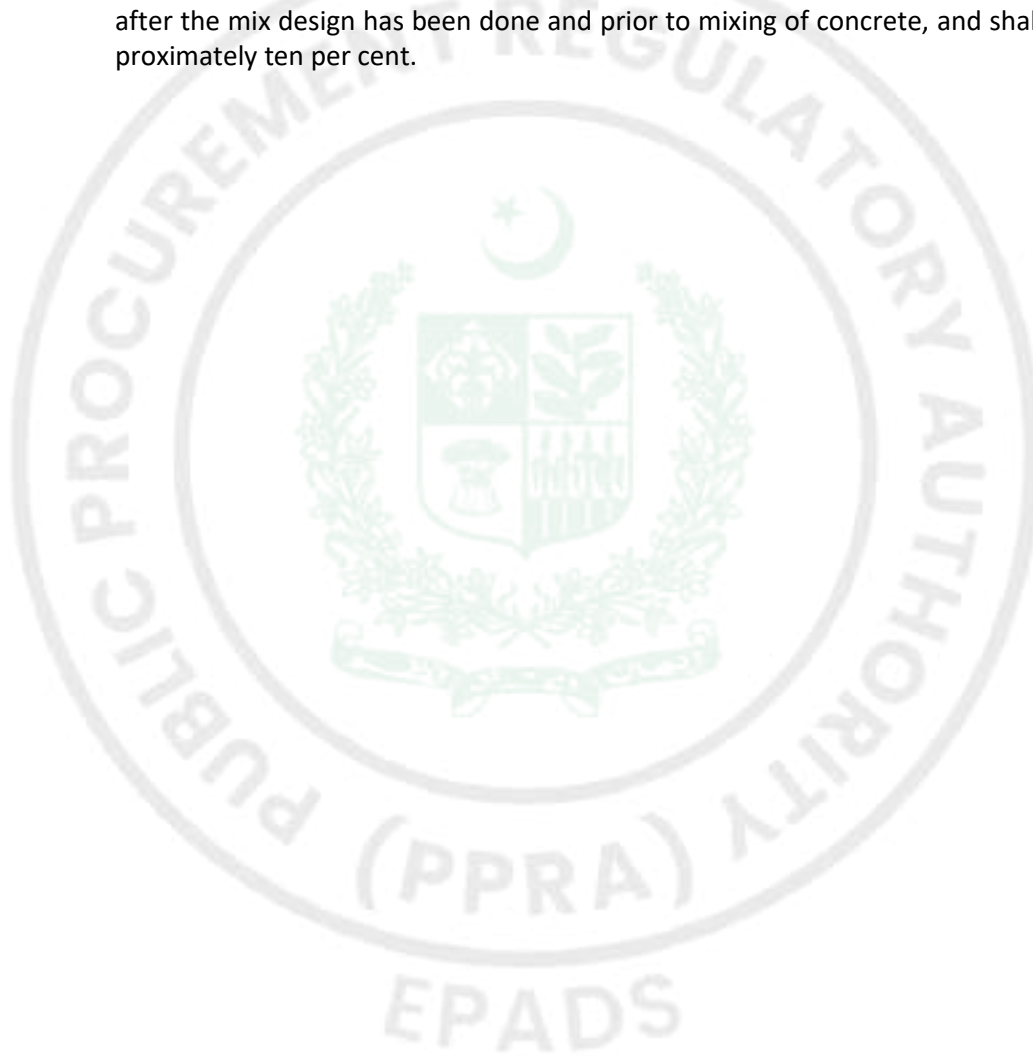
- a. **STRENGTH TESTS DURING THE WORK:** Strength tests of the concrete placed during the course of the work shall be made by the SUBCONTRACTOR. The SUBCONTRACTOR shall test, for control purposes, such number of cylinders as the EMPLOYER may direct. In general, three set of three cylinders shall be taken 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.
- b. 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.
- c. The standard age of test shall be 28 days, but 7-day tests may be used at the discretion of the EMPLOYER, 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 SUBCONTRACTOR may change the proportions of the constituents of the concrete, as necessary to secure the required strength for the remaining portions of the work.
- d. **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 EMPLOYER in accordance with the applicable requirements of ASTM C-42 entirely on the expense of the SUBCONTRACTOR. 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 EMPLOYER shall be taken to correct the deficiency. However, the EMPLOYER shall have the authority to prescribe such corrective measures, and the SUBCONTRACTOR shall take such measures if in the EMPLOYER'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 EMPLOYER due to the SUBCONTRACTOR's fault or negligence, the entire cost of replacing faulty concrete or carrying out prescribed corrective measures shall be



borne by the SUBCONTRACTOR who shall also reimburse the EMPLOYER for the cost of making tests.

e. 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, the cylinders will be required to have 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 as required for the larger size aggregate concrete. Such increments over the allowable strength shown will be established by the EMPLOYER after the mix design has been done and prior to mixing of concrete, and shall be approximately ten per cent.



3. BRICK MASONRY / FAIR FACE BRICKWORK

3.1 SCOPE OF WORK

This section of work includes first class brickwork in floors, walls both internal and external of any thickness and height shown on the drawings. The Brickwork shall be carried out in cement, sand mortar of ratio specified in the Bill of Quantities.

3.2 MATERIALS

Face Work

Brick and tile shall be special first class strong sound of well burnt clay uniform in shape and colour. Brick shall measure 9" x 4-1/2" x 3" that every four courses laid shall measure a foot in height. All the edges of the bricks shall be straight, true and sharp. Joints shall be filled with mortar as each brick is laid. Use of dead steel rods may be made to ensure uniformity of joints. Precautions shall be taken to keep mortar off the face of brick and the work shall be carefully cleaned of mortar splashes or stones as it progresses. The mortar shall be of 1:3 cement sand mixed with pozallana to match with the colour of the bricks. Tile size shall be 9" x 4-1/2" x 1-1/2". Bricks and tiles should produce a ringing sound when struck and they shall be free from flaws, cracks, chip stones, nodules of lime or kankar or other blemishes. Brick and tiles should not absorb more than 1/6th of its weight when soaked in water for an hour. Minimum crushing strength of bricks and tiles should not be less than 2000 Psi. Bricks and tiles of only one size shall be used throughout the work even if they are procured from more than one Kiln and shall conform to W.P. Specifications Vol.1 Part I No.4.1 for First Class Burnt Clay Bricks.

3.3 MORTAR

Mortar shall be cement: sand mortar. Its ingredients shall be mixed by volume in ratio specified in the Bill of Quantities unless otherwise directed by the EMPLOYER in writing.

Cement and sand shall be thoroughly mixed in a dry state on a pacca platform or in a trough. An approximate quantity of water shall be added to this dry mix to make the mortar of workable consistency. The quantity of mix in a single batch should be such as could be used within 30 minutes of its mixing with water.

Mortar not used within 30 minutes of its mixing shall be discarded and removed. The platform or the trough used for mixing shall be thoroughly washed and cleaned at the end of the day's work.

Portland cement and sulphate resistant cement shall conform to ASTM C-150 as specified in the Section "Concrete". Cement sand and water shall be as specified under Section "Concrete".

Mortar for special bricks in superstructure to be used for the purpose of facade shall be cement surkhi mortar of ratio (1:3). All bricks are surface / façade bricks.

3.4 WALL TIES

Wall ties will be provided by the client and cost will be born by the SUBCONTRACTOR. The ties will be fixed as per manufacturer instructions and as directed by the EMPLOYER.

3.5 SAMPLES



Before commencement of the work samples of all the material used for "Brick Masonry" shall be got approved from the EMPLOYER and the same type of material must be used by the SUBCONTRACTOR for the whole "Brick Masonary". The SUBCONTRACTOR shall get the material tested at his own cost from the laboratory approved by and in accordance with the instructions of the EMPLOYER.

3.6 WORKMANSHIP

Brick laying shall conform to the relevant requirements of W.P. Specifications Vol. I Part.II Part 21.1. The approved bricks and tiles shall be laid in mortar specified in this Specifications and strictly in accordance with the drawings. The bricks and tiles before use shall be soaked in water tanks by the SUBCONTRACTOR for at least four hours without allowing any damage to the bricks or tiles.

Bricks shall always be laid in running bond with frogs upwards, bed and vertical joints properly filled with the specified mortar and truly plumb when frequently checked with plumb bobs and straight edges. Brickwork should present a perfect straight and vertical surface subject to a max. variation of one mm in one metre in any storey height or any length of wall without any chipping or rubbing of the same. Brickwork shall be cut and chiselled finely where curved or champhered surface is needed without presenting an ugly look or requiring levelling up with extra mortar. Where work has to be left the wall shall be left in slope and in no case the difference of height between different walls shall be more than 5 ft at any section of the building.

All Brickwork, shall be bonded where it abuts concrete walls or columns as per directions of the EMPLOYER. Where brick walls and partitions intersect or abut, masonry shall be interlocked in such a way as not to leave a straight vertical line between the two walls. In such cases bond shall be obtained by placing 4.1/2 inches closer from the face in every alternate course of the wall.

The top most brickwork course under floor or roof slabs shall be filled with backer rod and sealant. Putlog holes shall always be along headers and not more than one brick deep and shall be neatly bricked in on removal of scaffolding.

Embedded pieces and all items shown on the drawings or specified or directed by the EMPLOYER are to be built into the masonry. Built-in items shall be filled as directed by the EMPLOYER even where latter building is required for leave openings in masonry for heating and plumbing, pipes, electric conduits etc. After piping or conduits have been installed, fill around the same with brickwork or as directed by the EMPLOYER.

The masonry shall be kept properly cured for at least 10 days where cement mortar is used. Vertical joints in alternate courses must be directly one over the other and horizontal joints shall be truly level with thickness of joints 3/16" to 5/16" and kept uniform. All cutting chiselling etc. of bricks required to conform to drawings and specifications shall be done by the SUBCONTRACTOR without any extra cost.

The joints of the masonry must be raked out uniformly at the close of each work day and any extra mortar sticking on the face of the work must be scrubbed out and cleaned daily. The thickness of joints must be kept uniform throughout the whole work.



4. CONCRETE BLOCK MASONRY

4.1 Scope:

The work covered by this section of the Specification consists of furnishing all plant, labor, equipment, appliances and materials and in performing all the operations in connection with masonry work, complete in strict accordance with the Specification herein and the applicable drawings subject to the terms and conditions of the Subcontract Agreement.

4.2 Materials:

4.2.1 Cement

Cement shall be Ordinary Portland cement meeting the requirements specified under "CONCRETE" in sub-section 2 of these Specifications.

4.2.2 Aggregates

Aggregates used shall meet the requirements specified under "CONCRETE" in sub-section 2 of these Specifications. All the aggregates dry and properly screened shall be acceptable for block making.

4.3 Concrete, Masonry Units

4.3.1 Concrete masonry block shall preferably be made on the Project Site and shall be of the sizes as noted on drawings and/or as directed by the EMPLOYER and shall conform to the requirements of UBC Standard 21-4 and 21-5.

4.3.2 The blocks shall preferably be solid or hollow conforming to ASTM C 90N standard. The blocks to be used for the masonry shall be carefully made so that they are true in line and face with square corner and free from all defects. The ends of the blocks, which will form the vertical joint in the masonry, shall be double grooved or as directed by the EMPLOYER. In the case of hollow blocks, the cavities shall be true to the shapes and sizes specified and shall have uniform wall thickness on the outside of the cavities.

4.3.3 The concrete for the blocks shall be mixed in a concrete mixer in the proportion of one (1) part of cement, three (3) parts of sand and six (6) parts of well graded coarse aggregate not exceeding 3/4" in size or one (1) part of cement and seven (7) parts of well graded all in aggregates not exceeding 3/4" in size.

4.3.4 Concrete blocks shall be machine moulded. The concrete shall be well worked into the moulds, vibrated, tamped and pressed to ensure that the moulds, vibrated tamped and pressed to ensure that the blocks are dense and free from voids.

4.3.5 The blocks shall be cured by keeping moist continuously for a period of at least ten (10) days and then shall be allowed to dry in shade for at least twenty (20) days before being used in masonry.

4.3.6 All blocks shall have clean cut straight and true edges, smooth dense faces of uniform appearance without voids, honeycombs, projections and shall be free from cracks spalls, chips, ragged edges or other defects detrimental to their use.

4.3.7 Where blocks are to be plastered or rendered, the block surface shall have a coarse texture suitable for bonding the plaster as approved by the EMPLOYER.



4.3.8 The average compressive strength of any ten blocks picked at random after curing and drying shall be not less than 1900 psi. Verification of the specified compressive strength shall be in accordance with UBC-97 Section 2105, 21.408 and Table 21-4-B.

4.3.9 The average moisture content of all the concrete masonry units shall not exceed 30 percent of the total water absorption of units. The shrinkage of cement concrete blocks in much greater at the time it dries for the first time after moulding subsequent to curing. It is therefore, essential that the SUBCONTRACTOR shall take full care to see that blocks are sufficiently and thoroughly dried so that their initial shrinkage is completed before the blocks shall be used, but the blocks shall also be laid dry without wetting except with slightly moistened surfaces on which mortar is to be applied to obviate absorption of water from the mortar and even during curing of the mortar joints the blocks shall be slightly moistened and shall not be allowed to be excessively wet till they receive any plaster or render.

4.3.10 The blocks shall be stored in such a manner so as to avoid any contact with moisture on the site of works. The blocks shall be stock piled on planks or other supports free from contact with the ground and if necessary cover for protection against wetting. The blocks right from casting to curing, drying, stock piling and their subsequent placing in masonry walls shall be handled with care.

4.4 Cement Mortar for Masonry

Mortar should conform to ASTM C 270 Type S (Masonry Cement shall not be used). Epoxy adhesives, mortars and grouts such as Sikadur 30 & 31 or equivalent conforming to ASTM C 881 for adhesion of reinforcing bars / plates etc to the concrete will be used wherever required as per manufacturer's instructions and as directed by the EMPLOYER.

4.4.1 Proportions

Cement Mortar shall be composed of one part of ordinary Port land cement to 6 (six) parts of sand for all concrete block walls Hand mixing when permitted by the EMPLOYER shall be done on clean hard platform as much as required for immediate use with only just sufficient water to produce mortar of a proper consistency. If directed by the EMPLOYER, the mixing shall be done by mechanical mixers. Sand shall be of an approved quality and shall pass 100% through 3/16" sieve.

Grout shall conform to ASTM C 476 (2000 Psi). Grout will be poured in vertical spaces and vibrated to ensure proper settlement and filling of all holes / empty spaces.

4.4.2 Gauging

The ingredients for mortar shall be measured in boxes. No retempering of mortar shall be allowed nor mixing of any anti-freezing ingredients in mortar shall be permitted.

4.4.3 Mixing

The dry materials shall be dry mixed for approximately 2 minutes and for 3 minutes after addition of water making total minimum time of 5 minutes in a mortar mixer. When hand mixing is permitted, or dry mix, shake well, turn over materials for each batch before adding water, until uniform colour or mixed materials indicates cementitious material thoroughly distributed throughout the mass. After dry mixing is complete, add water until thoroughly mixed mortar of the required plasticity is obtained. If mixing is not satisfactorily done, then the SUBCONTRACTOR shall take such steps as directed by the EMPLOYER. Mortar shall be used within half an hour of mixing. Mortar standing more than half an hour shall not be



used.

4.5 Masonry and Jointing

- 4.5.1** All masonry shall be laid plumb, true to line and level in accurately spaced course with each breaking joints with the course below. Corner and reveals shall be plumb and true. Chases grooves, reglect blocks and raked out joints shall be kept free from mortar and other debris.
- 4.5.2** The thickness and length of various walls shall be indicated on the drawings.
- 4.5.3** Unless otherwise shown on the drawings or specified, the spaces around frames and other built-in items shall be solidly filled with mortar, except the joints that are to be pointing shall be raked out 3/4" deep.
- 4.5.4** Work required to be built in with masonry including anchors, wall plugs and accessories shall be builtin, as the work progress. Wood plugs and blocking shall not be built into masonry.
- 4.5.5** All horizontal and vertical joints shall be completely and solidly filled with mortar as the blocks are laid. In horizontal bedding joints, mortar shall be spread over the entire top surface of the block to a uniform layer of 3/8" thick for vertical joints mortar shall be applied to a block unit when it is standing vertically, and then placing it horizontally on the horizontal bedding mortar and pressing it against the previously laid unit in that course, making a vertical joint of 3/8" thickness. In horizontal bedding joints mortar shall not be spread so much ahead of the actual laying of unit that it tends to stiffen and loose its plasticity resulting in poor bond. If it happens, then the stiffened mortar shall be removed and fresh mortar laid by the SUBCONTRACTOR at his own cost. When the mortar has stiffened somewhat, it shall be firmly compacted with a jointing tool.
- 4.5.6** The thickness of joints shall not be exceeding 3/8" inch and the joints shall be raked 1/2" inch deep when the mortar is still fresh, so as to provide for proper bond for the plaster. Any mortar which falls on the floor from the joints or is removed due to raking of joints shall not be re-used.
- 4.5.7** No masonry to be erected when temperature of outside air is below 40oF unless suitable means as approved by the EMPLOYER are provided to heat the material and provide protection from cold and frost to ensure that it will harden without freezing.
- 4.5.8** When the masonry is to receive plaster on one side and pointing on the other, the block shall be placed in such a way that the better face shall be on the side of pointing.
- 4.5.9** Wherever blocks abut columns, they shall be anchored there by means of anchor steel bars, as shown on the drawings or any other type of anchor steel bars, as shown on the drawings or any other type of anchors as approved by the EMPLOYER at a vertical spacing of approx. 12 inch for wall upto 6" thick and approximately 24" for walls morethan 6" thick unless otherwise directed by the EMPLOYER. Alternatively, the masonry may be built-up first leaving the dovetail type ends near the columns and the columns then be cast so that the concrete of the columns and the masonry make a dovetail type of joints, provided it is permitted in writing by the EMPLOYER.
- 4.5.10** Erection of partition and panel walls shall be delayed, wherever possible until the frame of the delayed, wherever possible until the frame of the structure is taken up. Care should be



taken that no deformation occurs due to structural loads. Otherwise the top course of partitions under slabs and beams shall not be laid until the form has been removed and the roof slab placed.

4.5.11 In damp soils to prevent the rise of moisture from the ground due to capillary action the foundation and basement masonry when, so directed by the EMPLOYER shall be laid in richer mortar than specified in which case the SUBCONTRACTOR shall not be paid the extra cost of cement used. In addition, a damp proof course shall be provided consisting of 1 to 2 inches thick layer 1:2:4 cement pudlow mortar or an approved type of bituminous course.

4.5.12 All masonry work and portions of walls shall be bonded together as directed by the EMPLOYER. In order to ensure appropriate bonding between walls, masonry bonds will be executed by extending alternate courses of units of an intersecting wall or partition through the thickness of the wall or partition it intersects.

4.6 Co-ordination

4.6.1 Co-operate with other trades in setting built-in items, taking special care in cutting fitting setting units so that built-in member are in their true, respective positions slush voids full.

4.6.2 For items provided in other sections such as door frames fasts, miscellaneous metal work occurring in the masonry sleeves, anchors, support nailing strips brance jambs, etc. are to be built in the masonry.

4.6.3 Special care shall be taken in building block at door frames. The SUBCONTRACTOR shall see that frames are square and plumb. Check frames before building work around or against them. The SUBCONTRACTOR shall see that full electric conduits are not housed into frames, so as to prevent extension of frame anchor.

4.6.4 The SUBCONTRACTOR shall be responsible for any damage to his own work and also to the work of other sections.

4.7 Protection and Cleaning

4.7.1 Surface of masonry, not being worked on shall be properly protected at all times during the construction operations. When rain is expected and the work is discontinued the top of exposed masonry walls shall be covered with strong water-proof membrane, well secured in place.

4.7.2 Exposed masonry surfaces shall be cleaned with water and fiber brushes as directed by the EMPLOYER.

4.7.3 Hollow Blocks through which reinforcement bars are passing will be grouted with the grout mentioned on drawings or with concrete 1:2:4 as directed by the EMPLOYER.

4.7.4 Protect adjacent work during cleaning operations. Make good any damages from neglect of this precaution.

4.8 SAMPLES

Samples of all kinds of materials, to be used on the job, shall be submitted to the EMPLOYER and shall be approved by him.



4.9 TESTING

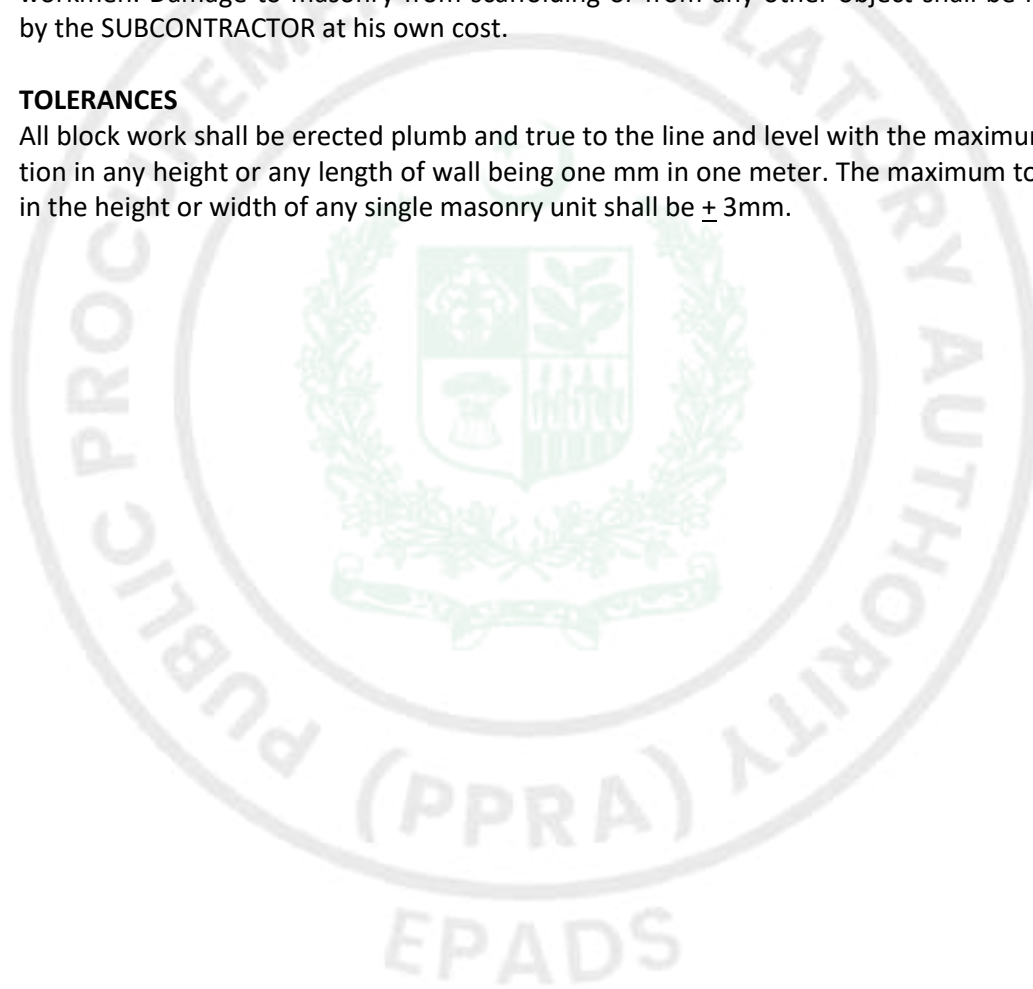
The randomly picked up samples of concrete masonry blocks before coming out of the approved manufacturing facility and before delivering to the construction site shall be tested as per ASTM C 90 as directed by the EMPLOYER. All the materials and completed masonry work shall be subjected to standard testing, and, if found below the given standard Specifications shall be rejected. Rejected material shall be removed from the site immediately. All testing shall be done at SUBCONTRACTOR'S cost.

4.10 SCAFFOLDING

The SUBCONTRACTOR shall provide safe scaffolding of adequate strength for use of workmen at all levels and heights at his own expense. Scaffolding which is unsafe in the opinion of the EMPLOYER shall not be used until it has been strengthened and made safe for use of workmen. Damage to masonry from scaffolding or from any other object shall be repaired by the SUBCONTRACTOR at his own cost.

4.11 TOLERANCES

All block work shall be erected plumb and true to the line and level with the maximum variation in any height or any length of wall being one mm in one meter. The maximum tolerance in the height or width of any single masonry unit shall be $\pm 3\text{mm}$.



5. TILE WORK PORCELAIN / CERAMIC TILES

5.1 Scope of Work

The work covered by this section of the Specifications, consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with the installation of tiles including bases, skirting and wainscots, complete in strict accordance with this section of the Specifications and the applicable drawings and subject to the terms and conditions of the Subcontract Agreement. The scope of this section of Specification is covered with detailed specifications as laid down herein.

5.2 Applicable Standards

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

5.2.1 ASTM (American Society for Testing and Materials)

- C 482 Bond strength of tile to Portland cement.
- C 648 Breaking Strength of Tile.
- C 650 Resistance of tile to Chemical substances.
- C 798 Colour Performency of glazed tile.

5.2.2 BSI (British Standard Institution)

- 1281 Glazed tiles and tile fittings for internal walls.
- 5442 Classification of Adhesives for construction Pt. 1 Adhesives for use.
- 203 Sheet and Tile Flooring.
- 209 Pt-1 Care and Maintenance of Floor Surface.

5.3 Material

5.3.1 Cement

Cement shall be ordinary Portland cement conforming to ASTM C-150.

5.3.2 Sand

Sand shall comply with ASTM C-33 and C-40. Sand shall consist of natural sand, crushed stone sand or crushed gravel sands or a combination of these. They shall be hard, durable, clean and free from adherent coatings.

The sand shall not contain harmful materials such as iron pyrites, salts, coal or other organic impurities or the appearance of the final product or any materials in contact with it. The sand shall be graded in accordance with the following table and the various sizes of particles shall be uniformly distributed.

Sieve Inch/mm	Max. Max.	Percentage Passing By Weight. Min.
0.32"/8 100		100
0.16"/4 85		30
0.08"/2 71		30
0.16"/4 85		30
0.16"/4 85		30
0.16"/4 85		30



Sand less than 0.0008" / 0.02mm shall be limited to 3% by weight. The aggregate 0.012" / 0.3mm shall not exceed 75% by weight.

5.3.3 Coarse Aggregate.

Coarse aggregate shall be crushed or uncrushed gravel or crushed stone consisting of angular or rounded in shape and shall have granular or crystalline or smooth surface free from friable, flaky and laminated pieces, mica and shale. It shall not contain matters injurious to concrete. All coarse aggregate shall conform to ASTM C-33, C-125, C-127, C-128, C131 and C-136 and shall be graded as follows:

<u>B.S. Sieve.</u>	<u>Passing by Weight.</u>
1" (25.40mm)	100
¾" (19.05mm)	90-100
3/8" (25.40mm)	20.55
3/16" (4.765mm)	0.10

The aggregates shall be stores on properly constructed paving or as directed by the EMPLOYER.

There shall be a physical partition between the stock piles of coarse and fine aggregate. If required aggregates shall be washed and screened to the satisfaction of the EMPLOYER. Sieve analysis of all the aggregates to be used in the works shall be carried out as and when required by the EMPLOYER. All aggregate shall be subject to the approval of the EMPLOYER.

Any aggregates not found to be of the specified/approved standard shall be rejected by the EMPLOYER and all such rejected material shall have to be removed from site without delay.

Floors sub-base o base constructed with rejected aggregates shall be dismantled and rebuilt at the expense of the SUBCONTRACTOR.

5.3.4 Water

Water used for mixing concrete, curing or any other operation of the works specified herein shall be fresh, clean and free from organic or inorganic matters in solutions or suspension. Only water of the approved quality shall be used for all construction purposes.

5.3.5 Glazed / Unglazed Tiles.

Glazed tiles shall comply with BS 1281 or the requirements ASTM C609, C648, C650, C798. Tiles shall be of standard grade. Unglazed tiles shall comply with BS 1286.

The tiles shall be free from cracks or crazing, free from twisting and uniform in colour. Tiles shall be obtained to the size and thickness indicated on the drawings.

All tiles shall be in colours selected by the EMPLOYER from the manufacturers range of standard colours in the standard grade of products.

Prior to commencement of work the SUBCONTRACTOR shall submits to the EMPLOYER three samples of each type of tiles of all available colour and patterns for his approval.

Manufacturers published literature containing instructions and recommendations shall also be submitted. The glazed/unglazed tiles shall be laid on cement concrete base of specified grade and the joints filled with neat white or gray cement including vertical and horizontal



covers.

The curing period of the setting bed shall be as directed by the EMPLOYER. As large an area of setting bed shall be spread at one time as can be covered with tiles before the base has set. Surplus base material shall be removed. The thickness of setting bed shall not be less than the thickness specified in the Drawings.

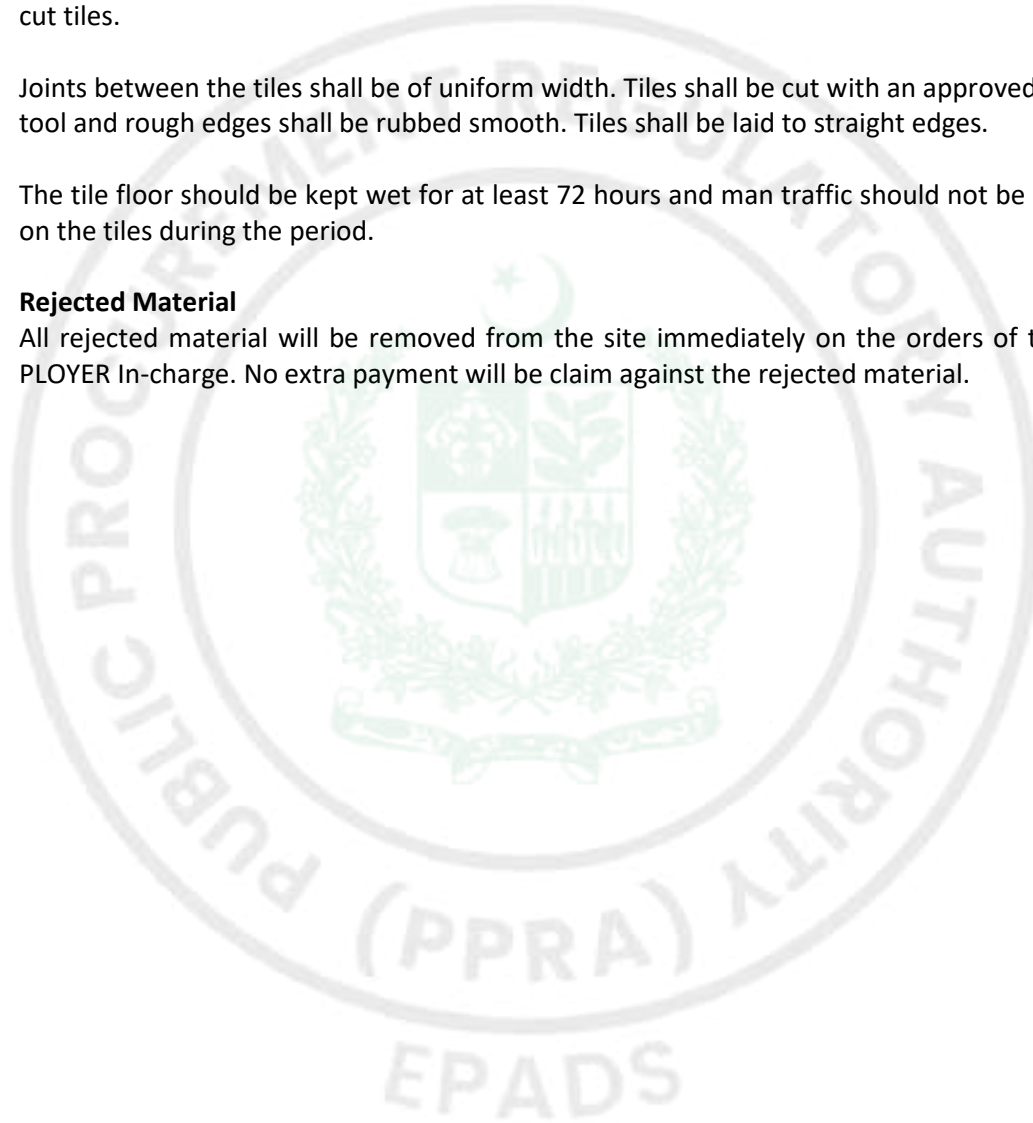
Floor and wall surface to receive the tiles shall be thoroughly cleaned of all dirt, dust oil and other objectionable matters. Tiles shall be laid out from the center line of each space in an outward direction and the pattern should be made symmetrical with a minimum number of cut tiles.

Joints between the tiles shall be of uniform width. Tiles shall be cut with an approved cutting tool and rough edges shall be rubbed smooth. Tiles shall be laid to straight edges.

The tile floor should be kept wet for at least 72 hours and man traffic should not be allowed on the tiles during the period.

5.4 Rejected Material

All rejected material will be removed from the site immediately on the orders of the EMPLOYER In-charge. No extra payment will be claim against the rejected material.



6. SURFACE RENDERING (PLASTERING)

6.1 Scope

This Section covers the work of cement plastering to block work walls and ceilings etc. and cement pointing to exposed block work walls or block work.

Plaster work shall conform to as applicable to work shown on drawings and specified.

6.2 Material

Cement for plaster and concrete works will be ordinary Portland Cement conforming to ASTM C 150.

Sand and water shall comply with requirements of ASTM C 144, C 631, CP 211 and CP 221, ASTM D-596, C-40, C-87, C-109 Clean sand of approved coarse grading available shall be deemed to fulfill the specified requirements.

6.3 Samples

The material used for plastering and pointing shall be got tested by the EMPLOYER at the expense of the SUBCONTRACTOR before giving approval thereof and the same approved type of material shall be used throughout the work. Waterproofing agent of proper standard shall be used where specified in Bill of Quantities.

6.4 Workmanship

The SUBCONTRACTOR shall be responsible to see that plastering shall not commence until all drainage and sanitary pipes, electric conduits, brackets, clamps, window and door frames and all other embedded items of work are fixed in position complete by himself or other SUBCONTRACTOR(s) as the case may be.

Before application of plaster or pointing the block walls shall be properly raked and wetted. Concrete surface shall be roughened by dragging wire brushes while the concrete surface is still raw. All windows and doors fixed shall be covered and protected from damage before plastering.

Plaster work shall be done in conformity with ASTM C 144, C 631, C-40, C-109 and C-87. All tools and the surface to be plastered shall be thoroughly clean and void of all surface impurities and extraneous matter before use and plastering.

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 of cement and sand mixed in the ratio 1:3 with water added to make a stiff creamy mix. The slurry shall be applied with a stiff brush on surface which has been previously well wetted. The surface so treated shall be left to cure for three days. The plastering shall be laid to a true and plumb surface in one plane subject to tolerance specified in the succeeding paragraph hereof and tested frequently with plumb bob and straight edge not less than 10 feet in length. All horizontal lines and surfaces shall be tested with a level and all jambs and corners with a plumb-bob as the work proceeds. All mouldings shall be worked true to template and shall be neat clean, level and parallel or truly plumb as the case may be.

Wherever a thickness of more than 3/4 inch is specified it shall be applied in two coats. In such a case the first coat shall be roughened with wavy lines drawn by wire brushes when wet to provide bond for second (final) coat. The plaster shall be kept wet for 10 days after



completion. Plaster containing cracks, blisters, pits etc. or discolouration will not be accepted. Such plaster shall be removed and replaced with plaster conforming to the specifications and approved by the EMPLOYER. Maximum deviation from a true plane shall be 3 mm or 1/8" as measured from the line of a 10 feet straight edge placed at any location on the surface.

Metal lath/ expanded metal shall be used over junctions of concrete and masonry specified.

Mortar mix (cement sand ratio) for plaster work shall be as specified in the Bill of Quantities.

Measurement of materials by volume shall be by containers of known capacity to maintain consistent proportions specified in the Bill of Quantities. Mixing equipment shall be clean and the mixing shall be continuous until complete and all ingredients are evenly distributed. Plaster ingredients shall be thoroughly mixed either by hand on a clean cement concrete platform or by a mechanical mixer as directed by the EMPLOYER. Only limited water shall be added for proper workability. Only such quantity of mortar shall be mixed and prepared at a time as will be consumed within half an hour of its preparation. Retempering shall not be permitted and all mortar which has begun to stiffen shall be discarded.

For cement pointing the surface shall be raked out before the mortar sets and the surface got approved by the EMPLOYER before start of pointing work. Pointing shall be either deep struck or ruled unless otherwise directed by the EMPLOYER. The mortar shall not be spread irregularly over the edges and corners of the bricks which shall be left clearly visible. The practice of smearing mortar over defects of bricks to hide them shall not be allowed and shall render the whole brickwork liable to be rejected. Pointing work shall also be kept wet for ten days.

After completion of the work of cement pointing and cement plaster, the rubbish, debris etc., shall be removed and the space left clean and tidy. The SUBCONTRACTOR shall protect the finish plaster and pointing work from damage by any source.



7. STEEL / ALUMINUM DOORS, WINDOWS & GLAZING WORKS

7.1 Scope

This section of Works covers providing and fixing of doors, windows, ventilators and shutters as per drawings including erecting and fixing in position, glazing, painting and metal ware fixtures as specified and given in the Bill of Quantities and specifications in accordance with the directions of the EMPLOYER.

7.2 Material

Best quality products available locally as per approved samples conforming to sizes shown on drawings shall be used.

7.3 Samples

All samples of the material used for the work shall be got tested and approved under the directions of the EMPLOYER at the expense of the SUBCONTRACTOR before procurement and the same type of material shall be used throughout the work.

7.4 Steel Doors and Shutters

All sections shall be of hot rolled low carbon steel and shall be solid one piece sections with flanges rolled integrally. Vent and frame sections shall be front to back 1-5/16 inch deep with steel thickness of 3/16". Flanges forming the weathering contacts shall provide not less than 1/4 inch closure. When z-section is used it shall be 1" deep and 1/8" thick except where shown otherwise in the drawings. Corners of frames and vents shall be mitred, solid welded, finished flush and smooth on surface that will remain exposed. In case of composite steel sections welds shall be continuous but staggered in order to avoid warping and twisting of members. Completed members shall be in one length and not more than 1/16 inch from a straight plane in either direction and shall be installed only by skilled mechanics, set plumb, level in alignment and properly braced to prevent distortion. These shall be fixed in position by proper holdfasts as shown on drawings or countersunk bolts and screws as directed by the EMPLOYER. Hinges shall be of steel or malleable iron with non-ferrous bushings or washers. Three hinges for each leaf of the doors and windows and two hinges per ventilator shall be furnished and installed unless otherwise directed by the EMPLOYER. Ten inches long solid bronze or moulded heavy gauge galvanized iron peg stays of approved make and design shall be provided and fixed with corrosion resisting bolts. Approved type locks and other fittings shall be installed as shown on the drawings, Bill of Quantities and specifications.

After installation they shall be protected from construction hazards, cleaned of all mortar, plaster or other foreign matter to present a neat appearance. Hardware and moving parts shall be lubricated. All doors, windows, gates shutters and ventilators shall be glazed and shop painted with one coat of approved paint as specified in respective sections before fixing and the remaining painting as per Bill of Quantities shall be done at site.

7.4.1 G.I Roller Shutters

The SUBCONTRACTOR to supply, deliver and or execute all the items under this section as per applicable ASTM / BS standard and furnish the copy of the same along with the brochure from the manufacturer and a certificate of origin / confirmation of the compatibility of the item from the supplier as applicable complete in all respect as per drawings and to the entire satisfaction of the EMPLOYER.

The brief description of the material is as follows:



G.I. sheet rolling shutters made of 24 gauge with all accessories and fitting encased in G.I. box made of 20 gauge complete with brackets, arrangement for inside and outside locking with operation handles 6" long of 1/2" dia M.S bar, lock plate of size 1.5" x 3/16" and 6" long, cutting holes and making good damages to walls etc. and painting 3 coats of approved enamel paint over a coat of primer, complete in all respect as per drawing.

7.5 Aluminum Doors, Windows, Ventilators, Grill & Wire Gauze Panels

Fabrication and Installation

Aluminum Sections of Pakistan Cables conforming to ASTM D-976, D-648, D-696, E-8 and D-393 shall be of the sizes and gauge as shown on drawings and as approved by the EMPLOYERS.

Aluminum work shall be fabricated and assembled in the shop.

The SUBCONTRACTOR shall be responsible for installation and fitting of members as shown on the drawing.

All holes/voids shall be accurately located. Holes/voids shall be drilled and shall not be made or enlarged by burning either in the fabrication shop or in the field.

All connections, unless otherwise shown on the drawings, shall be made by riveting / screws / welding. The welding shall be executed by duly qualified welders. Full width and depth of the joint shall be welded and grinded smooth if required.

Doors, Windows and ventilators shall be erected in prepared openings in accordance with the relevant drawings/details. They shall be set in plumb and properly aligned and securely anchored.

Silicon Glue or equivalent joint sealant will be applied at the junction of the wall and the windows / ventilators to ensure tightness against water seepage.

Glazing

All glazing shall be provided with best quality 5-mm thick clear glass, fixed with beading. Glazing shall be sand blasted as shown on building elevations.

Wire Gauze Panels

Operable / fixed wire gauze panels shall be manufactured with sections of sizes described in the drawings or in BOQ. Aluminum wire gauze shall be heavy duty netting 18x16 type (18 No. Wire with 16 squares per inch).

7.5.1 Aluminum Decorative Louvers

SUBCONTRACTOR to supply, deliver and or execute all the items under this section as per applicable ASTM / BS standard and furnish the copy of the same along with the brochure from the manufacturer and a certificate of origin / confirmation of the compatibility of the item from the supplier as applicable complete in all respect as per drawings and to the entire satisfaction of the EMPLOYER.

The brief description of the material is as follows: Providing and fixing Aluminum decorative louvers made of Aluminum Hollow sections of size 2" x 2" and 1.5" x 1.5" on external surface, complete upto any height and as per drawing.



7.6 Steel Gate

Structural steel shall confirm to the latest British Standard Specification / ASTM standards in all respects. All finished steel shall be well and clearly rolled to the dimensions, sections and weights as specified or required. It shall be sound and free from cracks, scales, blisters, surface flaws, laminations, cracked edges and defects every sorts.

Joints in plates, angles etc will be made only in such positions as shown on the drawing or as directed by the EMPLOYER. All joints will be cut truly square so as to but properly together.

The whole of the workman ship should be of first class quality throughout and true to dimensions. The riveting bolting or welding as specified should be carried out in a perfect manner. During erection, bending, straining or pounding with sledges should not be allowed.

All holes in girders and column must be drilled. The entire steel work will be executed in the best approved and workman ship like manner according to the directions of the EMPLOYER.

The rate for structural steel work shall be inclusive of hoisting and fixing the same in position.

The steel gate shall be of Crittall or equivalent standard obtained from approved manufacturers. They shall be either hot dip galvanized or zinc oxidized. The steel gate is to be supplied completed with all fitting as per schedule or as directed by the EMPLOYER. The gate shall be set straight plumb and level and the SUBCONTRACTOR shall be responsible for their satisfactory operation after the fixing is complete. Fitting shall be supplied after all plastering is complete or alternate shall be wrapped or protected from damage.

Rate shall be for the net sq.ft area inside to inside of the concrete columns.

7.7 Chequer Plate

Chequer plate makes ideal material where a large area needs to be covered, either it is on the floor or to protect an area of wall, which could be damaged due to movement of goods i.e. pallet trucks in a warehouse environment and the interior of a truck/van.

Features and Application: Chequer plate or checker plate is both slip-resistant and decorative and in sheet thickness from 2mm to 6mm.

7.8 M.S Railings

The SUBCONTRACTOR to supply, deliver and or execute all the items under this section as per applicable ASTM / BS standard and furnish the copy of the same along with the brochure from the manufacturer and a certificate of origin / confirmation of the compatibility of the item from the supplier as applicable complete in all respect as per drawings and to the entire satisfaction of the EMPLOYER.

The brief description of the material is as follows:

3 feet high M.S Hand Railing made of 16 SWG 2", 1.5" & 0.5" dia M.S pipe, 5 mm thick plate and 5/8" dia bolt on Ramps and stairs, Enamel Painted complete as per drawing.

7.9 Cold Storage Door

The SUBCONTRACTOR to supply, deliver and execute all the items under this section as per applicable ASTM / BS standard and furnish the copy of the same along with the brochure from the manufacturer and a certificate of origin / confirmation of the compatibility of the



item from the supplier as applicable complete in all respect as per drawings and to the entire satisfaction of the EMPLOYER.

The brief description of the material is as follows:

Cold Storage Doors made by Pakistan Insulation or equivalent made of 24 gauge sheet with 2" thick polyurethane insulation of density 38 kg / m³.

7.10 Steel Corrugated Sheet

The SUBCONTRACTOR to supply, deliver and or execute all the items under this section as per applicable ASTM / BS standard and furnish the copy of the same, with the brochure from the manufacturer and a certificate of origin / confirmation of the compatibility of the item from the supplier as applicable complete in all respect as per drawings and to the entire satisfaction of the EMPLOYER.

The brief description of the material is as follows:

Steel corrugated sheet roof with all supporting frame as per drawings.

7.11 Car Parking Shade

The SUBCONTRACTOR to supply, deliver and or execute all the items under this section as per applicable ASTM / BS standard and furnish the copy of the same, with the brochure from the manufacturer and a certificate of origin / confirmation of the compatibility of the item from the supplier as applicable complete in all respect as per drawings and to the entire satisfaction of the EMPLOYER.

The brief description of the material is as follows:

Car Parking Shade including Girder W-10x45, Base plate 10"x10"x3/4", Stiffner 8"x2"x1/4",Hollow pipe HSS 6" dia 1/4"thick,Angle 5"x3 1/2"x5/8",G.I corrugated Sheet 22SWG etc.



8. FLOORING

8.1 Scope

This Section of work includes flooring and paving at the places shown on drawings, Bill of Quantities or as directed by the EMPLOYER and consists of furnishing all plain laborou, equipment, appliances, materials and the performance of all operations required in connection with the laying of cement concrete floors.

8.2 Standard

Flooring work shall conform to ACI 301, 304, 305 & 318 as applicable to the work shown on drawings, Bill of Quantities and specified.

8.3 Material

8.3.1 Terrazzo Floor

Marble Chips (No.9, No 8 & No 7) Embedded in White Cement with 3/8" wide marble strips as dividers.

8.3.2 Tiled Floor

Porcelain / Ceramic Tiles as per specifications laid down under section Tile Work.

Cement, sand, aggregate, mild steel bars and water shall be in conformity with the specifications laid down under the Section "Concrete".

6" thick well graded crushed stone aggregate of following gradation.

Size	Gradation
2"	90 – 1001.
5"	35 – 70
1"	15- 25
½"	10 -15
#200	5- 10

8.4 Samples

All the material used shall be approved by the EMPLOYER and same type of material shall be used throughout the work. If there is a desire to get the material tested then it will be got done by the SUBCONTRACTOR at his own expense from a laboratory approved by the EMPLOYER.

8.5 Workmanship

8.5.1 Terrazzo Floor Finishes Details

Method of laying and finishing tile floor shall be as specified under "Tile Work". The floor shall be laid truly level at top in one plane horizontal or sloping as directed by the EMPLOYER and as shown in the drawings and specified for tile work.

8.6 P.C.C with Hardonate

The SUBCONTRACTOR to supply, deliver and or execute all the items under this section as per applicable ASTM / BS standard and furnish the copy of the same along with the brochure from the manufacturer and a certificate of origin / confirmation of the compatibility of the item from the supplier as applicable complete in all respect as per drawings and to the entire satisfaction of the EMPLOYER.



8.7 P.C.C Floor

The SUBCONTRACTOR to supply, deliver and or execute all the items under this section as per applicable ASTM / BS standard and furnish the copy of the same along with the brochure from the manufacturer and a certificate of origin / confirmation of the compatibility of the item from the supplier as applicable complete in all respect as per drawings and to the entire satisfaction of the EMPLOYER.



9. TUFF - PAVERS

9.1 Scope

The work under this section of the specifications consists of furnishing all plant, labor, equipment, all materials and performing all operations such as compaction of made up ground level (MUGL) in conformity with lines, grade, spreading, watering and compaction of sand and laying of Tuff Pavers, curing etc including supply from manufacturer and transportation to the site of works.

9.2 Material

Concrete Pavers: Solid, interlocking paving units, ASTM C 936, made from normal-weight aggregates in sizes and shapes indicated. Color to be by Owner with natural finish.

1. Coarse Aggregate: Clean, hard, unweathered stone crushed into angular particles varying in size up to 3/8 inch (9.5 mm).
2. Filler: Dust produced from limestone or other material as standard with manufacturer.
3. Dimensional Tolerances: Manufacture unit to standard dimensions indicated with deviations in any dimension not exceeding plus or minus 1/16 inch (1.6mm) by Owner with ground tudor finish.

9.3 Accessories

A. Steel Edge Restraints: Painted commercial steel edging with loops pressed from or welded to face of sections at 36 inches (900 mm) o.c. to receive stakes, and steel stakes 15 inches (380 mm) long for each loop. Size of edging as follows:

1. 3/16 inch (4.8 mm) thick by 4 inches (100 mm) high.
2. 1/4 inch (6.4 mm) thick by 5 inches (125 mm) high.

Concrete for Job-Built Edge Restraints: Comply with requirements of Section-2 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with minimum 28-day compressive strength of 3000 psi (20 MPa).

E. Joint Filler Materials: Portland cement, ASTM C 150, Type I; and sand, ASTM C 144.

9.4 Execution

Examine surfaces indicated to receive paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit pavers. Do not proceed with installation until unsatisfactory conditions have been corrected.

9.5 Preparation

Clean surface free of dirt, dust, debris, and loose particles.

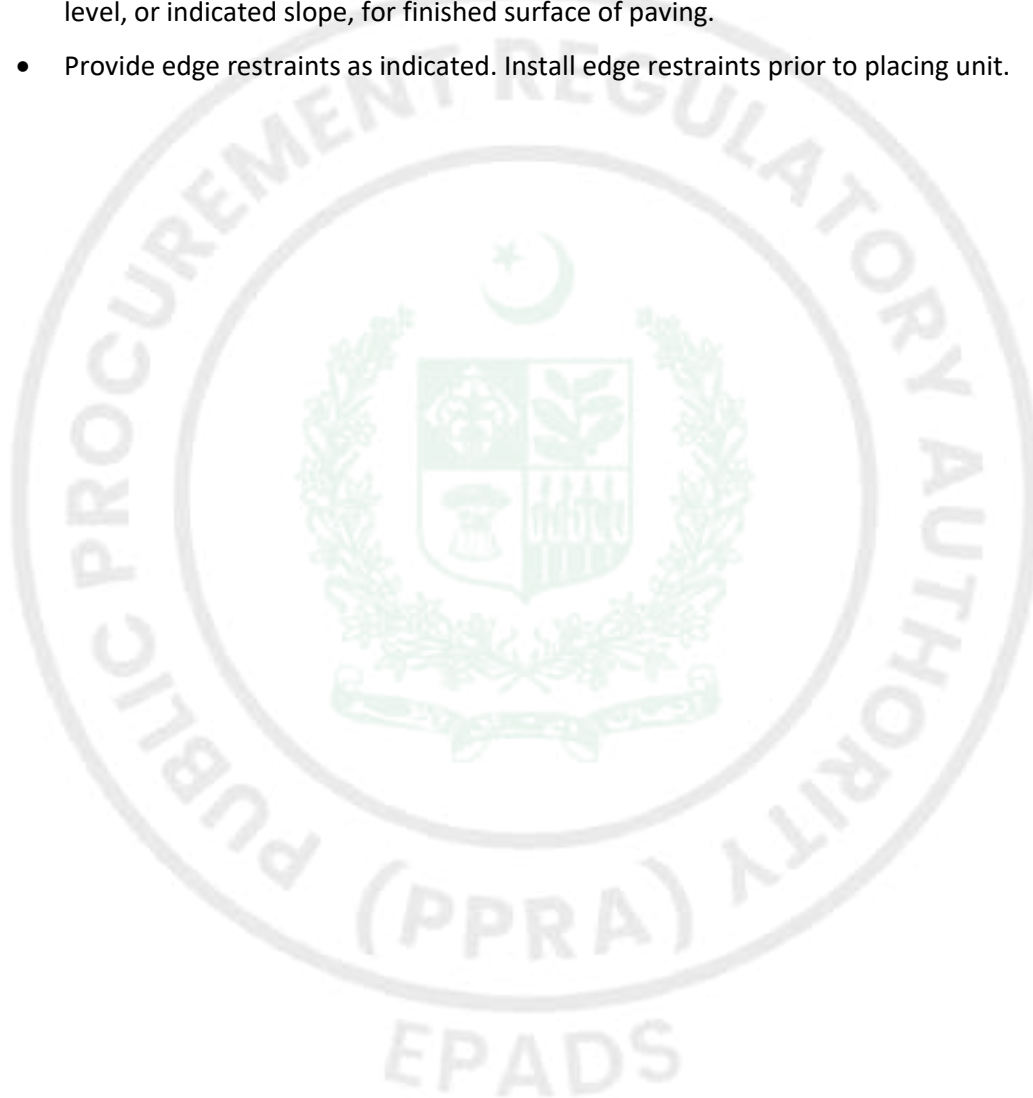
9.6 Installation General

Do not use unit pavers with chips, cracks, voids, discolorations, and other defects which are visible to the eye 6 feet away from the surface or could cause staining in finished work. Mix pavers from several pallets or cubes as they are placed to produce uniform blend of colors and textures. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable. Cut pavers are to be no smaller than 3 inches in any dimension where field cutting would result in



pavers below these minimum sizes, use larger pavers adjacent to fill space.

- Joint Pattern: Match field-constructed mockup.
- Joint Pattern: As indicated on drawings.
- Tolerances: Do not exceed 1/32-inch (0.8mm) unit-to-unit offset from flush (lippage) nor 1/8 inch in 10 feet (3 mm in 3 m) from level, or indicated slope, for finished surface of paving.
- Tolerances: Do not exceed 1/16-inch (1.5-mm) unit-to-unit offset from flush (lippage) nor 1/8 inch in 24 inches (3 mm in 600 mm) and 1/4 inch in 10 feet (6 mm in 3 m) from level, or indicated slope, for finished surface of paving.
- Provide edge restraints as indicated. Install edge restraints prior to placing unit.



10. WOOD WORK AND GLAZING

10.1 Scope

The work under this section consists of providing wooden doors as per schedule for doors shown on the Drawings. There will be two types of doors to be fixed at various locations as indicated in the Drawings.

- a) Deodar Wood Paneled Doors.
- b) Deodar Wood solid core flush doors with commercial ply on both faces.

The leaves for the above mentioned types shall be factory made.

10.2 Specifications

Except as otherwise specified, carpentry and joinery shall be manufactured from seasoned Deodar wood as per drawings.

10.3 Materials and Workmanship

All joinery to be of well seasoned selected deodar wood except where hardwood is specifically shown on the drawings, which shall be selected Burma teak wood fully seasoned unless otherwise specified. All the timber to be selected shall be of the best quality free from faults, shakes, waves, large, loose or dead knots, and all other defects. It should be well conditioned and bright, cut regular, have square edges and be straight. It is to be approved by the EMPLOYER.

- 10.3.1 All wrought joinery to be finished with a clean, even and smooth surface, and sand-papered ready for polishing/ painting work. All framings are to be properly mitred at the corners and joints are to be tennoned in the best approved manner. Members shall be of one piece unless otherwise indicated.
- 10.3.2 Protect all work with rough wood casings where necessary, remove casings on completion of work and make good all fixed joinery work damaged accidentally or otherwise during the course of the construction operations.
- 10.3.3 Coat with Solignum or other approved preservative the backs of all wood work or those portions which are built in.
- 10.3.4 All joinery to be painted is to receive approved priming coat before fixing. Knot and stop before priming is well smoothened with sand paper where necessary.
- 10.3.5 Should any of the joiner's work shrink, warp, or deform within 12 months of the final completion of the Subcontract Agreement, and should it, therefore, be condemned by the EMPLOYER the same as well as any work affected by it will be removed and reinstated by the SUBCONTRACTOR at his own cost.
- 10.3.6 The various items of iron mongery (rough and finish hardens) shall be as scheduled or other equally approved and shall be of the best quality and in accordance with the approved samples required to be submitted by the SUBCONTRACTOR to the EMPLOYER.

10.4 Door Frames



10.4.1 Door frames shall conform to the applicable requirements of B.S. 1567. All door frames shall be built into place as work proceeds and shall be fixed in the place by means of G.I. flat holdfasts placed as shown on the drawings, and not vertically apart more than 3'-6". The holdfasts shall be firmly bedded in cement (1:4) mortar. Where necessary, top chowkat members shall also be provided with G.I. holdfasts to prevent sag.

10.4.2 The doors are to be made in full accordance with the Drawings, all frames being truly jointed.

10.5 Door Leaves

10.5.1 Doors will be manufactured, from seasoned Deodar wood and approved commercial ply as per drawings and as directed by the EMPLOYER.

10.6 Glazing

10.6.1 The work of providing and fixing doors, windows, etc, shall be carried out with the type and quality of glass specified and indicated in the drawings or Bill of Quantities.

10.6.2 Glass shall be of quality and thickness specified in the pay items in the Bill of Quantities.

10.6.3 Putty/ shall be an elastic glazing compound suitable for interior and exterior glazing and shall conform to the requirements of B.S.S 544 "Linseed oil putty for use in wooden frames". The putty for metal frames shall be of a type specially prepared for use with metal frames conforming to the applicable requirements of the British Standard or of a make approved by the EMPLOYER.

10.6.4 Glass shall be protected against damage. After inspection, any label, paint spots shall be removed from the glass and glass shall be washed clean. Damaged or broken glass shall be removed and replaced at no additional cost to the EMPLOYER.

10.7 Painting & Polishing

All wooden doors, shall be painted or polished as specified in the Bill of Quantities. The Specifications for Painting and Polishing etc. are given under sub-Section 12 - "Painting and Polishing".

10.8 Kitchen Cabinet

The SUBCONTRACTOR to supply, deliver and or execute all the items under this section as per applicable ASTM / BS standard and furnish the copy of the same along with the brochure from the manufacturer and a certificate of origin / confirmation of the compatibility of the item from the supplier as applicable complete in all respect as per drawings and to the entire satisfaction of the EMPLOYER.

The brief description of the material is as follows:

Kitchen cabinet of approved design comprising 19mm thick formica laminated Lasani board (MDF), deodar wood framing & lipping, approved hardware including polishing to wooden surfaces etc.



11. WATER PROOFING & ROOF PROTECTION

11.1 Scope

The work under Section consist of laying water-proofing treatment of roofs, under floors, and retaining walls of R.C. structures as shown and described on the Drawings and Bill of Quantities and Rates.

The work of providing roof protection is also included in the Scope of this Section. This shall comprise the following:

- 11.1.1 Two coats of bituflex as specified in this Section.
- 11.1.2 Layer of 400 microns polythene sheet.
- 11.1.3 2" thick Jumbo Lon (Polystyrene) Board.
- 11.1.4 A layer of polyethene sheet 400 micron.
- 11.1.5 2" thick 1:2:4 RCC screed reinforced with 1/8" dia wire mesh of size 5"x5".
- 11.1.6 1" thick 1:3 cement sand mortar.
- 11.1.7 Brick tiles as shown on drawings.

11.2 Materials

The following shall be the applicable specifications for material to be used on various items of work in this Section:

- 11.2.1 Bituflex
- 11.2.2 Polythene Sheet: shall be smooth, stout and shall possess thorough water proofing qualities. It shall weigh minimum 80 grams per square meter.
- 11.2.3 Jumbolon Board (Polystyrene) shall be of density 32 Kg per cubic meter and according to specification of approved manufacturer.
- 11.2.4 2" thick RCC screed as per drawings. Cement and Sand and Aggregates and wire mesh shall conform to the specifications laid down for these items in "Concrete" attached with these Documents.
- 11.2.5 1" thick 1:3 cement sand mortar.
- 11.2.6 Terracota Tiles: shall conform to the specification for the first class brick and tiles and as described in part of Technical Specifications attached with these documents.

11.3 Roof Treatment

- 11.3.1 Preparation of Surface: Surfaces to receive water proofing shall be clean and dry. All holes, joints and cracks shall be pointed flush with mortar and high spots shall be cut off or ground smooth. Before water-proofing is applied, the surfaces to be covered shall be carefully swept to remove all dust and foreign matter, and shall be inspected and approved. Ap



proved bitumen primer in accordance with the manufacturer's recommendations shall be applied over the surface at the rate of 0.5 litre per m² and allowed to dry; it is essential that this coating is free of volatiles before the first layer of bitumen coating is applied.

- 11.3.2** Bituflex Coating: Two coats of bituflex shall be applied with an interval of 24 hours between the coats, at the rate of 20 lbs./100 sft. for 1st coat and 20 lbs. for second coat. Every care should be taken that no patch, spot, bubble is left uncoated. This application is for horizontal surfaces on vertical surfaces one coat of shall be applied at the rate of 20 lbs./100 sft bituflex.
- 11.3.3** Application of Polythene Sheet: The samples of the polythene sheet shall first be got approved from the EMPLOYER before incorporating in the Works. Polythene sheets shall be spread over the surfaces which have been treated with bitumen. There shall be an overlap of at least 6 inches when the sheets are spread both in horizontal and vertical surfaces.
- 11.3.4** Jumbolon board of 2" thickness and 32 Kg/m³ density will be fixed will glue recommended / provided by the manufacturer.
- 11.3.5** Screed 2" thick RCC screed reinforced with 1/8" dia wire mesh of size 5"x5".will be laid on polythene sheet covering the jumbolon board.
- 11.3.6** Brick Tiles: The burnt brick tiles of specified size and first class quality shall be laid wet, grouted in cement mortar 1:3. The top surface shall be smooth and accurately level in accordance with the specified slope. No broken or cracked tiles shall be used.

The surface of tiles shall be cleaned and rubbed off from any extra cement mortar and shall give their original colour.

11.3.7 Curing & Protection

- a. Tiles, after laying and grouting is completed, shall be kept wet throughout for at least seven days.
- b. The SUBCONTRACTOR shall take each and every care to maintain the slopes, levels and shall protect the work from any damage during the construction and Defects Liability period. The SUBCONTRACTOR shall have to remove, replace and rectify such damaged work at his cost and risk.

11.3.8 Measurement & Payment

- c. The measurement shall be made in per square foot or sq. metre by measuring length and breadth of actual work done at Site and approved by the EMPLOYER.
- d. The payment shall be made in square feet or square metre of the actual work done as measured above at the corresponding Subcontract Agreement unit rate item of BOQ. The rate includes for all materials, labor, tools and plant for the complete work as specified above.

11.4 Water Proofing (Horizontal Surfaces)

- 11.4.1** Placing of horizontal damp proof course. 2" thick or any other thickness as specified of cement concrete (1:2:4) over as specified on drawings.
- 11.4.2** Two uniform mopping coast of bituflex shall be applied @ 20 Lb/100 Sft. Over 4" thick lean concrete of foundation (as shown on drawings) including a top protective layer of Polyethylene sheet 500 gauge thick, unless it is already integral part of membrane, with 6" (150



mm) side laps and 8" (200 mm) end laps staggered with layers bounded together with asphalt. The surface shall be boomed to ensure that it is free of wrinkles.

- 11.4.3** The cement, coarse aggregate and sand (fine aggregate) shall conform to specifications as defined under Section 2 "Cement Concrete". The bitumen shall be bitulfex or its equivalent as approved by the EMPLOYER.
- 11.4.4** The cement concrete shall be placed compacted and cured as specified in Section 2. The laid concrete shall be protected against sun, rain and frost when fresh.
- 11.4.5** Measurement shall be made for the actual area of floor in square feet. Payment for floor water proofing shall be made at the unit rate per square foot stated in the Bill of Quantities. Such payment shall constitute full compensation for furnishing all materials, equipment and labor, including all incidentals necessary to complete the work according to this specification and the directions of the EMPLOYER.
- 11.5 Water Proofing (Vertical faces)**
- 11.5.1** Cement plaster (1:3) 3/4" thick shall be applied on the surfaces as specified on drawings. After drying of plaster, apply one coat of specified primer, two coat of bituflex at the rate of 20 lbs. per 100 Sft.
- 11.5.2** The method of measurement and payment shall be similar to that specified under clause 11.4.5 above.



12. PAINTING DISTEMPERING WHITE WASHING & POLISHING

12.1 Scope The Specifications of this section covers the following items:

- a) Painting of exposed concrete surface.
- b) Painting and polishing of wood work etc.
- c) Polishing of marble and terrazo work.
- d) Painting, Distempering and white washing interior surface

12.2 Specifications

- 12.2.1 Except as otherwise specified, all painting and distempering shall be applied in conformity with C.P. 231 'Painting' as applicable to the work.
- 12.2.2 Polishing of marble and terrazo works shall be carried out in accordance with standard practice for these trades.
- 12.2.3 Wax and french polishing of teakwood, deodar wood shall be carried out by expert craftsmen of these trades.
- 12.2.4 The colour and surfaces finish required for various materials shall be as approved by the EMPLOYER.

12.3 Materials

- 12.3.1 The material shall be brought to Site in original unbroken packages bearing the Maker's Name and brand. Materials shall conform to the applicable British Standard Specifications and shall be used in accordance with the Manufacturer's printed directions.
- 12.3.2 Paint for Steel Work: Shall be of high grade rust- proof lead based products of reputable manufacturers.
- 12.3.3 Paint for Wood Work: Shall be of high grade enameled products of approved manufacturers.
- 12.3.4 Cement Based Paint: shall be obtained in sealed tins from approved manufacturers. It shall be delivered at the work Site in original and sealed packages bearing the Maker's Name etc.
- 12.3.5 Wax Polish: shall be Mansion wax polish or equal brand approved by the EMPLOYER.
- 12.3.6 Spirit Polish: shall have shellac of approved quality.
- 12.3.7 Distemper: Shall be synthetic paste distemper or oil bound distemper obtained from approved Manufacturer as specified in the Bill of Quantities.
- 12.3.8 White Washing Material will be water bound comprising of dehydrated lime, approved quality glue, zinc powder and neel (Blue Pigment) etc. The solution will be prepared and applied as per suppliers / manufacturer's instructions.

Sample of the paints, distemper, and white washing material etc. to be used for the work shall be approved by the EMPLOYER and the same type of paints, distemper, and white washing material shall be used throughout the work.



12.4 Workmanship

Preparation of Surface

- 12.4.1** All surfaces shall be clean, dry and free from dust at the time any coating is applied. Base coats applied shall be in good condition and surface well covered by touching up base or abraded spots. Base coats shall be rubbed smooth.
- 12.4.2** Wood work shall be smooth and free from raised grain or other surface imperfections. Knots and pitch streaks shall be shellacked before polishing. Nail holes, cracks and similar blemishes shall be neatly puttied and sanded smooth after priming and before body or finish coats are applied.
- 12.4.3** Concrete surface shall be cleaned until free of all loose and foreign material and excess mortar, using metal scrapers and wire brushes if necessary. Grease and oil spots shall be removed by suitable cleaning compound and then rinsed with clean water to remove all traces of alkali. Efflorescence (alkali salts) shall be removed by washing with a 5 to 10 percent solution of muriatic acid, allowed to remain until effervescing ceases, then rinsing with clean water to remove all traces of acid. Interior concrete surfaces shall be washed with zinc sulphate solution. Treated surface shall be allowed to dry thoroughly before any paint is applied.
- 12.4.4** Plaster work shall dry for a minimum of 60 (sixty) days prior to distempering or applying any cement based paint. Surfaces shall be clean and free from grit, loose plaster and surface irregularities before distemper or cement based paint is applied.
- 12.4.5** Ferrous surfaces that have not been shop coated shall be cleaned and painted with protective paint conforming to British Standard Specifications B.S. 2521/4 and CP 231 followed by finish coats. Shop-coated metal shall be protected from corrosion before and after installation by treating corroded areas immediately upon detection.

12.5 Cement Based Painting On Plastered Surfaces – Grafito Paint Etc.

- 12.5.1** It is an acrylic based textured wall coating. To be applied on finished plaster surfaces. The coating should be resistant to a scale of 7 out of 8 on the blue scale. After first application it needs to be left untouched for minimum four hours and would completely dry off in 72 hours to get actual finish product. The ambient temperature for application should be within the average temperature range of 5 degree centigrade to 50 degree centigrade. The SUB-CONTRACTOR has to produce finished surface to satisfaction of the EMPLOYER he shall apply more coats till a uniform smooth surface is obtained at no additional expense to the EMPLOYER.
- 12.5.2** No further material shall be added to the cement based paint obtained in sealed tins. Where different colours may have to be mixed together to provide the desired shade, the quantities of the various colours required to give the desired shade shall be intimated by the EMPLOYER and this shall be mixed together by weighing (not by measuring volumes of different colours). The weighed quantities of cement based paint should be mixed as well as possible by means of trowel on a clean mixing board after which it must be sieved through 200 mesh sieve. This preparation i.e. mixing with trowel and sieving may have to be repeated two or more times until, when a trowel is passed over the surface of mixed cement based paint of various colours, no signs of streakiness or any trace of separate colour remains.



12.5.3 Cement based paint must be mixed in two stages, First by adding a little quantity of water to form a paste and the further quantity of water being added to get a mix of workable consistency. In the first stage, one measure of water to two similar measures of cement based paint must be thoroughly stirred and allowed to stand for 10 minutes. A further measures of water should then be added and thoroughly mixed. This mix must be applied with one hour of the mixing, the lid of the container must be tightly replaced immediately after the material has been taken out from it. Immediately before the first coat is applied the surface shall be thoroughly saturated with water. The cement based paint should be applied with brushes. The first coat of cement based paint shall be well scrubbed and allowed to set for a period of 24 hours after which period the next coat shall be applied. The number of coats shall be specified in schedule of Quantities but if the SUBCONTRACTOR has not produced finished surface to satisfaction of the EMPLOYER he shall apply more coats till a uniform smooth surface is obtained at no additional expense to the EMPLOYER.

12.6 Painting of Wood Work and Metal Surfaces

12.6.1 Paint and finishing materials shall be free from skins, lumps or any foreign matter when used. Pigments and fillers shall be kept well stirred while being applied. Work that is not to be finished under this section shall be protected against spatters, stains or soiling and each type of finish shall be protected against similar defacement by other finishes and shall be left clean.

12.6.2 Each coat of paint shall be protected against similar defacement by other finish and shall be left clean.

12.6.3 Each coat of paint shall be evenly worked out and allowed to become dry before any subsequent coat is applied or rubbing done and shall be of different tint from that of preceding coat.

12.7 Polishing Of Marble & Terrazzo Works

12.7.1 The polishing of marble and terrazzo work shall be carried out, when the final surface finish of these items of work have been approved and accepted by the EMPLOYER.

12.7.2 The surfaces before application of wax or polish shall be washed with hot water and soft soap, and allowed to dry for receiving final treatment. The polished surfaces shall be kept clean and protected from dust and stains till.

12.8 Weather shield Paint

12.8.1 Surface preparation

To get the best results with Weather shield Paint, make sure that the surfaces to be painted are sound, clean and dry (new surfaces particularly must be fully dry), Remove any loose or flaking paint. Areas affected by mould, lichen, algae or moss should be treated with a suitable fungicidal wash. Any surface defects should be filled with the appropriate product. If the surface is still powdery after thorough preparation, seal it with a coat of Weather shield Stabilizing Primer, but do not seal sound, new or bare surfaces.

12.8.2 How to use

Do not stir -This paint is ready to use. Thinning is only necessary when sealing new or bare surfaces, in which case add up to 1 part water to 5 parts Weather shield Smooth Masonry



paint. 2 full coats of Weather shield Smooth Masonry paint are normally required. However, on previously painted surfaces in good condition, where similar colors are used, 1 coat may be sufficient. The coverage of Weather shield y paint will vary according to the surface that is to be painted. An approximate guide is 13-15m²/liter on smooth surfaces such as rendering and 4-6m²/liter on rough surfaces e.g. pebble-dash. It is always a good idea to apply a small test area first.

12.8.3 Matt Enamel Paint

Enamel paint can be oil-, alkyd-based. It is a thicker paint that can be low-luster, semi gloss and high-gloss. It is important to prepare and clean the surface well before painting the area with primer. You can use paint brushes, or rollers to paint with enamel.

12.8.4 Instructions

Paintbrushes with nylon or synthetic bristles Roller Paint tray. Dip the end of a small brush into the paint can. Wipe off excess paint on the rim of the can to be sure it drips back into the container. Paint the outer edges of the painting project with the small brush. To paint the outer edges of a wall, or outline a window, for example, is called "cutting in."

Dip the largest brush you can use for the project in the paint. Wipe excess back into container. Use long vertical strokes, controlling the brush with your wrist, to paint a thin coat of the enamel over the project surface.

Paint the entire project with at least two coats of enamel. Thin paint layers make a smoother, more professional-looking surface.

12.8.5 Paint Rollers

Pour paint into the well of the tray at a depth nearly equal to the height of the roller. Roll the roller into the paint and draw it back up, removing as much excess as possible. Place the roller against the surface and start at the highest point of the wall or project. Pull down in a smooth sweep, filling in the space with paint.

Move the roller back up, at an angle and to your right, and smooth out the paint. Roll down again and back up as though you were forming a W shape. Continue to paint and fill in the wall or project with smooth, sweeping strokes. Refill the roller as needed, remembering to wipe away the excess paint each time.

12.9 Distempering To Cement Surfaces

Before work of distempering is commenced the plaster surface must be cleaned, and a priming coat consisting of primer to which a little distemper has been added and which should be applied hot. Distemper shall be applied quickly and boldly with large flat brushes of approved make. The brush is to be dipped and stroked cross wise on the surface and then immediately stroked up and down. This process shall be considered to form one coat of distemper. The distemper shall be mixed in the manner specified by the makers and each coat shall be inspected and passed by the EMPLOYER. Before the coat is applied, the finished surface shall be carefully stripped to remove any brush marks. The SUBCONTRACTOR shall carry out as many coats as are specified in the Bill of Quantities in accordance with the above specifications. The number of coats specified should be enough for producing a uniform smooth finish and if the finish, produced by the SUBCONTRACTOR is not upto the requirements he will be required to apply as many more coats as may be required to produce the required uniform finish, and no payment for the extra coats applied to produce the desired uniformity will be made.

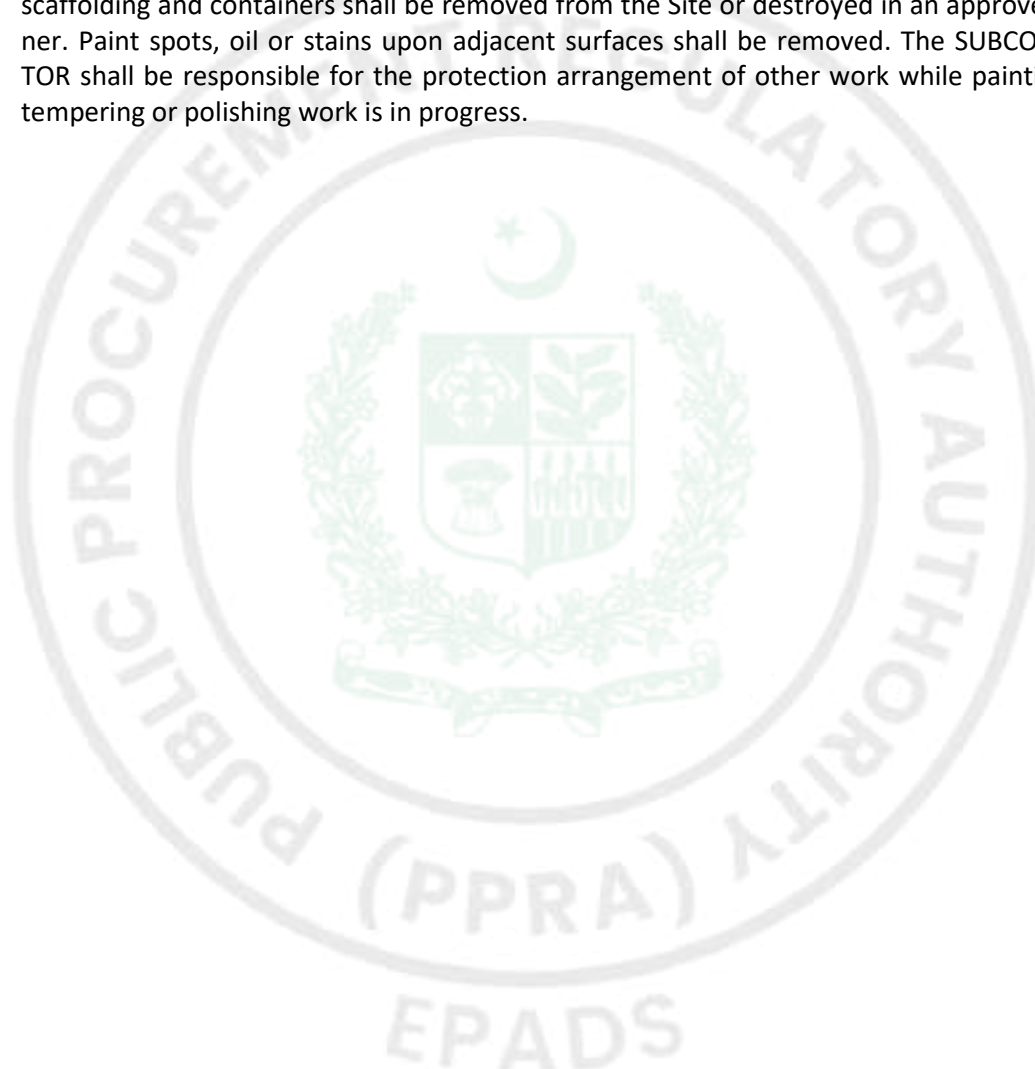


12.10 White Washing

The unslaked lime shall be placed in a large vessel full of water and shall be thoroughly mixed and stirred up with pole or rod until the mixture attains the consistency of thin cream. It will then be strained through a clean and coarse cloth and two chattacks of gum boiled with one cubic foot of lime. The whitewash then shall be applied in the same manner as distemper. When completed the wash shall not crack or come off on finger when rubbed.

12.11 Cleaning

All cloths and cotton waste that might constitute a fire hazard shall be placed in closed metal containers or destroyed at the end of each day. Upon completion of the work, all staging, scaffolding and containers shall be removed from the Site or destroyed in an approved manner. Paint spots, oil or stains upon adjacent surfaces shall be removed. The SUBCONTRACTOR shall be responsible for the protection arrangement of other work while painting, distemping or polishing work is in progress.



13. PUBLIC HEALTH WORKS INTERNAL & EXTERNAL FOR BUILDINGS

13.1 SCOPE

The work under this section comprises mainly of the following items of work:

- 13.1.1** Supply and installation of water supply pipelines and fittings or as indicated in the Bill of Quantities.
- 13.1.2** Supply and installation of soil and drainage pipes/ open channel storm drains and special fittings or as indicated in the Bill of Quantities.
- 13.1.3** Construction of R.C.C. underground/ on ground tank for storage of water.
- 13.1.4** Supply and installation of Fiber Glass water tanks as per drawings.
- 13.1.5** Construction of manholes, sewerage system and its connection to the main Drainage Systems.

13.2 PRELIMINARY

- 13.2.1** The materials used in jointing and installing and workmanship applied in works shall be of the highest quality and grade and conform to specifications given hereunder and details laid out in the drawings, and the Bill of Quantities as per directions of the EMPLOYER.
- 13.2.2** Because of small scale of the drawings, it is not possible to indicate all offsets, fittings and accessories that may be required. The SUBCONTRACTOR shall carefully investigate the structural and finish conditions affecting all the work and shall arrange such work accordingly.

13.3 MATERIALS

- 13.3.1** Chromium plated sanitary fittings such as bib cocks, taps, mixing valves, stopcocks, showers, towel rails, paper holders, traps, mirrors, and glass shelves etc. manufactured by sonex, master or equivalent shall be heavy duty, chromium plated, made of approved type and make and to be purchased by the SUBCONTRACTOR after getting approval of the EMPLOYER.
- 13.3.2** uPVC Soil Pipes and Specials shall be provided by the SUBCONTRACTOR. The pipes shall comply with BS-3505, ISO 3633 and PS 3214. Fitting and specials including solvent cement and rubber ring socket joint will also conform to ISO 3633.

uPVC Soil Pipes within the building shall be Class-“B” type while the uPVC pipe for infrastructure (between manhole to manhole) shall be Class-E type.

- 13.3.3** Polypropylene Random (PPRC) pipes shall be used for water supply. The pipes shall conform to DIN 8077 – 8079 PN-20 and fittings to DIN 16925 PN-25 for internal water supply and from water tank to internal water supply connections. For external water supply, PE (T-flex) conforming to ISO 4427, DIN 8079 - 8075 and PS-3580 from pump to water tank shall be provided.



13.4 SEWAGE/SANITARY PIPES

13.4.1 Jointing & Packing Materials

As already discussed, u-PVC Pipes shall be provided for sewage/sanitary pipes as shown on drawings. Jointing of uPVC pipe will be done by any one of the following methods.

- a. Solvent cement jointing.
- b. Rubber ring push fit jointing.

13.4.1-1 Solvent Cement Jointing

For jointing pipes to pipe or pipe to fitting with solvent cement, both the parts will be cleaned and it will be ensured that surfaces are dry, chamfer the pipe, apply solvent cement using a paint brush on the surfaces to be joined, then insert the spigot end fully into the socket / fitting 24 hrs will be given for setting of solvent cement prior to commissioning.

13.4.1-2 Solvent Cement Jointing

Clean the pipes spigot end from out side and the sealing groove of the fitting from inside, insert rubber ring into the socket end of the pipe / fitting, apply the lubricant to the spigot end and the sealing ring and push the spigot end into the socket containing sealing ring until / fully home.

13.4.2 General Terms/Definitions

Pipe Sleeves: For passage of pipe through Masonry or R.C.C. walls and floor slabs shall be of black steel as specified. Diameter of pipe sleeve shall be half inch bigger than the outside diameter of the pipe of which it is used.

Reinforced Concrete Pipes: These shall be of 'B' Class as per section 14.8 of "Specifications for Material of Construction", Part-I, Vol: 1, Government of West Pakistan (1964). These shall be cast spun and shall have longitudinal and hoop steel and cores thickness in strict conformity with the Tables T1 & T2 of above specifications. The inside surface shall be perfectly smooth and acid resisting and completely hardened before these are used. It will be at the option of the SUBCONTRACTOR to use spigot and socket or collar type of pipes. The collars shall also be as specified in the above mentioned standards.

Gully Traps & Pipes: Shall be of best and approved quality and the water seal shall not be less than 2.1/2" deep.

uPVC Clean Out: Clean out shall conform to ISO 3633, ISO 4633, PS 3214, PS 1915 and BS 3505.

Manhole Frame, Cover, Gully Traps & Gratings: Manhole frame, cover and gratings shall be casted from mixture of cast iron scrap and a suitable grade of Pig Iron, and resultant metal shall be of strong grey structure, free from chips, air bubbles and sand holes and shall be smooth and even both inside and outside.

Manhole Step Irons: These shall be of solid round section and the tails flattened.

uPVC SWC Nikasi pipes and fittings: These shall be conforming to ISO 3633 and PS 3214 and PS 1915.

Pipe Fittings: Fittings, Specials, Sockets, Elbows, Tees Unions etc. shall also conform to ISO 3633, ISO 4633 and PS 1915.



Valves: Wheel valve or gate valves shall conform to B.S.S 3464 "Cast Iron gate valves for general purposes" and to B.S.S 1952 "Copper alloy gate valves for general purposes" as applicable.

Hangers, Supports, Anchors & Sleeves: For fixing pipes to wall and ceiling shall be of approved design to be manufactured by the SUBCONTRACTOR consistent with good contracting practice and shall be painted Bitumastic enamel paint or the paint of the same quality as for the pipes supported by these hangers supports or anchors/ sleeves or any approved rustproof paint.

Civil Works: Materials for civil works such as brick work, concrete work, cement mortar and steel reinforcement to be used for the construction of manholes, sewer pipelines and underground tanks etc. shall be of the quality and grade as laid down under various sections of Building Works attached with these Specifications.

13.4.3 Samples and Tests Samples for all the items under this section shall be provided and approved by the EMPLOYER and the same type of materials will be used throughout the work in progress. If the EMPLOYER desires to get the material tested, this will be got done by the SUBCONTRACTOR from a Laboratory approved by the EMPLOYER.

13.4.4 Workmanship

13.4.4-1 General: The SUBCONTRACTOR shall employ properly licensed, trained and skilled workmen for carrying out the various items of work under this section. The quality of workmanship shall conform to the ISO 3633, ISO 4633, PS 3214 and PS 1915 for the respective trades. The SUBCONTRACTOR shall make adequate arrangements to carry out these items of work pertaining to services simultaneously with the civil works as far as practicable.

13.4.4-2 Trenching: The work of excavating and backfilling of trenches shall be carried out generally in accordance with specifications set forth in section for "Excavations".

13.4.4-3 Testing: There may be certain portions of piping, sewer lines which have to pass through brick work and PCC Structure or under the floors of the building and such portions are to be partially tested as prescribed before covering up. These tests shall be carried out in the presence of the EMPLOYER and such portions or lengths shall be properly sealed or covered so as to protect against blockage and damage during the construction operation.

13.4.5 Installation of Soil Waste, Vent Pipes and other fixtures

13.4.5-1 Examination of uPVC Pipes: Each pipe shall be carefully examined before being laid and defective or damaged pipes shall not be used. All pipes and fittings will conform to ISO 3633, ISO 4633, PS 3214, PS 1915 and BS 3505.

13.4.5-2 Preparation of Pipes: The pipes, before being laid shall be brushed throughout to remove any soil etc that may have accumulated therein, the inside of the sockets and outside of spigots being carefully cleaned.

13.4.5-3 Laying of Soil, Waste, and Vent & Anti-Syphonic pipes: The pipes shall run exposed or embedded in walls and floors as specified or shown on drawings. Where embedding in walls or floors is required, the necessary instructions and route of pipe work shall be approved by the



EMPLOYER. Pipes running exposed on walls and ceiling shall be properly clamped with hangers, supports and clamps. For passage of pipes through masonry wall and R.C.C. beams, slab and walls, sleeves shall be embedded and properly caulked and water-proof. Horizontal soil and waste pipes shall be given a grade of 1/4 inch per ft and 1/8 inch per ft. respectively.

- 13.4.5-4** Changes in pipe size on soil, waste and drain lines shall be made with reducing fittings or recessed reducers. All changes in direction shall be made by the appropriate use of 45 degree Y's long or short sweep 1/4, 1/6, 1/8 or 1/16 bends or by a combination of these or equivalent fittings except as indicated in these specifications. Single and double sanitary tees and quarter bends may be used in drainage lines only where the direction of flow is from horizontal to vertical. Short sweeps not less than 3" in diameter may be used where the change of direction of flow is either from horizontal to vertical or from vertical to horizontal and may be used for making necessary offsets between the ceiling and the next floor above. The use of short sweep bends or fittings, where deemed necessary because of installation conditions shall be subject to the approval of the EMPLOYER.
- 13.4.5-5** The SUBCONTRACTOR shall provide off-sets in the piping where required or directed by the EMPLOYER to avoid interference with other work, or to increase the headroom under piping, or to improve the appearance of the pipework. Piping shall be installed in such a manner that the use of fittings or off-sets, as may be indicated on the drawings or as required, will permit freedom of movement during expansion and construction without causing the pipes to be warped.
- 13.4.5-6** All piping shall be installed in such a manner as to prevent delay or interference with the work of others, working in the same area.
- 13.4.5-7** Traps: Each fixture and piece of equipment, including floor drain, requiring connection to the drainage system shall be equipped with a trap. Traps are to be supplied with the fixtures. Each trap shall be placed as near to the fixture as possible and no fixture shall be double trapped.
- 13.4.5-8** Floor Traps: Floor traps with gratings shall be made of high grade, strong, tough and even-grained metals, castings shall be free from blow holes, hard spots, excessive shrinkage, cracks, or other injurious defects, shall be smooth and well cleaned both inside and outside and shall have all fins and roughness removed. Castings shall not be required, plugged, brazed or burned in. The wall thickness of iron casting shall be not less than 1/4 inch.

13.4.6 Testing of Pipelines:

- 13.4.6-1** All plumbing pipes shall be tested by the SUBCONTRACTOR and approved by the EMPLOYER for a working pressure of 9 Bar.
- 13.4.6-2** The pipes in trenches and in places to be covered shall be tested before any covering is placed over them.
- 13.4.6-3** Test of soil waste, vent, and anti-syphonic pipes shall be carried out with water pressure or air pressure test as directed by the EMPLOYER.

13.4.7 Fittings of Appliances



13.4.7-1 Fitting in position of sanitary-ware and appliances shall be carried out strictly in accordance to locations shown on drawings or as directed by the EMPLOYER. The fittings shall be protected and cleaned before handing over to the representative of the EMPLOYER.

13.4.7-2 After testing the pipelines as specified, the interior of pipelines and inspection chambers and traps shall be inspected to ascertain that the pipelines are entirely clear of obstruction and that the invert is smooth. The inspection chambers and traps are to be provided with proper cover and grating as specified before handing over the system to the EMPLOYER.

13.4.8 Manholes and Gully Traps

13.4.8-1 Manholes shall be located at every change of grade and direction and at suitable intervals as shown on drawings. The wall thickness and other details shall conform to the specifications in the Bill of Quantities, drawings or as directed by the EMPLOYER. The top of Manhole shall be about 2 inches above the surrounding ground and it shall be sloped all round from frame to avoid any obstacle to the pedestrians unless the top of frame is required to be flush with the pavement level. Frame and cover shall be painted with bitumastic paint.

13.5 WATER SUPPLY

13.5.1 Material and Installation of water supply pipes

As discussed earlier, Polypropylene Random (PPR) pipes shall be used for water supply. The pipes shall conform to DIN 8077 – 8079 PN-20 and fittings to DIN 16925 PN-25 for internal water supply and from overhead water tank to internal water supply connections. For external water supply, PE (T-flex) conforming to ISO 4427, DIN 8079 - 8075 and PS-3580 from pump to water tank shall be provided. The pipe materials as shown on drawings shall be followed and shall also be approved by the EMPLOYER. The pipes shall run exposed or embedded in walls and floors as specified or shown on drawings. Where embedding in walls or floors is required the necessary instructions and routes of pipe work shall be approved by the EMPLOYER.

Pipes running exposed on walls and ceiling shall be properly clamped with hangers, supports and clamps. For passage of pipes through masonry walls,

R.C.C. beams, slabs and walls, asbestos sleeves shall be embedded and water proofed. Pipes laid underground shall be provided with protective coat if directed by the EMPLOYER.

Pipe Fittings: Fittings, Specials, Sockets, Elbows, Tees Unions etc. shall also conform to ISO 3633, ISO 4633 and PS 1915.

Hangers, Supports, Anchors & Sleeves: For fixing pipes to wall and ceiling shall be of approved design to be manufactured by the SUBCONTRACTOR consistent with good engineering practice and shall be painted Bitumastic enamel paint or the paint of the same quality as for the pipes supported by these hangers supports or anchors/ sleeves or any approved rustproof paint.

Valves: Wheel valve or gate valves shall conform to B.S.S 3464 "Cast Iron gate valves for general purposes" and to B.S.S 1952 "Copper alloy gate valves for general purposes" as applicable.

13.5.2 Jointing



Heat Fusion

Jointing of polydex pipes is carried out by a method called 'heat fusion'. This is done by means of a welding machine. The male and female parts of pipes and fittings are jointed together to form a joint.

The ends of the two parts are heated simultaneously. Once the welding temperature is reached, the two end parts (which are in molten form) are pressed together. They are held together till the recommended cooling time. When fully cooled, a permanent leak-free joint is formed. Heat fusion is an irreversible process; hence care should be taken in jointing in order to avoid loss of fittings.

Welding:

1. Cut the pipe at right angle with a cutter.
2. Mark off the welding depth at the pipe end.
3. Simultaneously heat the ends of both pipe and fittings as per recommended heating time.
4. Push the pipe end into the fitting and ensure its alignment of assembly within the specified time period.

13.5.3 Samples and Tests

Samples for all the items under this section shall be provided and shall be approved by the EMPLOYER and the same type of materials will be used throughout the work in progress. If the EMPLOYER desires to get the material tested, this will be got done by the SUBCONTRACTOR from a Laboratory approved by the EMPLOYER. All pipes shall be tested by the SUBCONTRACTOR and approved by the EMPLOYER for a working pressure of 9 Bar.

13.5.4 Pumps and Accessories

Coupled transfer pumps of 48 Gpm @ 55ft. head manufactured by Grundfos or equivalent with control panel, float valve for automatic pump operation shall be provided.

13.5.5 Valves: Wheel valve or gate valves shall conform to B.S.S 3464 "Cast Iron gate valves for general purposes" and to B.S.S 1952 "Copper alloy gate valves for general purposes" as applicable

13.6 STORM WATER DRAINAGE: An open drain is proposed to carry the storm water drainage from the site. The type of the proposed drain is rectangular RCC type. The wall thickness, proposed alignment and other details shall conform to the specifications in the Bill of Quantities, drawings or as directed by the EMPLOYER. The details given in the drawings like drop location and other arrangements can be changed as per the site conditions after approval of the EMPLOYER. The specifications regarding Excavation of the drain, concrete and reinforcement shall be followed in the relevant chapters in the same document and drawings. Medium duty grating at certain interval as shown on drawings shall also be provided.

13.7 UNDER GROUND TANK

SCOPE OF WORK

The work to be done under this section of the specifications includes furnishing all plant, labor equipment., appliances, material and performing all operations required in connection with construction of Under ground tank including provision and installation RCC precast slab making and fixing removable etc., complete as specified herein: as shown on the drawings, or as directed by the EMPLOYER/Client Representative.



APPLICABLE SECTIONS OF SPECIFICATION

The following specification sections shall be followed for carrying out civil/plumbing works associated with this section:

1. Earth work
2. Water Proofing
3. Termite Proofing
4. Form work
5. Reinforcement
6. Plain and reinforced concrete
7. Plumbing
8. Cast iron covers with frames ladder rungs

CONSTRUCTION

Underwater tank shall be of reinforced cement concrete of the sizes, thicknesses and class of concrete as shown on the applicable drawings. Where soil is alkaline sulphate resistant cement shall be used for concrete work. The work of excavation, backfilling, disposal of surplus/rejected earth, plain and reinforced cement concrete, PVC water stopper, formwork, reinforcement and provision and installation of C.I cover with frame, G.I vent pipes, G.I inlet and outlet fittings, C.I intercepting trap (if provided), pipe sleeves, puddle flanges, etc, are to be done under this section and shall be executed in accordance with the specifications as stated above. Inlet and outlet fittings, 0.1 frames and vent pipe shall be well set in place at the time of pouring of concrete.

13.8 FIBER GLASS WATER TANK

The SUBCONTRACTOR shall provide single-wall fiberglass tank as shown on the drawings. Sizes and fittings shall be as shown. The tank shall be a fiberglass tank as manufactured by an approved manufacturer. Tank shall be tested and installed according to the manufacturer Installation Manual and Operating Guidelines in effect at time of installation.

General

Governing Standards, as applicable:

- Tank manufacturer shall be in the business of manufacturing tanks to Underwriters Laboratories, Inc. (UL) Standard 1316.
- Tank manufacturer shall be in the business of manufacturing tanks with materials conforming to the requirements of NSF Standard 61.
- Tank manufacturer shall be in the business of manufacturing tanks conforming to the requirements of ANSI/AWWA D120-02.

A. Loading Conditions: Tank shall meet the following design criteria:

1. Internal Load: Tank shall be designed to withstand a 5-psig air-pressure test with 5:1 safety factor. When tank is designed for on-site testing, the SUBCONTRACTOR shall individually test tank for leakage prior to installation. Maximum test pressure is 5 psig (3 psig for a 12-foot diameter tank).
2. Vacuum Test: Tanks 10-foot diameter and smaller shall be designed to withstand a vacuum test to 11.5 inches of mercury.
3. Surface Loads: Tank shall withstand surface H-20 axle loads when properly



installed according to tank manufacturers current Installation Manual and Operating Guidelines.

4. External Hydrostatic Pressure: Tank shall be capable of being buried in ground with 7 feet of overburden over the top of the tank, the hole fully flooded and a safety factor of 5:1 against general buckling.
5. Tank shall support accessory equipment- such as internal pump platforms, drop/fill tubes, submersible pumps and ladders- when installed according to tank manufacturers current Installation Manual and Operating Guidelines.

B. Product Storage:

1. Tank shall be capable of storing water products with specific gravity up to 1.1.
2. Tank shall be vented to atmospheric pressure.
3. Tank shall be capable of storing products identified in the manufacturer's current standard limited warranty.

C. Materials:

1. Tank shall be manufactured with 100% resin and glass-fiber reinforcement. No sand fillers.
2. The laminate materials used in the internal coating system of a portable water tank shall conform to the requirements of NSF Standard 61.

D. Tank Dimensions (Refer to Xerxes literature on gallonage.):

1. Tank shall have nominal capacity of 1000 gallons.

E. Optional Anchor Straps:

1. Straps shall be FRP anchor straps as supplied by tank manufacturer.
2. Number and location of straps shall be specified in current literature by tank manufacturer.

F. Optional Manways (required for potable water tanks):

1. All manways shall be flanged and 22-inch-I.D., complete with gasket, bolting hardware and cover. (Optional 30-inch- and 36-inch-I.D. manways are also available on certain larger size tanks.).
2. Location is shown on tank drawings.
3. Optional manway extensions shall be FRP.

G. Optional Drop/Fill Tubes:

1. Drop/Fill tubes shall be FRP and shall terminate a minimum of 4 inches from the bottom of tank.
2. Drop/fill tubes for potable water tanks shall be manufactured with materials conforming to the requirements of NSF Standard 61 or shall be NSF-listed PVC.

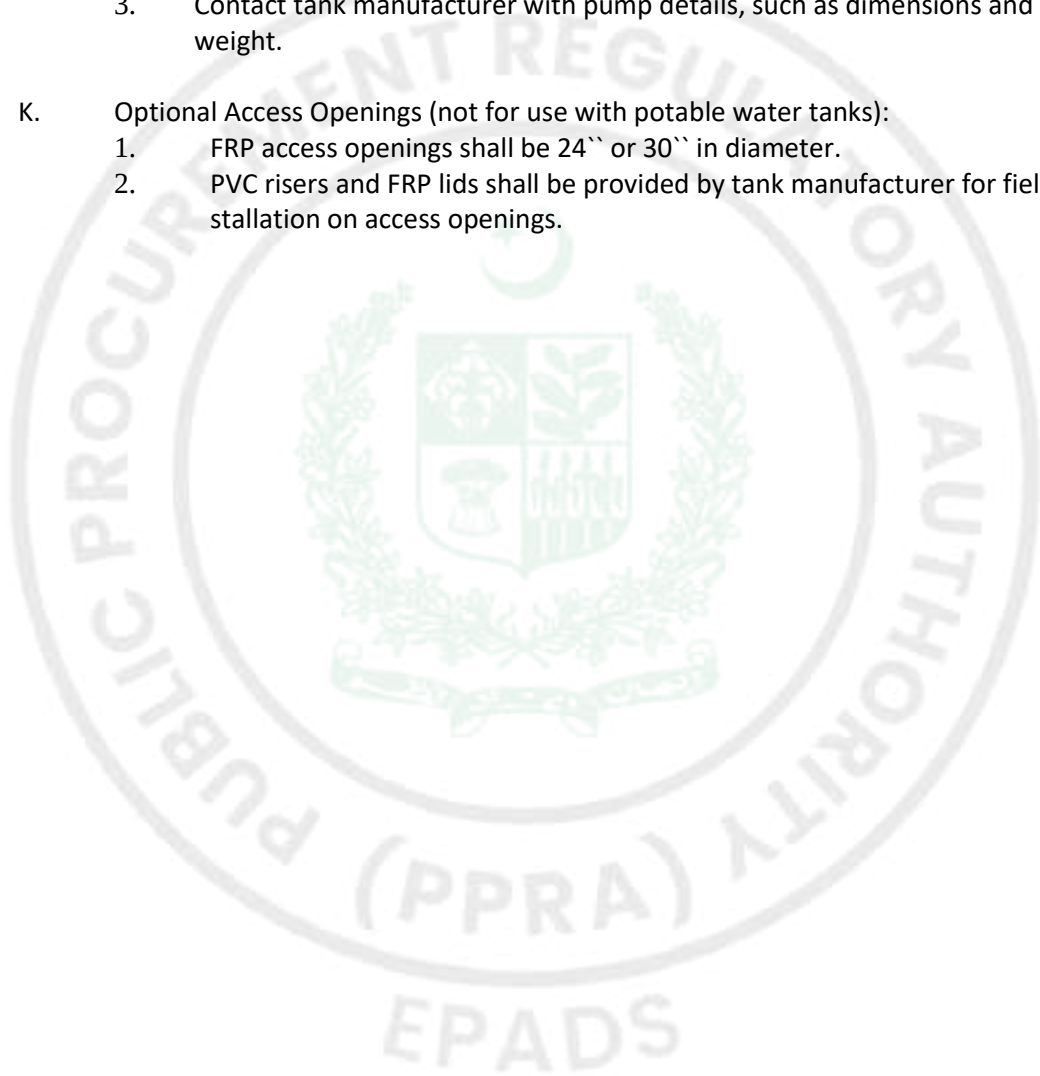
H. Optional Ladders:

1. Ladders shall be the standard ladder as supplied by tank manufacturer.
2. Ladders for potable water tanks shall be manufactured with materials conforming to the requirements of NSF Standard 61.

I. Optional Fittings:



1. All threaded fittings shall be constructed of carbon steel or FRP.
 2. All standard threaded fittings shall be half-couplings, and of 2-inch, 4-inch or 6-inch diameter. Reducers are to be used for smaller sizes where shown and provided by the SUBCONTRACTOR.
 3. All FRP and PVC nozzles shall be flat-faced and flanged, and shall conform to ANSI B16.5 150# bolting pattern.
- J. Optional Internal Pump Platforms:
1. Pump platforms shall be FRP.
 2. Pump platforms for potable water tanks shall be manufactured with materials conforming to the requirements of NSF Standard 61.
 3. Contact tank manufacturer with pump details, such as dimensions and weight.
- K. Optional Access Openings (not for use with potable water tanks):
1. FRP access openings shall be 24" or 30" in diameter.
 2. PVC risers and FRP lids shall be provided by tank manufacturer for field installation on access openings.



14. ELECTRICAL WORKS

14.1 GENERAL REQUIREMENTS

14.1.1 Scope

The work under these specifications includes providing of materials and equipment and performing all the works necessary for the complete execution of all the electrical work as shown on the electrical drawings, as herein specified, as directed by the EMPLOYER, except as otherwise specifically excluded and which, without excluding the generality of the foregoing shall include but not be limited to the following principal items of work:

- a) Transformer and associated L.T. switchgear.
- b) Distribution equipment including main distribution switch boards,
- c) A system of exterior/ interior (as required) lighting and power wiring including all feeders' branch circuits and connections to all lighting outlets and motors,
- d) All external/ internal lighting fixtures and lamps,
- e) Complete grounding system,
- f) Complete lighting protection system,
- g) Complete testing, commissioning and energization of the installation,
- h) Painting of electrical work and equipment,
- i) Complete Computer networking & telephone system
- j) Complete Fire Alarm and Fire Fighting system
- k) Air Conditioning work
- l) Optional items of work,
- m) If any thing has been omitted or any items of work or material, usually furnished, which are necessary for the completion of the electrical work as outlined herein before, then such items of work must be and are hereby included in this section of work.

14.1.2 Codes, Regulations Notices and Fees

The whole of the work shall be carried out in strict accordance with the regulations for the Electrical Equipment of Building (Latest Edition) as issued by the Institution of Electrical Engineers, London and shall also comply with the provisions of the Pakistan Electricity Rules.

Any special conditions and requirements of the local electric authorities shall be met. The work shall be carried out only by qualified workmen, in possession of necessary competency certificate, under instructions of a Supervisor having a license granted by the Government of Pakistan to undertake such a job. The bio-data of the Electrical Supervisor shall be submitted to the EMPLOYER before commencement of the work for approval.

The SUBCONTRACTOR shall familiarize himself with all requirements as to permits license, fees and codes and arrange to comply with them. All permits, license, fees inspections and arrangements required for the work of this Subcontract Agreement and shall be obtained by the SUBCONTRACTOR at his expense.

It will also be the SUBCONTRACTOR'S responsibility to give the required notices to the local Electrical Authorities and assist the EMPLOYER in getting electrical connection.



14.1.3 Cutting Floor Walls or Ceiling

SUBCONTRACTOR should work out in advance the position of holes channels etc to be left by Civil SUBCONTRACTOR. Where this is not reasonably possible, cutting and chipping of walls etc. may be permitted. All cutting and chipping of walls etc. for installing material concerning electrifications will be done by the electrical SUBCONTRACTOR who shall also repair the damage caused and will be responsible for bringing back the general finish to the position that it was before the cutting and chipping done by the Electrical SUBCONTRACTOR where applicable.

Cutting, chipping, repairing, patching of plaster and finishing of carpentry work, metal work or concrete work etc. which may be required for the electrical work shall be done by craftsmen skilled in their respective trades. When cutting is required, it shall be done in such a manner as not to weaken walls, partitions or floors and holes required to be cut in floors must be drilled without breaking out around the holes. Where patching is necessary in finished areas of the building, the EMPLOYER shall determine the extent of such patching and/or refinishing and work shall be done only upon his express instructions.

14.1.4 Identification of Circuits

Switch panels, fuse boards and similar distribution units shall be designated in accordance with the reference letters or number used in the specifications and/or shown on the drawing and the legend and description shall clearly spell out the full name of the equipment.

- a) All fuse boards shall be provided with a substantial circuit sheet fixed by screws to the inside of the front cover with Chart under the respective circuit number.
Spare branch ways shall not be printed "Spare" but left blank.
- b) The particular phase connected to a fuse bank and bus-bar shall be clearly indicated by marking with the appropriate color.
- c) Where medium voltage exists a label shall be fitted externally to the equipment with the words "DANGER 400" VOLTS" engraved in one inch letters.

14.1.5 Access to Equipment

Contactors, starters, switches, outlets, pull boxes etc. shall be located so as to provide for easy access for operation, repair and maintenance; if concealed, access doors shall be provided.

14.1.6 Operation and Maintenance Manuals:

During the time of the Subcontract Agreement and before final approval of the electrical installation, six copies of descriptive literature, maintenance and operation data and parts list of each item of electrical equipment installed under this Subcontract Agreement shall be submitted to the EMPLOYER.

14.1.7 Electrical Definitions:

These specifications and drawings are based on electrical system and apparatus terminology defined by the Indian Electricity Act and Rule as adopted in Pakistan and the latest edition of the rules of the Institution of Electrical Engineers, London. If some clarification is required in some instance a reference should be made to the EMPLOYER whose interpretation will be binding and final.

14.1.8 Earthing



The earthing electrode should consist of a copper weld Rod (copper coated steel Rod) in size of 25mm dia 3 meter long in size. It should be driven 3 meter in Ground & 2 feet below the general Ground level. It will not be less than 3 feet away from the nearest foundation. It will have a proper size clamp on top to Earth for incoming copper conductor/strip.

Number of earthing electrodes to be provided would be governed by Rules No.54 and 57 of the Indian Electricity Rules, 1937, as adopted in Pakistan.

The earthing lead shall comprise of H.D. bare copper conductor of not less than No.8 SWG for installation upto 50 Amps per main conductor. For installations of larger size than this, two earthing leads of not less than No.8 SWG each, Copper Conductor shall be used.

Earthing continuity conductors of the sizes as specified in Schedule of Quantities shall be provided and installed as specified herein and to comply with the latest I.E.E. regulations. All noncurrent carrying parts of switch gear, boards and clamps shall be connected to earth continuity conductor by means of thimbles or lugs duly soldered at the end of copper earth continuity conductor. All nuts, bolts, washers etc. shall be galvanized. The earth continuity conductor should form continuous path from any point of installation to the earthing sets. When two earthing sets are provided for same mains; these shall be at least 20 feet apart. The earthing lead shall be taken upto the electrode in suitable G.I. pipe irrespective of wiring system, and shall be sufficiently bonded to the earth electrodes, to make a permanent and positive connection with the earthing electrodes. The other end of the earthing lead shall be sweated into a cable lug of a correct size for the wire for its connections to the mains or apparatus to be earthed.

14.1.9 Testing

a) General:

Upon completion of the installations the SUBCONTRACTOR shall perform field tests on all equipments, materials and system. All tests shall be conducted in the presence of the EMPLOYER. In general all tests made by the SUBCONTRACTOR shall be of the nature to assure that the entire installation is sound and that all circuits, lighting, power and equipment etc. will function properly and as intended.

The SUBCONTRACTOR shall furnish and install all tools, instruments, test equipment material etc. and furnish all personnel required for carrying out complete testing.

The SUBCONTRACTOR shall record all test results and submit the same to the EMPLOYER

b) Insulation Tests:

The insulation resistance test shall be performed on all electrical equipments and wiring, using Megger testor or any self contained instrument such as direct indicating Ohmmeter of the generator type. Only D.C. potentials shall be used for such testing and these shall be as follows:

- Circuit under 230 Volts = 500 volt test voltage
- Circuit 230 to 400 Volts = 1000 volt test voltage

The minimum acceptable insulation resistance value for PVC cables shall be 1 Mega ohm.

The insulation test between each cable of a circuit shall be made and also between earth and individual cable. All equipment shall be tested to earth.



If the insulation resistance of the circuit under test is found less than that specified above, the cause of low reading shall be determined and removed. The corrective measures shall include dry out procedure by means of heaters if equipment is found to contain moisture, but if circuit cables are found defective these shall be removed and replaced and tested again. The tests shall be carried out at least three times and the lowest reading shall not be less than 70% of the average value.

14.1.9.3 Earthing Resistance Test

Earth resistance tests shall be made by the SUBCONTRACTOR on the earthing system, separating and re-connecting each earth connection as may be required.

The electrical resistance of the E.C.C. together with the resistance of the earthing lead measured from the connection with earth electrode to any other position in the completed installation shall not exceed one Ohm.

14.1.9.4 Phase Sequence Test

The SUBCONTRACTOR shall phase out the entire power installation before final connections to the line. Final connections of main feeder buses to the main circuit breaker of the switch gear shall only be made after correct phase relating of Power Company's (WAPDA) primary line has been established.

14.1.10 Shop Drawings and Samples

- a) Prepare and submit for approval working drawings showing full details of equipment, wiring routes clearly indicating route of conduits wires cable and material and layout shop drawings and cuts of all equipment, appliances and fixtures furnished. After final approval by the EMPLOYER a sufficient number of copies as directed shall be furnished for distribution. Fixtures and device cuts and/or catalogues shall be clearly marked to indicate the items furnished. Do not submit individual sheets, cuts, catalogues or drawings. For instance lighting fixture cuts should be for all fixtures furnished, rather than a few types.
- b) Submit to the EMPLOYER for approval samples of conduit, wire, wiring devices, and finished plates and of any other items as may be requested by the EMPLOYER.

14.1.11 Minor Modifications

The plans as drawn are based upon architectural plans and details and show conditions as accurately as it is possible to indicate them in scale. The plans are diagrammatical and do not necessarily show all fittings, etc. necessary to fit the building conditions. The locations of outlets, apparatus and appliances shown on the plans are approximate. The SUBCONTRACTOR shall be responsible for the proper location in order to make them fit with architectural details and instructions from EMPLOYER at the Site.

14.1.12 Guarantees

The SUBCONTRACTOR shall guarantee in writing that the electrical systems are free from all grounds and from all defective workmanship and materials and will remain so for the whole of the maintenance period, starting from date of acceptance of the work. Any defects, appearing within the aforesaid period shall be remedied by the SUBCONTRACTOR at his own expense.

14.1.13 Substitutions



Wherever it is desired to substitute a different make or type of apparatus from that specified, all information pertinent to the adequacy and adaptability of the proposed apparatus, shall be submitted to the EMPLOYER.

14.1.14 Approval of Material

As soon as practicable and within thirty days after the official award of Subcontract Agreement and before any materials or equipment are ordered the SUBCONTRACTOR shall submit to the EMPLOYER for approval, one complete list of materials, apparatus and equipment, in triplicate giving the manufacturer's name, address, descriptive data, trade names of items rated capacities, certified analysis, catalogue numbers etc. and when called upon to do so, complete specifications and cut or drawing of each item, of whole or portion of list as required by the EMPLOYER which he proposes to use or install.

14.1.15 Inserts, Anchors

Furnish to the proper trades all inserts, anchors, or other required items which are to be built in by them for securing all hangers or other supports of conduit and for anchorages for electrical apparatus and equipment. Supervise the placing of these inserts, anchors etc.

14.1.16 Subcontract Agreement Drawings

The location of various items indicated on the drawings are presumed to be approximately correct, but it is to be understood, however, that the small scale drawings are necessarily diagrammatic and that such locations, as shown are subject to the slight revision, as the work is installed, which may be necessary to accommodate local construction conditions. No major change shall be made, however, without the approval in writing of the EMPLOYER. The SUBCONTRACTOR shall examine and study the Architectural drawings, large scale and full size details, the approved shop drawings of other trades and he shall frequently consult with the EMPLOYER to ascertain any changes that may have been made and he shall be guided accordingly before establishing the precise location of conduit runs, panels, pull and junction boxes and outlets for all lighting, power system. All outlets covered or partly covered by ducts, piping etc. shall be extended laterally or to underside of same so that fixtures may be properly installed. Outlets indicated where beams occur shall be located adjacent to same, with proper clearance for fixtures as required.

14.1.17 Foundations, Pads, Bases, Supports and Fasteners

- a) Channel shims for leveling and support of all floor mounted electrical equipment shall be provided as part of the electrical work.
- b) Where an item of floor-mounted equipment is to be installed on floor the deck loading shall be checked.
- c) All necessary concrete foundations, pads and bases exterior to the building for lighting standards or other electrical equipment installed as part of the electrical work including such bases or foundations as detailed on architectural drawings, shall be provided as part of the electrical work.
- d) Supporting methods for all electrical equipment and circuitry shall conform to the best practice, shall utilize only approved materials and shall be in accordance with the standards published by the United States National Electrical Contractors Association/ B.S.S. Specifications.
- e) All fastenings to attach electrical work to the building structure shall be of an ap



proved type. In general, the only acceptable fastening methods shall be as follows:

- Woodscrews on wood,
- Bolts and expansion shields on concrete or brick,
- Toggle bolts on hollow masonry,
- Machine screws, approved clamps or welded threaded studs on steel.

14.1.18 Spares

When main equipment is part of Wapda's supply, the maintenance spares supplied by the equipment manufacturer will be handed over to the SUBCONTRACTOR who will maintain its account of consumption and will hand over the unutilized spare parts to the EMPLOYER at the end of the maintenance period. For equipment which is part of SUBCONTRACTOR'S supply, the SUBCONTRACTOR will maintain a similar record of consumption of the maintenance spares supplied by the equipment supplier in accordance with the requirement of this Sub-contract Agreement and hand over the unutilized spare parts to the EMPLOYER at the end of the maintenance period.

14.1.19 Completion of the Job

As far as possible each item of work has been fully described and included in these specifications and the Schedule of Values. However, supply and installation of any item shall be needed to include all such accessories as nuts, hooks, hangers, supports, small wiring of components of electrical panel boards, foundations for machinery and/or other such necessary accessories that are essential for completion of the job in accordance with the tender shall be deemed to have been included in the supply installation of the equipment unless specifically excluded.

14.2 MAINS

14.2.1 L.T. Switch Board

The L.T. Switch Board shall be cubicle type, fabricated out of sheet steel, moisture and dust proof, floor mounting factory assembled, ready wired with all copper connections and internal wiring for 400 volts, 50 cycles per second, 3 phase, 4 wire system.

Glands and/or cable boxes for the sizes of cables indicated on drawings shall be provided. The cubicle shall be subdivided into compartments, number and size of the compartments will depend upon switches and circuit breaker as detailed in the Schedule of Values. The compartment shall have enough space for convenient access to cable connections. Full interlock shall be provided between cubicle doors circuit breakers, switches and contactors. The construction of the cubicle shall be such that for extension any number of cubicles can be bolted together to form a self contained unit.

The metering and protective devices shall be provided as detailed in the Schedule of Values.

The color of the panel shall be grey enamel or as approved by Client inside and outside. A plastic name plate engraved with the panel designation in 3/8" high letters shall be fixed on each panel.

14.2.2 L.T. Switch Board Installation Instructions



All labor, equipment and tools required for complete installation and shall be provided by the SUBCONTRACTOR as well as all shimming of the supporting floor steel that may be required to set the switch gear in level position. The switchboard shall be fixed firmly on the floor according to the manufacturer's recommendations. All outgoing and incoming cable connections shall be made and special care shall be taken in fixing cable boxes and in cable connections so as to have no danger of leakage during operation. Earthing connection shall be made according to the earthing instructions.

14.2.3 Instructions for Lying of L.T. Cables

Low tension cables shall be installed in prepared trenches on cleats on walls and/or cable trays, as specified in drawings or Schedule of Values. Maximum care shall be taken at the time of lying to obviate criss-crossing of cables as far as possible. Where cables rise on walls from trenches upto a height of 6'-0" or upto its termination point whichever is more, provide a protective covering of G.I. pipe or duct or sheet steel trunking as specified or required. Leading into and out of cable trenches shall, as far as possible, be carried out from the sides and not from the bottom. Where location requires leading into or leading out from the bottom suitable shaped outlets shall be provided so that the insulation of the cable does not get damaged.

14.2.4 Cable Terminations

All PVC cables shall terminate in approved pattern metal boxes fitted with suitable glands for securing the armour wires and incorporating a compression or packing ring for the exclusion of water and moisture. The cable shall be secured at the requisite spacing by means of cable cleats or hangers, and where multiple runs occur they shall be accommodated on heavy gauge galvanized perforated metal tray.

The cores of multi-core cable shall be colored in conformity with the B.S. specifications in order to provide identification.

The cores shall be insulated by sufficient layers of empire tape for the voltage concerned.

Boxes shall be thoroughly clean and dry prior to filling with hot compound of the best quality. Boxes shall be finally topped up to make up any voids caused by shrinkage of the compound.

Cables rising from the ground shall be protected to a minimum height of 5 ft by means of pipe sheets or wood casing, whichever is more appropriate for the particular situation.

14.2.5 Switch Board or Distribution Boards Mounted on Walls:

Where a Switch Board or Distribution Board is mounted in walls or columns it shall be installed flush with the wall. Suitable provision shall be provided for the outgoing feeders. In case the number of feeders leaving the board in the downward direction require space more than that available on the sides of the main incoming switch or fuse switch, a suitably sized metal trunking shall be interposed between the switch and the Distribution. The trunking shall be of the same finish and color as the assembly and shall be robust enough to support the weight of the switch.

14.3 LIGHTING, FITTINGS AND FIXTURES



14.3.1 General

The work included under this section consists of furnishing all labor, materials, services and skilled supervision necessary for the construction, erection, installation and connection of all equipment specified herein, shown or noted on the drawings and/or normally required and its delivery to the EMPLOYER upon completion in all respects ready for use. The extent of work specified herein and/or shown on the drawings represents the minimum requirements.

14.3.2 Lighting Fixtures

The lighting fixtures shall be provided with all necessary support hangers etc. as required for installation. The fluorescent light fitting shall house all required accessories of first class quality and be completely pre-wired for ready connection. The chokes shall be polyester filled, of high efficiency, and starters with spring loaded rotor, both items shall be of Philips or G.E.C. make or equal.

All fittings shall be supplied complete with lamps. Unless otherwise specified at the time of installation, the fluorescent tube shall be cool day light type. All fluorescent light fittings shall be provided with in-built capacitors for improving the power factor to 0.85.

Wherever practicable all metal parts of fittings and accessories shall be of non-ferrous materials. All metal parts shall be adequately protected by an under coat of corrosion resisting paint. The luminaries and mounting channels of fluorescent tube fitting shall be painted with white impact resisting coating of synthetic resin enamel. A certificate would be required from the light fitting manufacturer confirming that these requirements have been complied with.

Lighting fixtures details are given in the schedule of quantities. If a definite manufacturer's type of lighting fixture has been specified, any approved equal type may be substituted, after the EMPLOYER approval has been obtained in writing. Emergency lights should have arrow sign indicating towards nearest exit. The determination of quality will be based on certificate photo-metric data, covering the coefficient of utilization, average brightness data etc. as well as equivalence of construction material, shape, finishes etc.

Lighting fixtures to be manufactured especially shall in all respects conform to high standard of the EMPLOYER and workmanship, performance and function as specified and fully meet the quality level requirements. The drawings produced for such fixtures forming part of the tender, only show the outlines and shape required for each particular fixture; a complete working drawing for the mechanical work involved shall be obtained from the manufacturer and produced by the SUBCONTRACTOR with the tender. After the approval of the drawings the successful tenderer shall submit a sample for final approval before these fittings are installed. All fluorescent light fixtures shall use lamps and ballasts strictly in accordance with the type and wattage specified.

14.3.3 Installation Instructions for Lighting Fixtures

Outdoor lighting fittings shall be weather proof type. The connections to these fittings shall be taken from a weather proof cast metal type junction box complete with cover and gasket; size shall be determined by the number of wires entering the box. All accessories for mounting outdoor fittings shall be provided and insulated. Recessed mounting fluorescent or incandescent lighting fixtures shall be installed in false ceiling or suitable recess in slab/wall/column etc. as applicable.

14.3.4 Shop Drawings



Within thirty (30) days after award of the Subcontract Agreement the SUBCONTRACTOR shall furnish to the EMPLOYER four (4) shop drawing portfolios (bound copies) containing cuts and curves of all manufactured lighting fixtures to be used on this project. The portfolios shall be made of standard manufacturer's specification sheets or detailed drawings of fabricated units and identified by number indicated on fixture schedule. The SUBCONTRACTOR should commence the placement of orders only when these have been approved by the EMPLOYER in writing.

14.4 FANS

14.4.1 Ceiling Fans

A.C. Ceiling capacitor type fans 56" sweep of approved manufacturer shall be installed as indicated on drawings. The fans shall have displacement of 10,000 cft. Of air/minute with a tolerance of 10% the fan regulator shall be suitable for flush mounting or surface mounting on walls with sufficient steps to give proper speed regulations. The name plates both on fan and regulator shall be marked for voltage and frequency.

14.4.2 Exhaust Fans

The exhaust fans of approved manufacturer shall be finished with baked on enamel finish of approved colors. It shall have gravity operated heavy duty, balanced shutters, both to be water and weather resistant. Protecting guards shall be provided for on the motor and discharge side. A frame shall be provided for the installation of the exhaust fan. The frame shall be strong and suitably finished to match the environs. The blade wheel should be dynamically balanced at the specified operating speed before final assembly. After final assembly the fan should be run at rated voltage and speed for check of balancing. The motor shall be split phase, capacitor start with low and smooth starting torque. The bearing shall be permanently lubricated sleeve type.

14.4.3 Installation Instructions for Fans

Ceiling fans shall be suspended from hooks placed into the slab at the time of concreting/"S" hooks shall not be permitted. U -Shaped concealed type hooks boxes may be used having 5/8" dia M.S. hooks. Where fan is to be suspended from a beam or rib, double clamp and hook arrangement shall be used.

Exhaust fans shall be fixed by means of suitably made frame with supporting cross pieces to support the weight of the fan. The angle of the fan shall be as indicated in drawings or as directed.

The ceiling fan shall be controlled by a separate switch and regulator. The regulator shall be mounted with the switch and if concealed shall have the steps clearly indicated on the sheet covering on the switch and regulator outlet box.

14.5 LIGHTNING PROTECTION SYSTEM

14.5.1 Lightning Protection System

The site is located in an area where Lightning Protection strikes are about 40 per year, that is why the precious equipment & human lives inside, the buildings to be very well protected. The system adopted is cage type, in which the building is protected as in a cage, by running Copper tape at the parapet walls and drops leading to earth pits at appropriate locations with lightning arrestor at positions shown in the drawings. Fixing material, arrestors, ss test joints are of much importance therefore, to be imported from famous companies engaged in



Lightning Protection System for years like W.J Furse U.K, Erica Australia or Wallis USA. The copper tape can be local but tinned to the satisfaction of the EMPLOYER. Given below in detail specifications of the material required. The earth resistance of the network at any point should not be less than 7Ω . All chimneys antennas, metal pipes, chillers, steel stairs etc. should be bonded to the network.

14.5.2 Copper Tape

The copper tape is to be run over the parapet walls exposed to sky fixed with saddles or D.C clips. The size of this tape is to be 25X3mm consisting of pure copper tinned for protection against erosion and oxidation. The same tape could be used as down conductor up to test joints on wall. The D.C clips should be fixed with Hilti/Spit plastic plugs and Brass wood screws. The weight of copper per meter should be around 0.67kg & purity 99%.

14.5.3 Lightning Arrestors

The lightning arrestors or air terminal are to be fixed at positions shown in the drawings with special base suitable for interconnecting copper tape. The size of the air terminal rod to be 3feet length and 25mm dia, it should be tapered at top threaded at bottom and made of copper. The base should be fixed on parapet wall with Hilti/ Spit plastic plugs and brass wood screws. Air terminal and base should be of any of the famous companies (W.J Furse U.K, Erico Australia, Wallis USA) which are approved and recommended.

14.5.4 D.C Tape Clips/Saddles

D.C tape clips to be made of high quality copper and aluminum alloys by W.J Furse U.K, Erico Australia or Wallis USA. These are to be fixed over copper tape at intervals of 1000mm and at 100mm at each bend, crossing or near the base of air terminals or joints. Use plastic Rawl plugs of Hilti/Spit with brass wood screw 1½ inch 10 nos.

14.5.5 Oblong Test or junction Clamp

For straight joints of copper tape use oblong test or junction clamps of copper 26X8mm, 0.29kg weight of W.J Furse U.K, Wallis USA or Erico Australia. Fix one D.C clip at each side of the joint not more than 100mm away.

14.5.6 Square Tape Clamp

When cross or tee joints are to be made in network then use square tape clamps of appropriate size, made of special oxidation and corrosion resistance material of W.J Furse U.K, Wallis USA or Erico Australia, with counter sink screws of brass, fixed with plastic wall plug over parapet wall.

14.5.7 Disconnecting Link or Test Point

Where copper tape sown on wall at 4'-6" above finished floor level fix disconnecting link with removable copper link over insulators earth rod's resistance measurement as well as complete networks resistance. These are to be also of W.J Furse U.K or Erico Australia.

14.5.8 Earth Rods

Copper bended rods of 25mm dia and 10feet length are required to be used for earthing purposes. These should be of low carbon steel with 99.9% molecularly bonded electrolytic copper over. The rods should be supplied with rod to tape clamps. Both of these should be of W.J Furse U.K, Wallis USA or Erico Australia. These rods are to be driven in ground, the down conductor to be clamped to these and earth pit should be over it.

14.5.9 Earth Pits



The earth pits should be locally made of concrete same as designed W.J Furse U.K concrete inspection pit cat. No.PT005.

14.5.10 Testing

After completion of the lightning protection system as per drawings, B.O.Q and Specifications it should be tested with earth resistance tester using 2 rods method at each earth pit. The testing to be witnessed by the EMPLOYER incharge and recorded and signed by all the witnesses.

14.6 FIRE DETECTION, ALARM SYSTEM AND FIGHTING SYSTEM

14.6.1 Scope of Work

The work under this section consists of designing, manufacturing, fabricating, supplying, installing, operating, testing and commissioning of all material and services of complete proposed Fire Detection & Alarm System and Fire Fighting system as explained in these Specifications, shown on the drawings, given in the Bill of Quantities, as directed by the EMPLOYER and as per manufacturer's instructions.

The SUBCONTRACTOR shall discuss the layout of the proposed Fire Detection & Alarm and Fire Fighting System with the EMPLOYER and co-ordinate at site with other services/ systems for exact route, location and position of various equipments of the proposed system.

The proposed Fire Detection & Alarm and Fire Fighting System with accessories shall also comply with the general specification section-8001 and with other relevant provisions of the Tender Documents.

14.6.2 GENERAL

The proposed Fire Detection & Alarm and Fire Fighting System shall be manufactured and supplied by a concern that is certified by the relevant standards of the ISO 9000 standard.

The proposed Fire Detection & Alarm System is intended for early detection & reporting of any accidental fire. The early reporting of the accidental fires shall help the hospital staff to take necessary steps and measures for the safety of lives of the patients admitted in the various wards of hospital and also for the expensive equipment used for the treatment of patients.

The proposed Fire Detection & Alarm system shall be intelligent, addressable, pre-signal circuit, class A wired and supervised system. The Intelligent Control Panel shall display the exact address of the Automatic Fire detectors and manual call points employed in the system.

The proposed Fire Detection & Alarm system shall be capable to monitor up to 60 or 120 addressable devices on each loop.

The system shall operate on 24V DC from a battery charger with stand-by batteries. The incoming supply shall be 220 VAC.

The system wiring and installation shall be in compliance with all applicable codes, and the manufacturer's recommendations.

The system shall monitor and report the status of manual call stations and automatic fire detectors. The system shall also perform control functions as alarm indications, etc. The Intelli-



gent system shall be fully programmable with alpha-numerical display.
The Main Control Panel shall have elegant finish. The finish color(s) of the Main control panel shall be as per relevant international standards.

The SUBCONTRACTOR shall provide wall charts for the operation and maintenance of the proposed Fire Detection & Alarm System. The wall charts shall contain following minimum information in both English and Urdu languages. The characters of written instructions shall be Bold and minimum 6 mm high.

- Complete layout of the proposed Fire Detection & Alarm system showing locations of all automatic detectors, manual call points and bells zones in different Bright colors.
- Operating and maintenance instructions in BLACK color
- Emergency instructions in RED color

The proposed Fire Detection & Alarm System under the present Subcontract Agreement shall comprise the following equipments but not limited to;

- Main Control Panel for the proposed Fire Detection & Alarm system with LED/LCD/backlit indications, Push buttons for Alarm accept, Alarm silence, Alarm test, system reset, Key operated ON/OFF switch all required keys for programming of the system, etc.
- Mains Power supply system with 220 VAC / 240 VAC, single phase or 400 VAC Three phase input from building's power supply network.
- Back up Power supply system suitable for 120 minutes uninterrupted operation of the proposed system at Full load.
- Ionization Smoke Detectors with addressable bases
- Rate of rise Heat Detectors with addressable bases
- Manual Call Point with addressable base.
- Audio Alarm Bell
- Any other optional equipment that is deemed necessary for the completion of the proposed Fire Detection & Alarm system.
- All required accessories that are deemed necessary for the completion of the proposed Fire Detection & Alarm system.

14.6.3 APPLICABLE STANDARDS AND CODES

The latest editions of following standards codes shall be applicable for the materials covered within the scope of this section: UL 38 -Manual call station UL 268 -Ionization smoke detectors. UL 464 -Chimes, bells and horns for fire alarm system. UL 521 -Heat Detectors EN 54-Pt 2&4

UL 864 -Fire Detection and Alarm Control Panel UL 864 -Annunciation Panel NFPA – F - Installation of Fire detection and Alarm System NFPA – H -Testing of Fire Detection and Alarm System

14.6.4 MATERIAL

14.6.4.1 Fire Detection & Alarm Control Panel



The Main Control Panel for the proposed Fire Detection & Alarm system shall be of low voltage, solid state, and modular design with integral static protection. The Main Control Panel shall have LCD display.

The Main Control Panel shall be Installer friendly & equipped with indicating lines plug in addressing system.

The proposed Fire Detection & Alarm system shall be capable to monitor up to a minimum of 120 addressable devices on each loop.

Each detector & manual call point shall be constantly supervised for ground, open circuits and short circuits. It shall be possible to individually program the input modules by internal switching or software programs to:

- Initiate an alarm instantaneously
- Disregard an alarm if the detector resets within 5 Seconds and is not actuated again within 30 seconds.

The Main Control Panel shall have on site programming facility, The user & service menu's shall be password protected.

The Fire Detection Alarm Control Panel shall be housed in a semi-flush mounted cabinet with a lockable cover. All indications shall be visible from the locked cover. The controls shall be accessed from an access door on the cover.

The common alarm output shall be activated whenever there is an alarm on any line. Common trouble output shall be activated if any open circuit is detected on any alarm line and the tamper alarm shall be activated by removal of the front cover of the panel.

The Fire Detection and Alarm Control Panel shall provide the following functions/features:

- Indicate the actuation of fire detectors
- Supervise all alarm initiating and indicating lines for open circuit, short circuit & ground faults.
- Provide visual and audible indication in case of alarm or fault condition.
- Indications of power 'ON', power failure, ground fault & low battery.
- Power supply shall be a part of the panel and shall be of sufficient size to power all modules in panel and devices connected to the panel. It shall also have the capacity to recharge completely discharged back up batteries within eight hours and during normal operation, keeping the back up batteries fully charged by trickle charging. Input to the power supply shall be 220VAC.
- Back up batteries shall be of sufficient size to keep the panel fully operational in case of power failure for at least 2 hours. This time shall include 15 minutes of general alarm.
- Normally, in case of alarm on any line, only the alarm device shall be activated. If required it shall be possible to activate the general alarm from the panel.
- In case of alarm, it shall be possible to silence the alarm or activate general alarm device from the panel. The alarm indication shall however remain on the panel until the alarm initiating device and the panel are brought back to normal operating conditions.
- Silencing of an alarm shall not prevent resounding of the audible alarm devices.



in case of a subsequent alarm on some other line.

14.6.4.2 Repeater Panel

The repeater panel should be compliant with NFPA 72 Standards requirement and fully compatible with the remaining fire detection system. It should have nominal operating voltage of 230 volts and nominal frequency of 50 Hz and have a built-in standby battery and battery charger as well. It should have LCD to show the display of FACP as well as other conditions such as fault, maintenance, normal operation etc. It should be capable of both directly connecting to FACP and to the detection loop and suitable for installation at minimum 500 meters away from FACP. The repeater panel should have provision for both flush mountable and surface mountable and suitable for indoor and outdoor installation. It should have provision for controlled access to authorized personnel.

14.6.4.3 Ionization Smoke Detector

All automatic fire detectors shall;

- suitable for mounting on false ceiling or RCC ceiling surface.
- have visual alarm indicator with a 360° field of view
- have provision for remote alarm indicator
- be self resetting
- have strong weather resistant casing

The ionization smoke detector with addressable base shall be of low voltage, unipolar and dual chamber type. The dual ionization chamber shall be connected to an electronic evaluation circuit. This dual chamber provision shall ensure that each detector is self-compensating for the effects of air movement, temperature, humidity and atmospheric pressure. The detectors shall be fully operable after every alarm without any need for adjustment. Removal of the detector from its base shall cause a trouble indication on the display system. All detectors shall be equipped with an integral alarm indicator.

Wherever the remote alarm is connected the integral indication shall remain active.

The detectors shall have adjustable sensitivity. Each detector shall meet the following minimum technical specifications.

- Rated Voltage 24 V DC
- Operating Voltage 17 to 32 V DC
- Radio Activity Less than 1.0 micro curie
- Integral Alarm Indicator LED
- External Alarm 30 to 120 mA at 6 to 24 V DC
- Detector Coverage 80 sqmm with flat ceiling of 4.5 m height
- Operating Temperature 10 to 60°C
- Operating Relative Humidity 10 to 95 %

14.6.4.4 Fixed Temperature/Rate of Rise Heat Detector

The addressable fixed temperature/rate of rise heat detector shall be low voltage, comprising electronic evaluation circuit with twin thermistor differential temperature sensing.

Removal of the detector from its base shall cause a trouble indication on the display system. All detectors shall be equipped with an integral alarm indication. Whenever the remote alarm is connected the integral indication shall remain active.



These detectors shall conform to the following minimum technical specifications:

- Rated Voltage 24 V DC
- Operating Voltage 15 to 28 VDC
- Integral Alarm Indicator LED
- External Alarm 30 to 120 mA at 6 to 24 VDC
- Detector Coverage 50 Square meters with ceiling height of 4.5 to 6 m.
- Maximum Response Temperature 60o C + 4o C
- Response Sensitivity Grade 3, in accordance with UL test guidelines and EN54.

14.6.4.5 Manual Call Station

The addressable manual call station shall be break glass type suitable for surface mounting. An auxiliary Normally Open (NO) contact shall be provided. The glass shall be interchangeable.

14.6.4.6 Alarm Bell

The addressable alarm bell shall be surface mounting type the bell shall have the following minimum technical specifications:

- Rated Voltage 24 V DC
- Operating Voltage 18 to 30 V DC
- Sound Pressure Level at 3 m. 85/90 db (A)

14.6.4.7 Alarm Buzzers

The addressable alarm Buzzers shall be surface mounting type & have the following minimum technical specifications:

- Rated voltage 24V DC
- Operating voltage 18 to 30V DC
- Sound pressure level at 1 m 75 db (A)

14.6.4.8 Visual Alarm Signal

Visual alarm signal shall be installed at locations shown on the plans. Visual alarm signal shall have a high intensity flashing light, The electronic light shall be protected by lexan lens. The word FIRE shall appear on the lens. The visual alarm signal shall be semi-flush mounted type & have the following minimum technical specifications.

- Rated voltage 24V DC
- Operating voltage 18 to 30V DC
- Flashing Frequency of two flashes per second

14.6.4.9 Power & communication/ data control cables

The cables for the proposed Fire Detection & Alarm system shall be twisted pair screened Copper conductor cables or as per manufacturer's recommendations.

All wires and cables shall be color coded, tagged and checked for open, short or ground faults. No transposition of colors will be permitted. All wiring in terminal cabinets shall be made on terminal blocks of proper size and type for the services involved.

Cable joints shall only be allowed on the detector bases or junction boxes.

14.6.4.10 PVC conduits on surface

The PVC conduits shall have same specifications as in section "PVC conduits & Pipes" or



these specifications.

14.6.4.11 Installation

The installation of Fire Detection and Alarm System shall be in strict accordance with the manufacturer's instructions/ recommendations and these specifications.

14.6.4.12 Testing

The testing of Fire Detection and Alarm System equipment shall be in strict compliance with the relevant standards and regulations. During testing of equipment, emphasis shall be laid on the following points:

- a) Operational Safety
- b) Regular functioning of the system and devices
- c) Protection against false alarms.
- d) Various detectors like smoke, heat, etc. shall be subjected to the basic tests and sensitivity tests. The detectors shall be tested in various ways to check real and false alarm behaviors.
- e) The control panels shall be subjected to the following tests:
 - i. Power failure test.
 - ii. Battery failure test.
 - iii. Real alarm and real trouble test.
 - iv. Ground Fault test.
 - v. Zone wise and General alarm test.
 - vi. Lamp test (only for alarm lamps/LED'S).
 - vii. Field modifiable programming test.
 - viii. Function test of each board.

14.6.4.13 Training

A training session shall be presented by a fully qualified, trained representative of the equipment manufacture/supplier who is thoroughly knowledgeable of the specific installation. The training shall be given to personnel responsible for operation and maintenance of the Fire Detection and Alarm system.

The training session shall include but not limited to the following:

- i. Detailed explanation of wall charts as mentioned in Article 2.0 of this section.
- ii. Function of each control switch.
- iii. Periodic operational testing of panel/devices.
- iv. Maintenance of fire log book supplied by manufacturer
- v. Actions to be taken upon receiving following signals:
- vi. False alarm indication
- vii. Trouble on any initiating or indicating zone
- viii. Common alarm or common trouble indication
- ix. Low battery voltage indication
- x. Field modifiable programming
- xi. How to perform periodic testing of panel and devices

14.6.4.14 Fire Fighting Specifications

All fire fighting specifications would be as per relevant NFPA standards and manufacturer recommendations as approved by EMPLOYER.

14.7 WIRING ACCESSORIES



14.7.1 Switches

Switches for controlling light and fan points shall be single pole, rated for 10 Amp, 250 VAC. The body of switches shall be made of poly carbonate / urea with white face plate suitable for flush mounting on sheet steel outlet box. The switches shall be gang type having silver tipped contacts and operate with snap action.

For locations where switches and fan speed regulators are installed together, single switches shall be grouped and fixed on 3 mm thick plastic sheet screwed to a sheet steel box of appropriate dimensions. The fixing of plates on outlet boxes shall be means of flat head counter sunk galvanized screws with the head of the screw finish flush with the surface of the plate. Except for switches controlling light points, all single switches for fans, sockets, etc., shall have identification symbols on the operating levers.

Two way switches shall be used for stairs to control lights from two different locations.

14.7.2 Switch Socket Outlets

3 Pin 5/10A and 15A Socket units shall be moulded type having white plastic face plate, suitable for mounting on a sheet steel box of appropriate dimensions. Switch sockets shall have shrouded live contacts such that the earth pin is engaged to socket earth before making with the live contacts. Where specified, the switch socket unit shall have spring loaded dust tight cover for mechanical protection. The socket units which are installed in open environment shall be of weather proof type.

13A flat 3 pin socket unit shall conform to BS 1363 and shall be used for computer. The socket unit shall be provided with a normal earth and a clean earth.

14.7.3 Sheet Steel Boxes

The outlet boxes for installation of switches, fan speed regulators and socket outlets shall be 16 SWG sheet steel having appropriate dimensions. The boxes shall have suitable knockouts or welded nipples for receiving the conduits. An earth terminal shall be provided for connecting at least three earth wires of 4 sq. mm. The outlet boxes shall be given two coats of antirust red oxide and one coat of enamel before installation. The boxes shall be suitable for mounting flush with the surface of wall or on the surface of wall as may be required. The boxes shall not be less than 75 mm x 75 mm (3" x 3"). All boxes shall be water tight where installed in the vicinity of liquids.

14.7.4 Fans

a) Bracket Type

The bracket type fans shall be suitable for mounting on the wall and suitable for operation semi-horizontally. These shall operate satisfactorily on 230 volts, single phase, 50 Hz, A.C. supply with + 10 % tolerance.

The fans shall comply with BS 380 as far as constructional requirements, range of fan speed regulator, starting, radio interference, silent operation and temperature rise are concerned.

b) Exhaust Fan

The exhaust fans shall be three blade types, mounted on the steel/plastic structure of its own, which will be fixed to the structure by means of suitable grouted foundation bolts



The fan shall be suitable for operation on 230 VAC with + 10 % tolerance.

Fans shall be direct driven and supplied complete with electric motor, back draft dampers and anti-vermin screen. The bearings shall be ball, roller or sleeve type of permanently lubricated and sealed type. Wheels shall be heavily and rigidly constructed and accurately balanced both statically and dynamically and free from objectionable vibration or noises.

The fans shall comply with BS 380 as far as constructional requirements, range of fan speed, speed regulator starting, radio interference silent operation and temperature rise is concerned.

14.8 CONDUITS & PIPES

14.8.1 PVC Conduits, Pipes and Accessories

The PVC conduits and accessories for lighting and power circuits shall be furnished by the SUBCONTRACTOR as shown in the drawings or given in BOQ. The PVC bends shall have enlarged ends to receive conduit without any reduction in the internal diameter at joint. Manufactured smooth bends shall be used where conduit changes direction. Bending of conduits by heating or otherwise will be allowed in special situations only, for which the consent of the EMPLOYER shall be required. The use of sharp 90 degree bends and tees will not be allowed for concealed wiring.

The round PVC junction boxes for ceiling light or fan points shall have minimum dimensions of 64 mm diameter and 64 mm depth. The junction boxes for wall light points shall have minimum dimensions of 57 mm diameter and 40 mm depth. Round junction boxes shall be provided with one piece bakelite cover plate fixed to the box by means of galvanized screws.

The PVC pipe shall be rigid and shall be minimum D-Class (working pressure 12 Kg / cm), unless otherwise stated on Drawings or Bill of Quantities. Where pipe changes direction, manufactured smooth bends shall be used. For jointing of pipe, all precautions and procedures recommended by manufacturer shall be followed.

14.8.2 Steel Conduit and Accessories

All conduits shall be of heavy gauge 16 SWG steel, manufactured and tested in accordance with latest relevant standards.

The conduit shall be protected by two base coats of red oxide antirust paint and finished in first quality black on paint. The coating shall be of heavy enamel, which shall not flake or crack during installation and handling. Each conduit length shall be furnished with threaded ends and a threaded coupling at one end. Soft metal bushes shall be provided at conduit termination to prevent damage to cable during pulling operation.

Junction boxes shall be 100 mm square, having minimum depths of 38 mm or 65 mm as required for accommodating the number of wires. The junction box shall be 16 SWG sheet steel provided with antirust paint and finished in heavy black enamel paint. The cast Iron outlet boxes for light points shall be round having 50 mm diameter and 63 mm depth. The above dimensions are given as minimum only, and the exact size shall be determined by the SUBCONTRACTOR keeping in view the ease of Installation and maintenance. All outlet boxes and junction boxes shall be provided with one piece bakelite cover plate of suitable design.



14.8.3 Galvanized Iron Pipes and Accessories

The G.I. pipes shall be galvanized from inside and outside by hot dip galvanizing method. The pipes shall be free from stains, burrs or any other defect. The accessories for G.I. pipes shall be galvanized from inside and outside. The conduit shall be NPT threaded, with at least 5 complete threads and assembled with TEFLON tape.

14.8.4 Inspection Boxes / Pull Boxes

The rectangular inspection boxes or pull boxes shall be of 16 SWG heavy gauge, sheet steel having nipples welded to box at entry holes to receive PVC conduit with force fit. The box shall be painted inside and outside with black enamel paint over a base coat of red oxide primer paint. The minimum length of inspection box shall not be less than six times the cable manufacturer's recommended bending radius of the cable. All concealed type pull boxes shall have a white plastic sheet of appropriate size fixed to the box by means of galvanized screws.

14.8.5 Adaptable Boxes

Adaptable boxes shall be made of 16 SWG sheet steel box, painted and finished to the same quality as the light Distribution Board. The boxes shall be 50 mm in depth for conduits up to 25 mm diameter, 63 mm in depth for conduits up to 40 mm diameter and 87 mm in depth for conduits up to 50 mm in diameter. For conduits more than 50 mm in diameter, the minimum depth shall be two times the diameter.

14.8.6 Conduit / Pipe Accessories

Bushes, plugs, glands, etc., shall be of brass and all male bushes shall be of long thread pattern. Covers for boxes shall be screw fixed and finished as the boxes. Gaskets shall be fitted only when finish is galvanized unless otherwise specified.

14.8.7 Cable Trunking

Where required, wiring shall be run in hot dipped galvanized (after fabrication) sheet steel cable trunking of the specified gauge complete with all fittings and accessories, manufactured and installed in accordance with BS 4678/NEMA. The trunking shall be constructed with return flanges. Trunking covers shall be secured by anchored turn buttons and locking bars and minimum length of individual sections shall be 2.44m. The trunking shall be suspended/supported from the structure at maximum 2m intervals with straps and hangers fabricated from minimum 6mm dia HDGF bars, or supported by angle iron brackets.

Conduit drips from the trunking shall also be supported with hangers. Factory made connectors shall be used at joints.

Junctions (tee and 4way) in multi-compartment trunking shall be double depth to avoid reduction in cabling space. Cable in vertical runs shall be supported by pin racks, prongs or bridging pieces. Fire barriers shall be provided at each floor level. Allowance for expansion shall be incorporated.

Bonding links shall be provided at each joint and secured by screws, nuts and shockproof washers. The bonding links shall make contact with the metal of the trunking of fitting, and continuity shall not depend on contact through the screws, nor on removal on site paint finish from ferrous metal.

14.8.8 Installation

(a) PVC Conduits Concealed



The conduit shall be installed concealed in roof, wall, column, etc .At all joints and bends, PVC jointing solution as manufactured by Pakistan PVC Limited or approved equivalent must be used to strengthen and to seal the joint.

Manufactured smooth bends shall be used. Bending of conduits by heating or otherwise will be allowed in special situations only, for which the consent of the EMPLOYER shall be required. The use of 90 degree bends and tees will not be allowed.

The conduit shall have a minimum of 38 mm cover of concrete. In the reinforced cement concrete (RCC) work, the conduit shall be laid before pouring of concrete. Under no circumstances shall chases be made in the RCC structure for concealing conduit and accessories, after pouring of concrete. The concrete shall be supported on top of bottom reinforcement of slab and shall be firmly secured by tying to the reinforcing steel in order to avoid being disturbed during pouring of concrete.

All outlet boxes to be firmly supported and installed such that they finish flush with the soffit of slab of beam.

Where conduits have to be concealed in cement concrete (CC) work after concreting, or in block masonry, chases shall be made with appropriate tools and shall not be made deeper than required. The conduit shall then be fixed firmly in the recess and covered with cement concrete mixture to have to at least 32 mm covered before plastering. The work of curing in the cement concrete work or block masonry work shall be coordinated with the civil work. The SUBCONTRACTOR shall obtain approval from the EMPLOYER for the route, to suit the site conditions before starting chasing and cutting.

The termination of conduits at or near the Switchboard / Distribution Board is shown diagrammatically on the drawing. The exact final locations of the termination shall be coordinated with the Switchboard / Distribution Board to be installed. Any extension of conduit near the Switchboard / Distribution Board to suit the site condition shall be made without any extra cost. Conduit ends pointing upwards or downwards shall be properly plugged in order to prevent the entry of foreign materials. All openings through which concrete may leak shall be carefully plugged and boxes shall be suitably protected against filling with concrete. At all termination of concrete, soft bushes shall be fixed to prevent sharp edges of conduit ends from cutting or damaging the wires or cables to be pulled through them.

The entire conduit system shall be installed and tested before wiring is carried out. Any obstruction found shall be cleared by use of cutting mandrel or other approved device and the conduit shall be cleaned out before the installation of cable.

Pull boxes / Adaptable boxes shall be provided in conduit runs wherever required to facilitate pulling operation. The drawings are diagrammatic and do not indicate the position and spacing of pull boxes or adaptable boxes. However, these shall meet the following requirements:

Pull boxes. For straight runs the spacing shall not be more than 30 meters. For runs with one 90 degree bend, the spacing shall not be more than 15 meters.

Adaptable boxes. For conduits up to 25 mm diameter, the boxes shall be 50 mm in depth. For conduits up to 40 mm diameter, the boxes shall be 63 mm in depth. For con-



duits up to 50 mm diameter, the boxes shall be 87 mm in depth.

Wherever the conduit lengths cross the expansion joint either along the column or slab, suitable arrangement shall be provided so that when the conduit lengths in the expansion joint are stressed, the conduit neither develops any cracks nor breaks down.

Bending, off setting and similar operations shall be performed through the help of proper bending tool to give a perfect bend of required angle without Desha ping of conduit to the least.

(b) Steel and G.I Conduit

The minimum size of conduit shall be 20 mm.

The use of solid or inspection elbows, bends or tees will not be permitted and 120 degree bends shall be limited to one between any two drawn in boxes.

Conduit coupling joint shall not be used where conduit enter spout entry boxes. Conduit running, joints shall not be used where conduit enter conduit boxes or spout entry boxes.

Equipment that is required to be removed for maintenance shall be provided with conduit unions in all conduits that enter such equipment. The use of conduit nipples shall be avoided as far as practicable.

All conduits shall be cut square and reamed at the end. All conduit ends and the inside of conduits shall be clean and free from burrs.

Where bushed spouts or tapped holes are not provided at conduit termination, the conduit shall be terminated in a flanged socket and a smooth bore brass hexagon bush, with a lead washer fitted between the flanged socket and the equipment or box.

All exposed threads and parts where the galvanizing has become damaged shall be thoroughly cleaned and painted with galvanized paint. The exposed conduit ends shall be capped to protect threads from being damaged before installing cables.

Repair painting shall take place before any making good on site or buildings is carried out. The entire conduit system shall be checked for continuity. Any observation found shall be removed without damaging the installation.

The conduit system shall be installed empty with a 16 SWG steel wire drawn through the conduits for pulling of cables. Joints in underground conduits shall be avoided or reduced to the absolute minimum.

Where adjustable dies are used they shall be so adjusted that threads cut with them shall be the same depths as machine made threads.

The use of manufactured bends shall be avoided and instead smooth bends shall be provided by using approved type of bending tools.

Flexible steel conduits shall be installed at all points' locations where flexible connection is required, as directed by the EMPLOYER. The flexible conduits when used shall be pro-



tected by external PVC sheath, resistant to oil damages.

G.I. pipes for under ground installation shall be given bituminous paint coating and wrapped with suitable paper or cloth before installation.

(c) Fixing of Conduits and Fittings

Conduits in process units and on steel work with "U" bolt type fixings. Conduits in buildings shall be fixed with galvanized distance saddles. Where a number of conduits follow a single route they may be fixed to mild steel brackets.

Conduits shall be supported on both vertical and horizontal runs as follows:

- Conduits size 20 mm and 25 mm maximum spacing of fixing 1000 mm.
- Conduit sizes larger than 25 mm spacing of fixing 1500 mm.

All conduit boxes that support fittings shall be securely fixed. All conduits shall be fixed 150 mm before and after every right angle or off set. All conduit fittings and equipment shall be fixed true and line able.

All conduit bends shall be made with an approved conduit bending machine or hickory. The radius of curvature of the inner edge of any bend shall not be less than the following table:

<u>Conduit size</u>	<u>Radius</u>
20 mm (3/4")	Not less than 130 mm.
25 mm (1")	Not less than 150 mm.
32 mm (1 1/4")	Not less than 200 mm.
38 mm (1 1/2")	Not less than 255 mm.
50 mm (2")	Not less than 305 mm.
70 mm (2 1/2")	Not less than 380 mm.
82 mm (3")	Not less than 460 mm.
100 mm (4")	Not less than 610 mm.

Underground conduit stud up or kick pipe through concrete envelope shall be extended a minimum of 150 mm above grade and adequately braced to prevent shifting during concrete pouring work. The concrete envelope shall extend at least 76 mm above grade.

Under floor conduit installation shall be at a minimum depth of 120 mm from finished floor level. The G.I. pipes / conduits shall be installed at a minimum depth of 1000 mm measured from the top of size to the finished road level.

(d) Location of Conduits and Fittings

Before conduits are installed, confirmation shall be obtained that the conduit may be installed in that position.

Particular attention shall be given to the location of conduits to prevent the infringement of headroom and access ways.

Conduits shall be located to avoid obstructions, furnaces, hot lines and other places of high temperature.



Conduit shall not be located than 150 mm (6") where it runs parallel to or crosses hot surfaces. Under ground conduit runs shall be kept to minimum in both number and length. Conduits shall not be recessed in fair brick work.

Draw boxes shall be so positioned to enable the cables to be drawn in easily. The boxes shall not be located in the corners or other such locations and shall be positioned to avoid tight bends, bending and cable kinks.

Conduits shall not generally be installed having a greater length 12,000 mm (40 feet) between drawn in boxes.

Conduit entries shall wherever possible be located in the bottom of boxes and equipment etc.

14.9 CABLES & WIRES

14.9.1 Cables for Conduit Wiring

All cables / wiring in concealed or surface mounted PVC or steel conduits shall be single core PVC insulated of specified grade and size, unless specifically shown on the drawings or given in BOQ.

14.9.2 Cable Accessories

All cable accessories shall be provided for the complete cabling and wiring system without any additional cost unless specifically mentioned in BOQ. These shall include but not limited to the items such as saddles, clamps, fixing channels, connectors, cable joints (where necessary and approved by the EMPLOYER), clips, lugs, tapes, solder, identification tags, bushes, glands, etc.

14.9.3 Installation

When the laying is effectuated by others, the SUBCONTRACTOR shall test the cable characteristics insulation and continuity, at all phases of these and communicate them in a report to the EMPLOYER, as per recommendations of the standards according to which the cable is manufactured.

The cables shall be spaced by categories along their entire length as well as upon penetration into buildings and in their interiors, according to their following rated voltages:

- 20 cm at least between a cable carrying voltages between 50V 500V, and any power or control 10 cm at least between a cable carrying voltages lower than 50V and telephone or these possible being grouped.

All installation material, labor, tools and accessories for cable installation shall be furnished by the SUBCONTRACTOR. The cable and accessories shall be installed as described in accordance with these specifications, drawings and manufacturer's instructions.

a) Conduit Wiring

The wiring through conduit shall be started only after the conduit system is completely installed and all outlet boxes, junction boxes, etc., are fixed in position. The filling rate inside the conduits shall not exceed 50 %. Cables directly embedded in the masonry are not accepted.



The wires shall be pulled in conduit with care, preferably without the use of any lubricant. Where necessary and if approved by the EMPLOYER, the cable manufacturer's recommended lubricant may be used. Where several wires are to be installed in the same conduit, they shall be pulled together along with the earth conductor. All wires of same circuit shall be run in one conduit.

The wires shall not be bent to a radius less than 10 times the overall diameter of the wire, or more if otherwise recommended by the manufacturer.

The wiring shall be continuous between terminations and looping in system shall be followed throughout. Any joint in wires shall not be allowed. The use of connectors shall only be allowed at locations where looping in is rendered difficult. The consent of the EMPLOYER shall be required for using connectors. The connector shall be of suitable rating having porcelain body with sunken screw terminals. The connector shall be wrapped with PVC insulation tape after its installation. A minimum of 150 mm extra length of cable / wire shall be provided at each termination to facilitate repairs in future.

Where cable joints are required for extending the existing circuits, ferrules shall be used for extension of circuit or point wiring. The high conductivity copper/tinplated ferrules shall be used with appropriate size as per requirement. These shall have high conductivity and shall be corrosion resistant. The ferrules shall be cramped with proper cramping tools and suitable insulation jacket shall be provided over ferrules after cramping. The joints shall be properly insulated and protected from any leakage. All the jointing work shall be carefully carried out with good workmanship and to the satisfaction of the EMPLOYER.

14.10 DATA SYSTEM

Main Patch panels are provided in IT Room in office block. The cable run from the PP to the associated Data outlet is limited to 90m.

Wiring system used shall be star topology i.e. each data outlet is connected directly to the associated floor distributor (PP).

Horizontal runs from a patch panel to the data outlets using 4Pair Cat 6 UTP cable.

Data Processing system shall be supplied installed and tested complete in place including but not in a way of limitation, cables, socket outlets, adapters, connectors, patch panels, patch cords, wire management, floor distributors (racks/cabinets).

The Data Cabling System shall be designed using standard, proven equipment and materials with the latest Technology version or model. If there is any problem during warranty period related to the shortage of Materials, the SUBCONTRACTOR shall supply them with no extra cost to the Project.

The design shall fully comply with TIA/ EIA 568B & ISO 11801 in a full star topology configuration.

The UTP Category 6 cable's technical specifications shall be up to the TIA/EIA568B.21 industry standards and should have performance specifications better than 250 MHz and ample margin compared to the Category 6 Standard for performance in factors such as NEXT.



14.10.1 Copper Cable & Connectors

Unshielded twisted pair copper cables shall be approved & recommended by component manufacturer. This is to enable the component manufacturer to give the necessary product and application warranties for the system.

Provide unshielded twisted pair copper cable and connectors in sizes and types as recommended by the active equipment manufacturer for indicated applications. Mate and match connector materials to factory installed equipment.

Computer cabling System Accessories: Provide computer accessories, including modular wall and floor jacks, junction boxes, connecting blocks and prewired boxes.

The selection and type of material required for the Services shall conform to the specifications given herein and items or matters not specified herein shall conform to ISO/IEC 11801, EN 50173 and TIA / EIA 568B Category 6 Standards as applicable.

The cable shall be composed of 23 or 24 AWG bare, solid copper conductors. The insulated conductors shall be twisted into individual pairs and four such pairs twisted together. The cables shall be fully colour coded as provided hereunder, colour contrast being such that each pair in the cable is easily distinguishable from every other pair.

Conductor Identification	Coloured Code	Abbreviation
Pair 1	White – Blue Blue – (White)	WT – BL BL
Pair 2	White – Orange Orange – (White)	WT – OR OR
Pair 3	White – Green Green – (White)	WT – GN GN
Pair 4	White – Brown Brown – (White)	WT – BR BR

14.10.2 Specifications of UTP Cables

Cable Type	Category 6 UTP
Conductor Size(mm)	23 or 24 AWG
Number of Pairs	4
Nominal Outer Diameter (mm)	6.0
Impedance(Ohm)	100+/15
Velocity of propagation (% speed of light)	69
Frequency (MHz)	250
Max. Attenuation @ 250 MHz (dB)	32.1
Worst case NEXT @ 250 MHz (dB)	38.3

14.10.3 Horizontal Cabling Distances

The maximum horizontal portion of a cabling system from work area information outlet to a mechanical termination at the patch panel in the wiring closets must not be more than 90 meters.

Both ends of the cable shall be labeled for identification, i.e., at the patch panel and work



area information outlet according to TIA/EIA 606 administration standards for the Data cabling of commercial buildings.

The horizontal cabling system shall be correctly designed and the work area outlets in each shown or required location shall be correctly mapped to an appropriate wiring closet. The star topology shall be applicable to every individual unit of the transmission media.

14.10.4 Data Outlet

The SUBCONTRACTOR shall provide the identification labels at each and every information outlet with clear information of its connection. The labeling shall be on the faceplate of the information outlet according to TIA/EIA 606 Administration Standard.

In the process of installing the information outlets, if the SUBCONTRACTOR envisages difficulty in mounting the outlet at planned location as indicated in its design/ EMPLOYER'S drawing, the SUBCONTRACTOR shall notify the Company of this, the SUBCONTRACTOR shall not make its own discretion in modifying or changing any information provided in the approved design drawings.

The type of information outlets shall be of modular RJ45 of Matt Chrome/ metallic or any other approved finish, 8 position, 8 conductor designed for high speed networking applications that use data transmission rates over frequency ranges up to and potentially beyond 250 MHz & 100 MHz. The outlets shall be of insulation displacement connectors (IDC) type.

The 8 position/8 conductor outlet shall meet the category 6 transmission requirements for connecting hardware specified in ISO/IEC 11801 and EIA/TIA568A/B and Class E design guidelines.

The modular outlet shall provide maximum versatility in designing a premise distribution system. It shall be designed to snap into modular faceplate. When the outlet is inserted into the faceplate or frame, it shall lock into place and shall only be released using the dual purpose wire insertion tool. The mounting and removal system shall allow easy installation and modification. The faceplate jacks must be shutter protected and shall include a label window required to write circuit identification number. Each port must support a color icon to identify the port function.

The plastic used to construct the modular data outlet shall be of high impact, flame retardant, made of poly phenylene oxide with flammability rating meeting UL 94V0UL, the jack wires shall be at least 50 micro inch lubricated gold plating over 100 micro inch nickel under plate. The connector shall be of copper alloy, at least 100 micro inch bright solder over 100 micro inch nickel under plate.

The insulation displacement connector shall accept 24/23 AWG solid copper wire conductors. The connector shall have multicolor labels marking wire terminals with numbers, assuring fast, accurate installation. The outlet must support wiring configuration as per T568A and T568B on the same RJ45 jack

The connector shall be wired using the wire insertion tool (impact tool). The module shall be wired from the centre to the outside and shall not untwist paired conductors more than 12.7 mm. In the process of terminating the cables in patch panels/outlets the SUBCONTRACTOR shall ensure ISO/IEC and TIA/EIA category 5E/6 transmission performance requirements.

14.10.5 Patch Cords



The SUBCONTRACTOR shall supply patch cords for all the installed points on the network switch side as well on the workstation side. The cord length shall be of two different sizes 5ft. [1.5 m] on the network switches side and 10 ft. [3.05 m] on the workstation side.

The patch cable shall meet the requirements warranted to meet ISO/IEC 11801, EN 50173 and TIA/EIA 568A/B category 6 wiring standards capable of connecting high speed information terminal devices to information outlets, to interconnect information terminal devices and 8position modular jack panel applications. The patch cord shall be designed to provide support for extended multimedia transmission distance over frequency ranges up to and potentially beyond 100/250 MHz.

The patch cord shall support the computer networking applications over frequency ranges up to and potentially beyond 250 MHz and shall be compatible with voice and information applications.

The construction of the cord shall be of stranded type cordage tightly twisted, 24 AWG, 8 conductor. The cord shall be terminated to an 8position RJ45 modular plug on both ends. The cords shall support the transmission requirements warranted to meet ISO/IEC 11801 Class E, EN 50173 or TIA/EIA 568B Category 6, Class E component specifications and standards.

The SUBCONTRACTOR supplied cord shall be of factory crimped modular plug at both ends.

14.10.6 Patch Cord Organizer

The SUBCONTRACTOR shall supply and install sufficient patch cord organizers/interbay patch cord organizers that are used for routing patch cords in 19inch (48.3cm) frames. The patch cord organizers shall support the requirements of routing patch cords both at the equipment side as well as the Category 6 patch panel cabling side at the wiring closets. These organizers shall be located in the 19inch frame inside the wiring closet.

The SUBCONTRACTOR supplied patch cord organizers/inter-bay patch cord organizers shall support the requirements of routing cords in both horizontal and vertical pathways.

14.10.7 Patch Panels (Jack Panels)

The SUBCONTRACTOR shall supply and install the modular patch panels to meet the full cabling system requirement of the "building/complex". Every category 6 cables serving the information outlets at work areas shall be terminated at the patch panels. The SUBCONTRACTOR shall ensure that the supplied patch panels meet the ISO/IEC 11801, EN 50173 and TIA/EIA 568 warranted component specifications and standards.

The patch panels shall be of 19inch rack mounted panels. The rear of the panel shall feature connecting blocks mounted on a printed wiring board. These connecting blocks shall be capable for use in terminating category 6 station wires, equipment, or tie cables. The modular patch panel shall be capable of supporting up to 24 jack positions (ports) as required by the design drawings of the Data system and shall have the facility to write the circuit designation details at the front side of each jack. The SUBCONTRACTOR shall provide 20% spare capacity for both the Data.

The insulating displacement connector field in the patch panel shall be made continuous to the 8pin modular jack field on front of the panel through printed wiring board connections to enhance the features to confirm to TIA/EIA 568A/B cabling recommendations.



The construction of the modular jack panel shall be of category 6 – compliant and shall have the stringent requirements of connecting hardware as specified in TIA/EIA 568A/B commercial/ residential building Cabling System standards.

When the patch panels are tested in accordance with the appropriate test methods described in TIA/EIA 568 A/B and ISO/IEC 11801, EN 50173 Category 6 specifications. The modular patch panels shall meet the worst pair near end cross talk (NEXT) requirements over the entire frequency ranges up to and potentially beyond 100/250 MHz on all pair combinations.

Care must be taken to ensure that the cables are terminated correctly at category 6 cross connect hardware (patch panels).

The cable conductors shall be terminated as described in TIA/EIA 568A/B and ISO/IEC 11801, EN 50173 Category 6, Class E wiring sequence by using the proper insertion tool (impact tool).

When terminating the cables in the insulating displacement connector field, care must be taken to ensure that the strip – back is limited only as much cable jacket as is required to perform connecting hardware terminations. The cables shall be properly secured to the 19” rack with cable ties as well as at the patch panels.

Each port of the patch panel must support color Icon to identify the port function.

Each port must be numbered in sequence with white printing on black background or other high contrast colors.

Each port on the patch panel must have a label place holder and for the patch panel number.

The package must include frame mounting screws, labels, cable ties and instruction sheet.

14.10.8 Cabling Cabinet (Steel Cabinet)

The SUBCONTRACTOR shall supply and install cabling System Cabinets to house the passive and active network equipment.

The 6U wall mounted cabinet shall be used in the IT and Cold Store (Bar Code) Room.

The SUBCONTRACTOR supplied Cabling System cabinets shall meet the requirements of accommodating the high volume of cabling 19” 24port patch panels & LAN Equipment fully assembled.

A power outlet strip shall have a 2 meter flying lead, (3wire extension cord) with a 3 prong British plug with fuse and shall have 13 amp. 250 volt 3 prong British outlets with individual on/off switch and indicator light with mounting brackets. The AC Mains distribution integral at the rear pillar of the cabinet should have at least 10 of 13 amp. Power Outlets. Cable management panel inclusive of other accessories such as earthing kits, screws, washers, gripnuts and a removable shelf, able to resist a weight of 50 to 60 kgs. The cabinets shall be rugged and strong and all steel shall be finished scratch proof in a durable enamel Grey paint on both sides.



The front glass door shall have at least 4 mm toughened & 50 percent light transmission smoked safety glass able to resist a weight of 80 to 100 Kgs. Placed within 200 mm of the door center. The door shall be lockable and shall have a swing handle supplied with 2 keys.

The rear door shall be the same as the front except the construction of the door shall be of rugged and strong 1.6mm steel finished in a durable enamel Grey paint on both sides, and without glass.

The internal panel mounting angles shall be supplied in pairs to provide 19" mounting positions with hole patterns to accept captive nuts on universal centers. In the design of the panel mounts the centers of each U height shall be notched, to make the positioning of cage nuts much simpler. The panel mounting shall be fitted onto panel mount angle supports to allow infinite adjustment throughout the depth of the track.

The cabinets shall be supplied at least with one shelf kit. The shelf should carry a load rating of 50 kgs. And shall be manufactured with holes/slots providing sufficient airflow to LAN equipment when installed inside the cabinets.

Four steel castors with rubber wheels at least 40 mm high. These castors shall be mounted at the corners of the cabinet and be able to support the total weight of the cabinet and all options.

The cabinets must support the installation of fire protection units and all 19" equipment including frames for 110 punch block.

14.11 Telephone System

A telephone junction box (TJB) shall be provided in IT room of the Office Building. The telephone junction boxes are located as marked in drawings.

Wiring system used shall be star topology i.e. each telephone outlet is connected directly to the TJB.

Telephone system shall be supplied installed and tested complete in place including but not in a way of limitation, cables, socket outlets, 110 wiring block, connectors and telephone junction box.

The telephone cabling system shall be designed using standard, proven equipment and materials with the latest Technology version or model. If there is any problem during warranty period related to the shortage of Materials, the SUBCONTRACTOR shall supply them with no extra cost to the Project.

The design shall fully comply with TIA/ EIA 568B & ISO 11801 in a full star topology configuration.

14.11.1 Telephone Cabling

Horizontal runs from a TJB to the telephone outlet using 2 Pair telephone cables. Wiring system used shall be star topology i.e. each telephone outlet is connected directly to the TJB.

The voice backbone cabling system shall meet the TIA / EIA 568A/B5 and ISO 11801 Category 5, Class D specifications.



The pair twist of the cables must be maintained as close to the termination at the patch panel IDC Modular outlet as possible. Cables shall not be untwisted for more than 12.7 mm. The cable conductor's entry shall be at the center of the IDC module and the module shall be wired from the center to the outside.

14.11.2 IDC Wiring System

The IDC blocks shall be used for the voice cross connect and should be 19" rack mountable type.

The IDC blocks shall be capable of terminating up to 100 pairs.

Shall be capable to terminate 22/24 AWG solid conductors or 22/24 AWG stranded conductors.

Shall be made of high impact UL 94V0 rated thermoplastic.

Maximum insulated conductor outside diameter 0.05"

Complete kit including connecting blocks, labels and label holders shall be used.

Jumper troughs shall be used to route cable horizontally and vertically.

The IDC connectors must be color coded to meet both T568A and T568B wiring Configuration. The IDC connector on the back of the patch panel shall support 22 to 25 AWG solid conductor cables.

14.11.3 Telephone Junction Box.

The telephone Junction Box (TJB) shall be made of 16 SWG sheet steel, antirust treated and painted to match the wall color, suitable for recess mounting and shall be of appropriate size to accommodate terminal strips with adequate space available for wiring. The terminal strip shall be made of copper, soldered type with suitable capacity for terminating all incoming and outgoing cables including direct lines. The strip shall be installed on insulated material sheet inside the sheet steel box.

The TJB shall be provided with a lockable hinged door, fastened to the steel outer Box by means of nuts and bolts.

14.12 Diesel Generator

To continue feeding electrical energy to specified main distribution board during main failure hours, an emergency diesel generating set shall be provided and installed in Generator Room as shown on the drawing. The installation shall be complete with all necessary auxiliary equipments, control and protective gears, oil tank and related piping, exhaust piping and control cabling to provide a complete operational system of emergency power supply.

14.12.1 Rating

The prime power diesel engine driven generating set shall have the following rating and electrical characteristics:

- | | | |
|----|-------------------------|--|
| a. | Generating Capacity | (Prime Power Rating) As indicated in the BOQ |
| b. | Voltage 400 Volts, + 5% | |
| c. | System 3 Phase 4 wire | |
| d. | Frequency 50 Hz, + 2% | |



- e. Number of revolutions 1500 RPM

14.12.2 Special Requirements

The generating set shall be designed in such a way that the capacity shall be sufficient to give 10% overload for one hour in any period of twelve hours operation.

14.12.3 Operation Description

The A.C. diesel engine driven electric generating set shall be arranged for electric starting mains within limits, the set shall stay in standby position.

It shall automatically start and supply power to the load within approximately 0 to 5 Second of the complete cessation of mains supply failure on one or more phases, or when the voltage is reduced by 20% of nominal, and automatically shut down the plant and retransfer the load back to the mains supply to stabilize before retransfer of the load takes place, and shall be adjustable over the 110 minute range.

14.12.4 Alternator Specifications

- a) The alternator shall be continuously rated and be of steel construction. It shall be A.C. Brushless type. The bearings shall be grease lubricated or roller bearings.
- b) The rotor shall consist of dynamically balanced salient pole revolving field. The poles shall be equipped with damper windings. The field coils shall be to withstand high centrifugal stresses without developing any damage. Rotor insulation shall conform to Class H.
- c) The stator core shall be made from high grade laminated silicon steel and carefully tightened to prevent occurrence of magnetic vibrations. The stator windings shall be provided insulation conforming to Class F. All windings shall be fully impregnated for tropical climates with high quality oil resistant varnish.
- d) The A.C. exciter shall have permanent magnets in its field ensuring positive voltage buildup. The rectification shall be affected by a suitably rated silicon diode assembly overhung to the shaft. The rotating rectifier assembly shall be built to withstand vibration and centrifugal forces.
- e) The inherent characteristics of the alternator shall be such to maintain the output voltage under all conditions of load, power factor and temperature, within the limits of $\pm 5\%$ of nominal.
- f) The alternator shall have self contained excitation system with transistorized automatic voltage regulator. The automatic voltage regulator and control gear shall be mounted in a component box on the side of the machine using ant vibration mounting. Electrical connections to the voltage regulator shall be taken through a multi-way plug and socket.
- g) The alternator shall be screen protected and drip proof. It shall have efficient cooling system using centrifugal fans. It shall be provided with a large terminal box for outgoing cable connections.
- h) The alternator shall be able to suppress radio or television interference in accordance with BS 800. Line voltage waveform shall contain not more than approximately 2% total harmonic contents.
- i) The temperature rise and performance shall comply with BSS 2613/1957.



14.12.5 Alternator Protection

Alternator protection shall be incorporated to shut down automatically the set with a visual cum audio alarm of the following conditions:

- a. Over / Short circuit current
- b. Over and under voltage.
- c. Over and under frequency
- d. Reverse power
- e. Rotor ground fault protection

14.12.6 Diesel Engine Specifications

- a) The engine shall be 6 cylinder, 4 stroke, direct injection, continuously rating as in the BOQ, water cooled industrial diesel engine.
- b) The engine shall withstand a 10% overload for a period of 1 hour (in 12 hours) in accordance with BS 5514).
- c) c. An engine driven pump shall circulate the lubricating oil under pressure and full flow filters with replaceable elements shall be fitted.
- d) An inline fuel injection pump and a diaphragm type lift pump with full filters with replaceable element and a fuel solenoid shall be provided.
- e) e. Governing shall conform to Class A limits of BS 649/1958 and an electronic Governor shall be provided.

14.12.7 Engine Protection Equipments Engine protection equipment shall be incorporated to shut down automatically the set with a visual cum audio alarm of the following conditions:

- a. Low lubricating oil pressure (Below a safe working value).
- b. High cooling water temperature
- c. Engine Over speed.
- d. With fuel oil level down engine protection system shall develop visual cum audio alarm.

14.12.8 Genset Control Panel The control panel shall be electronic solid state type. Automatic start Engine management and instrumentation system module in cubical is installed on **individual** bracket with anti-vibration isolator, with instruments and graphical icon in LCD display as follows.

- a. Generator running indicator.
- b. Voltage adjuster.
- c. Emergency stop button
- d. Selector Switch with key (STOP / RESET, AUTO, MANUAL).
- e. Manual start button.
- f. Common alarm indicator
- g. Scroll button for the display on LCD.
- h. Value display on LCD.
 - ✓ Frequency / RPM.
 - ✓ AC voltage Line Neutral.
 - ✓ AC voltage Line Line.
 - ✓ AC line current.
 - ✓ Oil pressure. Coolant temperature.
 - ✓ Engine hours run. DC battery voltage.



- i. Alarm indication with graphical symbol on LCD.
- j. Status indicator.
- k. Remote communication via RS 232 or RS 485 “modbus” output

14.12.9 Mechanical Coupling

- a. The Diesel Engine and A.C. brushless Generator shall be coupled with each other by means of flexible coupling complete with all necessary control equipment mounted on a substantially fabricated type steel base.
- b. The generator end shield and the engine flywheel housing faces shall be fully machined with spigots concentric to their shafts. A fabricated steel coupling ring with both faces machined shall be flange mounted to the flywheel housing and generator end shield by steel bolts.
- c. A flexible coupling shall be fitted between the engine and generator to provide the drive and shall be suitable to absorb the transmissions of shock loads.
- d. The distortional flexibility shall be designed to match the distortional characteristics of the system to prevent resonant conditions.

14.12.10 Mounting Description

The combined engine generator unit shall be bolted to a separate sub-frame which shall be attached to the main frame through 'Resilient Mountings including vibration isolator so providing complete protection from the engine vibration to the control gear, and other set mounted components.

14.12.11 Cooling System

- a. The diesel engine shall be water cooled. The cooling water shall be circulated by a centrifugal pump through a tropical duty radiator, cooled by a reverse flow fan.
- b. A fan cowl and hand protection guard shall be fitted.
- c. A thermostat shall be pass the coolant, until a predetermined operating temperature is reached.
- d. An immersion heater shall be incorporated in the cooling system.
- e. In order to provide sufficient air flow along the radiator a canvas / G.I air duct shall be made from the radiator to the outside wall with out any extra cost of the owner.
- f. The SUBCONTRACTOR shall provide all material and labor that is necessary to achieve purpose.

14.12.12 Starting System

- a. The starting system shall consist of a heavy duty starter motor and starter switch, a set of 24 volt heavy duty lead acid starting batteries of adequate capacity, all arranged for automatic electric starting.
- b. The starter motor shall automatically disengage when the engine shall fire. There shall be three automatic starting attempts before the starting batteries are, should the engine fail to start due to shortage of fuel, etc.
- c. Battery charging shall be provided from a suitable single phase full wave rectification static charger. Charger shall be complete with all necessary relays, cutouts, controls



- switches and instruments for automatic charging of batteries.
- d. The batteries shall be housed in a cradle on the main base frame.

14.12.13 Genset Grounding

The genset frame shall be grounded at two points by two independent earth protected conductor and it is necessary to bond to a grounding electrode. The genset neutral earthing shall be done with PVC insulated cables and connect to grounding electrode. Earthing resistance shall be less than one ohm.

14.12.14 Exhaust

A large and efficient critical acoustic type silencer with a suitable length of flanged flexible exhaust pipe shall be installed. The pipe shall be of suitable dimensions to fit direct in the exhaust manifold to allow for the free movement of the engine alternator and to give some isolation from vibration to the surrounding fabric. The exhaust pipe shall be thermal insulated and brought outside the building to a suitable height and have a rain cap at the other end.

14.12.15 Finish

- a) All sheet steel used shall be zinc coated.
- b) The set shall be painted with good quality primer and finished with high gloss paint.

14.12.16 Accessories

The AC diesel engine driven electric generating set shall be supplied with the following accessories and manuals.

- ✓ One Kit of engine tools.
- ✓ One Set of holding down bolts.
- ✓ Three sets of installation drawings.
- ✓ Three sets of circuit diagram.
- ✓ Three sets of engine maintenance book.
- ✓ Three sets of spare parts manual.
- ✓ Three sets of generating set instruction manual.

14.12.17 Fuel Storage Tank

- a. A fuel storage tank with a capacity of as specified in the BOQ shall be provided inside the building. The tank shall be complete with fill pipe with connection and vent pipe with cap.
- b. The tank shall be provided with fuel level gauge.
- c. 25 mm diameter schedule 40 pipe with socket, elbow and valve etc. for fuel filling from outside the building to fuel storage tank and fuel storage tank to genset skid base tank.
- d. The fuel storage tank shall be sheet steel of 10 Gauge.
- e. Filling pipe with valve and flange shall be provided.

The overflow pipe going back from fuel tank to the Genset Skid tank shall be of 50mm diameter.

14.12.18 Generator Tests

A manufacturer's standard test report/certificate shall be submitted, which shall include the following as a minimum:

- a. Load test temperature rise
 - 25 % load ½ hour
 - 50 % load ½ hour



100 % load 1hour

110 % load 1hour

- b. Operation of automatic starting, control sequence and all protection circuit/sensor.
- c. Prior to acceptance of installation, the equipment shall be subjected to an onsite test with full load for a minimum period of 8 hours, plus one hour at 110% load.

All operating fluids (including fuel, oil, lubricants, coolant etc.) and load banks for the testing shall be provided by the SUBCONTRACTOR, who shall commission the genset, making all initial adjustment and setting required and test all the control and protection function and circuit. Three copies of the witnessed test report shall be submitted to the EMPLOYER.

The SUBCONTRACTOR shall have the kWh meters sealed and the installation approved by the electrical inspector.

14.12.19 Spares

The SUBCONTRACTOR shall submit, in the format given below, a detailed itemized price list of manufacturer' recommended spares for the generator, engine and control panel for 1000 hours in the environmental condition.

Required Spare Parts

Type No.	Description	Qty Set	Rate (Rs)	Amount (Rs)
	<u>Engine:</u>			
	Fuel filter	4 sets		
	Oil filter	4 sets		
	Air filter	1 set		
	Water filter	4 sets		
	Fan belt	1 set		
	Water pump belt	1 set		
	Alternator belt	1 set		
	Rocker cover gasket	2 sets		
	Gasket	2 sets		
	<u>Alternator & Panel:</u>			
	AVR	1 set		
	Forward diodes	3 set		
	Reverse diodes	3 set		
	Fuses 2 amp	5 Nos		
	Fuses 6/8 amp	5 Nos		
	Fuses 10 amp	5 Nos		

Total = _____

14.13 Automatic Transfer Switches

14.13.1 PART1 GENERAL

14.13.1.1 Scope Furnish and install automatic transfer switches (ATS) with number of poles, amperage, voltage, and withstand current ratings as shown on the plans. Automatic transfer switch shall consist of an inherently double throw power transfer switch unit and a microprocessor controller, interconnected to provide complete automatic operation.

14.13.1.2 General Notes All system designs and installations of ATS unit must be done in accordance



with all applicable electrical regulation codes and practices as required. Supplier shall be responsible for ensuring the compatibility of all components of the unit. The unit shall be free of defects in material and workmanship. The automatic transfer switch assembly shall be rated for 100% continuous load without derating. The current rating shall be based on all classes of load including resistive and motor loads. The unit shall be installed with ambient temperatures between +10 degrees and +50 degrees Celsius, relative humidity from 095% no condensing. All materials and parts used in the unit shall be new, of current manufacture, of best industrial grade, and free from defects and imperfections. The transfer switch mechanism shall provide a simple means of manual operation using only components, which are permanently affixed, in the operating position. The automatic transfer switch design shall provide front accessible components and wiring for easy serviceability. Power or control connections, which are not readily serviceable while the transfer switch is mounted in its enclosure, are not acceptable. All power contacts used shall operate in a quick make / quick break manner, the speed of which shall be independent of supply voltage and / or speed of operation by manual means.

14.13.1.3 Codes and Standards The automatic transfer switches and accessories shall conform to the requirements of:

- a. NFPA 70 National Electrical Code
- b. NFPA 99 National Electrical Code
- c. NFPA 110 Emergency and Standby Power Systems
- d. IEEE Standard 446 IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
- e. International Standards Organization ISO 9001

14.13.2 PART 2 PRODUCTS

14.13.2.1 Mechanically Held Transfer Switch

- a) The transfer switch unit shall be electrically operated and mechanically held. The Electrical operator shall be a single solenoid mechanism, momentarily energized. The switch shall be mechanically interlocked to ensure only one of two possible Positions, normal or emergency.
- b) The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.
- c) All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented blow on construction for high withstand current Capability and be protected by separate arcing contacts.
- d) Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors.
- e) Designs utilizing components of molded case circuit breakers, contactors, or parts thereof which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.

14.13.2.2 Microprocessor Controller with Membrane Interface Panel

- a) The controller shall direct the operation of the transfer switch. The controller's Sensing and logic shall be controlled by a built in microprocessor for maximum reliability, minimum maintenance, and inherent serial communications capability. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance.



- b) The controller shall be enclosed with a protective cover and be mounted separate from the transfer switch unit for safety and ease of maintenance. Sensing and control logic shall be provided on printed circuit boards. Interfacing relays shall be industrial grade plugin type with dust covers.
- c) The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:
 - i. ANSI C37.90A/IEEE 472 Voltage Surge Test
 - ii. NEMA ICS – 109.21 Impulse Withstand Test
 - iii. IEC8012 Electrostatic discharge (ESD) immunity
 - iv. ENV50140 and IEC 801 – 3 Radiated electromagnetic field immunity
 - v. IEC 801 – 4 Electrical fast transient (EFT) immunity
 - vi. ENV50142 Surge transient immunity
 - vii. ENV50141: Conducted radiofrequency field immunity
 - viii. EN55011: Group 1, Class A conducted and radiated emissions
 - ix. EN61000 –4 – 11 Voltage dips and interruptions immunity
- d) Controller shall be flush mounted display with LED indicators for switch position and source availability. It shall also include test and time delay bypass switches.

14.13.3 PART 3 OPERATION FUNCTIONAL REQUIREMENTS

14.13.3.1 GENERAL DESCRIPTION The automatic transfer switch shall automatically transfer the load to the generator supply in the event of a utility supply failure and return the load to the utility supply upon restoration. The automatic transfer switch power switching devices shall be mechanically and electrically interlocked to prevent the utility and generator supplies from being interconnected.

- a. The voltage on any phase of the utility supply is below preset levels of rated voltage for a preset time delay, a contact shall close to initiate starting of the generator set.
- b. The load shall transfer to the generator supply when the generator voltage and frequency have reached acceptable preset levels and the warm up time delay has expired.
- c. When the utility supply is restored to above preset levels of rated voltage on all phases, load transfer from generator to utility supply shall be initiate following expiry of the utility return timer.
- d. Once the transfer mechanism operates and opens the generator power switching device, the transfer mechanism shall stop in the neutral position (i.e. with both power switching devices open) for the duration of the neutral delay timer setting to allow load voltage to decay prior to reconnecting the utility supply.
- e. The load shall be reconnected to the utility supply once the neutral delay timer expires and the transfer mechanism continues operation and closes the utility power switching device.
- f. The load shall immediately retransfer to the utility supply (if within acceptable limits) should the generator supply fail prior to expiry of the utility transfer delay.
- g. The generator set shall continue to operate following a load transfer for a cool down delay period, and then a contact shall open to stop the generator set.

14.13.3.2 Voltage and Frequency Sensing

- a. The voltage of each phase of the normal source shall be monitored, with pickup ad



- justable to 95% of nominal and dropout adjustable from 70% to 90% of pickup setting.
- b. Single phase voltage and frequency sensing of the emergency source shall be provided.

14.13.3.3 Time Delays

- a. An adjustable time delay shall be provided to override momentary normal source outages and delay all transfer and engine starting signals.
- b. An adjustable time delay shall be provided on transfer to emergency, adjustable from 0 to 5 minutes for controlled timing of transfer of loads to emergency.
- c. An adjustable time delay shall be provided on retransfer to normal, adjustable to 30 minutes. Time delay shall be automatically bypassed if emergency source fails and normal source is acceptable.
- d. A 5minute cool down time delay shall be provided on shutdown of engine generator.
- e. All adjustable time delays shall be field adjustable without the use of tools.

14.13.3.4 Additional Features

- a. A start signal shall be provided for an engine start. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source re-stores before the load is transferred.
- b. A pushbutton type test switch shall be provided to simulate a normal source failure.
- c. A pushbutton type switch to bypass the time delay on transfer to emergency, the engine exerciser period on the retransfer to normal time delay whichever delay is active at the time the pushbutton is activated.
- d. Terminals shall be provided for a remote contact which opens to signal the ATS to transfer to emergency and for remote contacts which open to inhibit transfer to emergency and/or retransfer to normal.
- e. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of one contact, closed when the ATS is connected to the normal source and one contact, closed, when the ATS is connected to the emergency source.
- f. Indicating lights shall be provided, one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red). Also provide indicating lights for both normal and emergency source availability.
- g. Terminals shall be provided to indicate actual availability of the normal and emergency sources, as determined by the voltage sensing pickup and dropout settings for each source.

14.13.4 PART 4 ADDITIONAL REQUIREMENTS

14.13.4.1 Tests and Certification

- a. The complete ATS shall be factory tested to ensure proper operation of the Individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the specification requirements.



- b. Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards, and withstand and closing ratings.

14.13.4.2 Service Representation

- a. Ease of maintenance and parts replacement, the switch nameplate shall include drawing numbers, part numbers for main coil and control.

14.13.4.3 ENGINEERING SUBMITTALS The following documentation shall be made available for submission to the EMPLOYER for review/approval purposes on the automatic transfer switch:

- Physical Layout Drawing
- Outline dimensions, cable entry/exit locations, interior/exterior
- Component layouts, connection data.
- Electrical Schematic
- Internal wiring, customer connection terminals, optional components,
- Controller settings.
- Product Data Sheets
- Equipment Ratings.

14.13.4.4 EXECUTION

14.13.4.4.1 FACTORY TESTING The automatic transfer switch shall be factory tested prior to delivery to the purchaser. The following tests shall be conducted by qualified factory personnel:

- a. Visual Inspection: Electrical and Mechanical inspections to verify Installed components are of correct ratings; meet the requirements of the project specifications and to ensure regulatory and quality requirements are met.
- b. Mechanical Tests: As a minimum, the following mechanical tests shall be performed on the transfer switch:
- i. Power Conductor Torque Verification
 - ii. Verification of Mechanical Interlock
 - iii. Manual ATS Mechanism Operation/Adjustment
 - iv. All Mechanical Fasteners/Wire Connections Tight
- c. Electrical Tests: As a minimum, the following electrical tests shall be Performed on the transfer switch.
- i. Adjustment/Setting All Timers & Voltage Sensors
 - ii. Verification of Electrical Interlock
 - iii. Function Test Normal Operation 3 Complete Cycles
 - iv. Mechanism Adjustment
 - v. Dielectric Test
- d. Final Inspection: As a minimum, the following final inspection tasks shall be performed on the transfer switch:
- i. Calibration Label/Equipment labels Installed & Correct
 - ii. All safety/warning labels attached
 - iii. All wiring straight, neatly bundled and adequately protected.
 - iv. Enclosure is clean, no paint imperfections
 - v. Final Documentation is Enclosed (Drawing, O&M Manual)
- e. The transfer switch manufacturer shall provide upon request of the project EMPLOYER.



ER, four (4) copies of as built drawings, certified Factory Test Reports for the transfer switch supplied.

14.13.4.4.2 Field Testing/Commissioning

The automatic transfer switch shall be tested once installed at the project site to confirm proper operation of the system. Schedule and witness testing activities shall be coordinated with the EMPLOYER, the SUBCONTRACTOR, and the OWNER as required in advance of the testing. Qualified local factory trained field service representatives shall conduct the following tests:

- a. Visual Inspection: Electrical and Mechanical inspection to verify the installation is correct as recommended by the transfer switch manufacturer and as per NEC/CEC standard.
- b. Mechanical Tests: As a minimum, the following mechanical tests shall be performed on the transfer switch:
 - c. Power Conductor Torque Verification
 - d. Verification of Mechanical Interlock
 - e. Manual ATS Mechanism Operation.
 - f. All Mechanical Fasteners/Wire Connections Tight
 - g. Confirmation of correct transfer switch voltage, current and withstand ratings as is required for the application
- Electrical Tests: As a minimum, the following electrical tests shall be performed on the transfer switch:
 - h. Meggar Testing the Power Cabling to the transfer Switch
 - i. Verification of correct power cabling phasing and phase rotation, prior to energization. Confirmation of settings for all Timers & Voltage Sensors
 - j. Full Function Test Normal Operation 3 Complete Cycles of failing the utility supply, and transfer load to/from the generator set.
 - k. Verification of all Test Modes operate correctly
 - l. Qualified factory trained field service personnel shall provide upon request of the EMPLOYER four (4) copies of field test reports noting any deficiencies that require corrective action.

Perform automatic transfer tests:

- i. Simulate loss of normal/preferred power.
- ii. Return to normal/preferred power.
- iii. Simulate loss of emergency power.
- iv. Simulate all forms of single phase conditions.

Verify correct operation and timing of the following functions:

- a. Normal source voltage sensing relays.
- b. Engine starts sequence.
- c. Time delay upon transfer.
- d. Alternate source voltage sensing relays.
- e. Automatic transfer operation.
- f. Interlocks and limit switch function.



- g. Time delay and retransfer upon normal power restoration.



Annexure "A" to B.O.Q

List of Approved Manufacturers and Suppliers for Electrical Works

The SUBCONTRACTOR shall use material only from the following approved manufacturers in the works. The SUBCONTRACTOR shall provide samples / literature etc. of the items to the EMPLOYER for all material for his selection and approval.

S.No.	Equipment / Material	Make	Country of Origin	Manufacturer / Supplier	Telephone
1	Main Panel Boards, Distribution Boards		Pakistan Pakistan Pakistan Pakistan	JEL, Lahore Sunbeam, Karachi Hussain & Co., Karachi Libra, Karachi Electrech, Lahore	04235714333 0210561083 0216340930 04251228845 0424221938
2	Moulded Case Circuit Breakers	TERASAKI MITSUBISHI Legrand MG ABB	Japan Japan France France	Jubilee Corp., Karachi Prince Electric Co.,Lahore Shahid International, Lahore Sh. Wilayat & Sons, Karachi ABB (Pvt) Ltd, Pakistan	111000520 5752323 7670980 2623081 43021014
3	Miniature Circuit Breaker	TERASAKI MITSUBISHI Legrand MG ABB	Japan Japan France France	Jubilee Corp., Karachi Prince Electric Co.,Lahore Shahid International, Lahore Sh. Wilayat & Sons, Karachi ABB (Pvt) Ltd, Pakistan	111000520 5752323 7670980 2623081 43021014
4	Current Transformers	Fico Frer Siba	Pakistan Italy Germany	Sh. Wilayat & Sons, Karachi Rachena Corporation, Lahore InPro, Lahore.	2623081 577470003 668583940
5	Ammeters (Digital) Voltmeters (Digital)	Autonics EMZED F & G Entes Frer Lumel	S. Korea Australia Turkey Italy Poland	Jubilee Corp. Karachi EMZED Engg. Karachi Shahid International, Lahore Rechena Corporation, Lahore InPro, Lahore	111000520 5880856 7670980 577470003 668583940
6	Selector Switches (Ammeter Selector) ASS (Voltmeer Selector) VSS	Kelvin & Breter Kraus & Niamer BREMAS MERZ	Italy Nland Italy Germany	Sh. Wilayat & Sons, Karachi Jubilee Corp., Karachi EMZED Engg., Karachi InPro, Lahore.	2623081 111000520 5880856 668583940

S.No.	Equipment / Material	Make	Country of Origin	Manufacturer / Supplier	Telephone
7	Instrument Protection Fuses	Legrand SO-COMEC Kaleporselen Siba	France France Turkey Germany	Shahid International, Lahore Sh. Wilayat & Sons, Karachi Jubilee Copr. Karachi Rachena Corporation, Lahore or InPro, Lahore	7670980 2623081 111000520 577470003 668583940
8	Indication Lamps	Fuji Legrand Maruyasu GE	Japan France Japan Europe	Sh. Wilayat & Sons, Karachi Shahid International, Lahore Jubilee Corp. Karachi InPro, Lahore	2623081 7670980 111000520 668583940
9	Wiring Terminals	CIAMA Legrand Cabur GE	Spain France Italy Europe	Sh. Wilayat & Sons, Karachi Shahid International, Lahore Rachena Corporation, Lahore InPro, Lahore	2623081 7670980 577470003 668583940
10	Low tension Cables, Single Core & Multi Core	Pakistan Cables Pioneer Cables Newage Cables AGE	Pakistan Pakistan Pakistan Pakistan	Pakistan Cables, Karachi Pioneer Cables, Lahore Newage Cables, Lahore AGE Cables	7120791 7235741 111777300 2419275
11	Wiring Accessories (Switches, Sockets)	Clipsal Legrand MK	Australia France UK	Clipsal, Pakistan Shahid International, Lahore EZZI Engineering	111081081 7670980 583254041
12	ON / OFF Push Buttons	Fuji Legrand Maruyasu	Japan France Japan	Sh. Wilayat & Sons, Karachi Shahid International, Lahore Jubilee Corp. Karachi	2623081 7670980 111000520
13	PVC Conduits, Ducts & accessories	BetaGalcoDa dexAdamjee	Pakistan Pakistan Pakistan Pakistan	Shafi Sons, Lahore Laiq & Sons Zaka Traders	5880151242965 62764608
14	Fans (Ceiling, Bracket, Exhaust)	Millat Asia Climax Pak Fan	Pakistan Pakistan Pakistan Pakistan	Metalax Corp. Karachi Anwar Industries Gujranwala Climax Industries Gujranwala	2561429 82270 80470
15	Accessories for	3M Panduit	USA USA	3M Pakistan	111225536 5671

S.No.	Equipment / Material	Make	Country of Origin	Manufacturer / Supplier	Telephone
	Computer System	Clipsal Datacom Siemens	Australia Germany	Panduit Pakistan Clipsal, Pakistan Siemens Pakistan	50672789 5635960
16	G. I Pipes	IIL Pakistan Hilal	Pakistan Pakistan	Laiq & Sons Laiq & Sons	2732464 2732464
17	Light Fixture	Philips Pierlite		Philips, Pakistan Clipsal, Pakistan	2560081 111081081
18	Cable Trays	EZZI Engineering Electroline	Pakistan Pakistan	EZZI Engineering Electroline	5832540 5869201
19	Fire Alarm	Simplex Honey Well Secutron		Tyco EZZI Engineering Pak Security & Safety	5832540 4528541
20	Telephone Cable	Pakistan Cable Siemens Pony	Pakistan Germany Japan	Pakistan Cables, Karachi Siemens Pakistan Memon Associates	7120791 5635960 7729275
21	Generator Set	Caterpillar Cummins F. G Wilson	USA UK USA	Allied Engineering & Services Ltd. Cummins Pakistan S. M Jaffer	111250250 45396035 111765765

LIST OF APPROVED MANUFACTURERS AND SUPPLIERS FOR PHOTO VOLTAIC SYSTEM	
EQUIPMENT	SUPPLIER CONTACT
DC Ceiling Fans	www.nextekpower.com
Solar Equipment	Trillium Pakistan (Pvt) Ltd 10th Floor, AWT Plaza. 5The Mall, Rawalpindi 05155241812 Contact: Maj (R) Shahid Mahmood Afzal Akhter Computers (Pvt) Ltd Suite No. 405, 4th Floor, Saddar, Rawalpindi 0515111221 Contact: Sharjeel Ahmed Sulehri Petrocon (Pvt) Ltd 76W, 2nd Floor, Umar Plaza Jinnah Avenue, Blue Area, Islamabad 44000, Capital, Pakistan Phone: 92512878853 / 2878851 / 2878852 / 4449953 Fax: 92512878850

14.14 HVAC WORKS

14.14.1 SHEET METAL DUCTWORK AND ACCESSORIES

a. Sheet Metal

Sheet metal ductwork shall be constructed of galvanized sheet steel conforming to ASTM A-366B2T and zinc coating shall conform to ASTM 52664T.

Rectangular Ducting shall be fabricated according to the following dimensions:

LARGEST DIMENSIONS
OF DUCTING
MM (INCHES)

U.S.S.
GAUGE. MM

NOMINAL
THICKNESS



Up to 675 (27")	24		0.70
7001275 (2851)		22	 0.85
13002025 (5281)		20	 1.00
Above 2025 (81)		18	 1.31

b. Installation

i. General

Sheet metal ductwork shall be constructed have galvanized sheet steel conforming to ASTM A366B2T. Unless otherwise approved ducts shall conform accurately to the dimensions indicated and shall be straight and smooth on the inside, with joints neatly finished. Ducts shall be secured to the structural slab in the building, and the method of anchoring and/or fastening is as detailed on the drawings. Ducts shall be constructed and installed so as to be completely free from vibrations under all conditions of operation. Layout drawings required under the clause Approval of Materials and Equipment shall show, for suspended ductwork, the location of all supports typical details for anchorage and details for special anchorage.

ii. Duct Construction

- a.** Joints for low velocity ducts shall be made substantially airtight, and no duct marks from air leaks shall show at duct joints, or connections to grills, registers and diffusers.
- b.** Laps at the joints for low velocity systems shall be made in the direction of airflow. Button punch or bolt connections in standing seams shall be spaced at fixed centers not greater than 150 mm (6"). Horizontal locks or seams of the type known as Button Punch Snap Lock, may be used in lieu of Pittsburgh Lock on low velocity systems.
- c.** Transformations shall be made with sides pitched not to exceed a maximum of 20o, 40o included angle, for diverging air flow, and 30o, 60o included angle, for converging air flow, or as indicated on the drawings.
- d.** Other details for duct construction: Casing construction, access doors, hangers and supports, duct joints, volume dampers, penetration of casing, casing curb detail, and hood construction shall be as indicated on the drawings or as indicated by the EMPLOYER. Ducts shall be connected to intake and exhaust louvers, rainhoods or goosenecks. Details of connections shall be as indicated, or directed by the EMPLOYER. All connections of ducting to package airconditioning units, dampers, plenums, etc. shall be through removable flanges. Installation of items not shown in detail or not covered by detailed specification shall be as set forth in the SMACNA Publications "Low Velocity Duct Construction Standards".

iii. Bracing shall be done as per following table:



Ducting Dimensions – Inches**Size of Bracing Angle**

Up to 23" larger dimensions

None

24" – 30" larger dimensions Joints at 4 ft. centre without bracing or joints at 8 ft. centre with 1" x 1/8" bracing between joint.

31" – 42" larger dimensions 1" x 1" x 1/8" – 4 ft.

Centre

43" – 72" larger dimensions 1.5" x 1.5" x 1/8" – 4 ft.

Centre

73" – 84" larger dimensions 1.5" x 1.5" x 1/8" – 4 ft.

Centre

85" – 96" larger dimensions 1.5" x 1.5" x 3/16" – 4 ft.

Centre

iv. Duct Hangers

Duct hangers shall be installed as per the table given below:

Larger Duct Dimension Spacing	Angle Size	Maximum
Up to 30"	1" x 1" x 1/8"	10' – 0"
31" – 60"	1" x 1" x 1/8"	10' – 0"
61" – 84"	2" x 2" x 1/8"	8' – 0"
85" – 96"	2" x 2" x 3/16"	8' – 0"
Over 97"	2" x 2" x 1/4"	6' – 0"

The above table shows the maximum spacing of hangers. Hangers shall however be installed at every change of direction, at volume control damper, at other duct mounted accessories location and where necessary to support the duct suitably.

v. Flexible Duct Connections (Expansion Joint)

Flexible duct connections as specified elsewhere shall be fitted wherever ducts at suction and discharge end of Fans where ducts are connected to such unit, and or wherever shown on the drawings.

Details of flexible connections and bases shall be submitted to the EMPLOYER for approval.

14.14.2 Exhaust Fans:**a. General:**

The SUBCONTRACTOR shall supply and install fans of the type and capacity specified in drawings and conforming to the specifications given herein. The SUBCONTRACTOR shall be responsible for the proper selection of the fans so that the specified operating conditions are obtained. Motor shall be sized to provide the required BHP for meeting the specified conditions without overloading.

b. Propeller Fans

Propeller Fans shall be supplied of the quality indicated on the drawings. Propeller fans shall operate on 220V/1 phase/50 Hertz A.C. current. Fans shall be directly mounted or



the motor, and shall operate without disturbing noise, during normal operation. The discharge side of the fan shall be provided with selfclosing shutters.

c. Centrifugal Fans

Shall be capable of delivering the specified capacity against the specified static pressure. Scroll shall be fabricated of heavy gauge steel, completely welded for maximum duty and leak proof construction. Fan wheel shall be of aluminium and have backward curved blades, rigidly constructed with nonoverloading characteristics, and shall be balanced both statically and dynamically, and shall be free from objectionable noises and vibration. Sealed permanently lubricated, sleeve, roller or ball bearings shall be provided. Spring type vibration isolators shall be provided. Fan shall be provided with 1450 rpm motor with weather proof enclosure, suitable for 220V, 1 phase, 50 Hertz. Fan shall be directly mounted on the motor, and shall be operated without disturbing noise, during normal operation.

d. Installation

i. General

Propeller fans and Centrifugal fan as shown on drawings shall be installed by the SUBCONTRACTOR, complete in all respects and as per satisfaction of the EMPLOYER. Fans shall be rigidly secured so that they operate without vibration and transmission of vibration to the structure shall be through isolated. Connection to ducting shall be through flexible connectors. Ducting connection to fan shall ensure lowest turbulence and smooth transition of sizes. All supporting arrangements of the fans shall be drawn up by the SUBCONTRACTOR and submitted to the EMPLOYERS for approval.

ii. Commissioning and Testing

The fans shall be commissioned and tested by the SUBCONTRACTOR.

14.14.3 Split Room Air Conditioning Units

General

Units to be in two parts indoor & outdoor units, including filters, evaporator coils, compressors, condenser coils, and fan section. Units to require only connection of single phase power, refrigerant piping, remote sensors, control wiring.

Provide units prepiped, prewired, factory assembled and factory tested, with all controls protested prior to shipping.

Provide a terminal strip with each electrical component individually and separately wired to strip.

Provide a separate fuse, internally mounted, for each electrical component. A single fuse for multiple compressors or fan motors will not be accepted.

a. Indoor Unit

i. Cabinet, Casing and Frame



Unit framework to be formed of structural steel members of 12 to 14 gauge mild steel. After assembly paint the framework for maximum protection against rust. Exterior panels to be fabricated of 18 gauge galvanized steel finished with a baked acrylic enamel over an epoxy primer. Provide neoprene gasketing between panels and frame members; panels to be attached to the frame with quick release latches (no sheet metal screws). Insulate sections including compressor compartment with 1" thick, 3lb./cu. ft. density fiberglass having an R value of 4.16.

Arrange units for full front, side and rear service access to all mechanical, electrical and refrigeration controls, check out of electrical control panel, without disrupting or interfering with air flow.

ii. Supply Fan and Motor

Provide single width, forward curved Class I & II supply fans secured to a machined, ground and polished solid steel shaft. Coat shaft with a rust inhibitor and support by two outboard bearings selected for a minimum 200,000 hours average life.

Provide single phase NEMA design 'B', 40qC continuously rated fan motor with energysaving design, .85 power factor, NEMA 'T' frame, open dripproof, operating at 1750 rpm and supplied with greaselubricated ball bearings.

Direct Expansion Coil Provide direct expansion coil with ½" OD seamless copper tubes expanded into aluminum fins, not less than 3 rows deep or more than 12 fins per inch. Provide evaporator coil with a distributor with side port for hot gas bypass and thermostatic expansion valve with adjustable superheat and external equalizer. Test coil at 300 PSIG air pressure under water, completely dehydrate and pressure test with refrigerant.

Provide coils with heavy gauge, insulated, galvanized steel drain pans complete with mastic coating for corrosion protection.

Filters Provide filters having a 40% ASHRAE dust spot efficiency, U.L. Class I pleated media type 2inch deep.

Evaporator Defrost Thermostat Provide defrost thermostat package with enclosure, wiring and hardware for field installation.

b. Condensing Unit

i. General

Provide units prepiped and prewired, factory assembled and factory tested, with all controls pretested prior to shipping.

Design units for use with Refrigerant 22.

Assemble all condenser components on a common base in a weatherproof housing. Provide condenser coil, condenser fans and motors, refrigerant reservoir, charging valve, all controls and holding charge of R22.

Condenser Coil Construct condenser coil of aluminum plate fins, mechanically bonded to seamless copper tubes. Circuit coil for subcooling. Test coils to 425 psi.



Condenser Fans and Motors Furnish directdriven, propellertype beltdriven, centrifugal fans arranged for vertical horizontal discharge. Provide condenser fan motors of the permanently lubricated type, resiliently mounted. Provide a safety guard for each fan. Include controls for cycling fans for intermediate season operation and low ambient control. Balance each fan statically and dynamically.

- ii. **Controls Locate factory wired controls in a separate enclosure.** Provide high and lowpressure switches and compressor overload devices. Incorporate a positive acting timer to prevent short cycling of compressor if power is interrupted. Timer to prevent compressor from restarting for approximately 5 minutes after shutdown.

Refrigerant Circuits Each refrigerant circuit is to be an independent circuit completely piped, tested, dehydrated and fully charged with oil and green gas refrigerant. The refrigerant circuits are to include compressor, condenser coil with integral liquid subcooler, liquid line service and charging valve, filter drier, and sight glass. Compressor units to include suction and discharge line braidedwire isolators.

Casing Make unit casing fully weatherproof for outdoor installation. Construct casing of galvaneal steel, zinc phosphatized and finished with baked enamel.

- c. Provide openings for power and refrigerant connections. Make panels removable for servicing. Provide heavy duty coil guards, unit mounting rails and drain holes.

d. Execution

Provide refrigerant piping and accessories to connect condensing units condensers to indoor air conditioning units according to manufacturer's instructions.

e. Startup and Testing

- i. Manufacturer's service technician to check alignment of bearings, drives and motors after installation to ensure that no misalignment exists, or make any necessary alignment adjustments prior to startup.
- ii. The manufacturer shall furnish a start up check list to the Owner at least two months prior to start up. The list must be explicit as to the various items to be checked prior to start up.
- iii. Before units are started up, manufacturer to pump new grease into bearing housings to force out old grease and provide adequate lubrication.
- iv. Before acceptance of the equipment by the Owner, conduct all tests as required to demonstrate that the equipment operates mechanically, electrically and acoustically as specified.
- v. Conduct a satisfactory performance test in the presence of the Owner. Any units found to vibrate beyond acceptable levels must be rebalanced in the field at the SUBCONTRACTOR'S expense.

14.14.4 Condensate Drain Piping



a. General

Drain, piping shall be UPVC classD pipe & fitting by Dadex or approved equivalent.

b. Installation

- i. Pipes shall be cut accurately to measurements established at the job site and worked into place without springing or forcing, properly clearing all windows, doors and other openings. Excessive cutting or other weakening of the building structure to facilitate piping insulation will not be permitted without written approval. Layout drawings required under the title of "APPROVAL OF MATERIAL AND EQUIPMENT" shall show locations of all supports, the load imposed on each fastening or anchor, typical details for special anchorage, and details for special anchorage for supports attached to metal roof decking, mechanical equipment. Supports shall be attached to metal decking. Where supports are required between structural framing shall be provided and detailed. Pipe shall have burrs removed by reaming and shall be installed to permit free expansion and contraction without damage to joints and hangers. Changes in direction shall be made with fittings, except that bending of pipe bender is used and wide sweep bends are formed. The centerline radius of bends shall not be less than 6 diameters of the pipe. Bent pipe showing kinks wrinkles, flattening or other malformations will not be accepted. All piping shall be installed with sufficient pitch to ensure adequate drainage and venting. Piping connections to equipment shall be provided with unions or flanges. Open ends of pipelines or equipment shall be properly capped or plugged during installation to keep dirt and other foreign matters out of the system.
- ii. Screwed joints shall be used on pipes of diameter 2" and below. Screwed joints shall be with tampered threads properly cut. Joints shall be made tight with a stiff mixture of litharge and glycerin, or polytetrafluoroethylene tape, or approved thread joint compound applied to the male thread only. Not more than three threads shall show after the joint is made up. Flanges and Unions shall be faced true. Flanges shall be provided with 1/16inch asbestos gasket, and made square and tight. Except where copper tubing is used, unions or flanged joints shall be provided in each line immediately preceding the connection to each piece of equipment such as coils, pumps, control valves and other similar items.
- iii. All Anchors, nuts, bolts, screws, fasteners and rivets shall be of HILTI make.

c. Pipe Supports:

- i. General: pipe hangers, brackets, saddles, inserts, clamps and pipe rolls including rods, bolts, turn buckles, bases and protection shields shall conform to standard recommended engineering practice, using stock or production parts wherever possible. Chain, wire, strap or other makeshift devices will not be permitted as hangers or supports. Accurate weight balance calculations shall be made to determine the required supporting force at each hanger location and pipe weight load at each equipment connection. Pipe hangers shall be capable of supporting the pipe in all conditions of operations. They shall allow free expansion and contraction of the piping, and prevent extra stress resulting from transferred weight being included in the pipe or connected equipment. Hangers shall be supported from beams, clamps, concrete inserts Phillips concrete fasteners, and power actuated drive pins. Concrete inserts when used shall be installed in the exact location prior to the pouring of the



concrete.

- ii. Suspended Horizontal Piping: shall be supported by adjustable hangers or supports, which shall provide a means of vertical adjustment after erection. Unless otherwise indicated on drawings maximum spacing between pipe supports for straight runs of pipe shall be in accordance with recommended spacing shown in accordance with recommended spacing shown in the table given below:

Nominal Pipe Size Inches (mm)	0.5 (13)	0.75 (20)	1 (25)	1.5 (40)	2 (50)	2.5 (65)	3 (75)	4 (100)	5 (125)	6 (150)	8 (200)	10 (250)
Maximum Span Feet (Meters)	5 (1.5)	6 (1.8)	7 (2.1)	9 (2.7)	10 (3.0)	11 (3.3)	12 (3.6)	14 (4.2)	16 (4.8)	17 (5.2)	19 (5.8)	22 (6.7)
Rod Size dia mm.	10	10	10	10	10	13	13	16	16	19	22	22

Pipe hangers and supports shall be spaced not over 5 feet (1.5m) apart at heavy fittings and valves.

A hanger shall be installed not over 1 foot (0.3m) from each change in direction of piping. Where necessary to prevent vibration transmission, the support closest to the sources of vibration shall be spring cushion, or other approved type of isolation hanger. Where the piping system is subject to shock loads, such as thrusts imposed by the actuation of safety valves, hanger design shall include provision of shock absorbing devices of approved design. Hangers shall be designed so that they cannot become disengaged by movements of the supported pipe.

- iii. Vertical Piping: shall be guided or supported in the center of each riser but not over 15 feet on center and shall be supported at the base of the riser on a base elbow or tee with a pipe stand only where required. For uninsulated brass or copper pipe or tubing, the riser clamp shall be compatible nonferrous or electrolytically coated steel as for hangers.
- iv. Piping in trenches: Pipes shall rest on suitable wall floor supports with rollers.
- v. Pipe Sleeves: Pipes passing through concrete or masonry walls or concrete floors or roofs shall be provided with pipe sleeves fitted into place at the time of construction or afterwards if necessary. Each sleeve shall extend through its respective wall, floor or roof and shall be cut flush with each surface. Sleeves shall be of such size as to provide a minimum of 1/4" all around clearance between bare pipe and sleeve or between jacket over insulation and sleeve. Sleeves in bearing walls shall be steel or cast iron pipe. Sleeves in nonbearing walls, floors, or ceiling may be steel pipe, cast iron pipe or G.I. sheet metal gauge 14, with lock type longitudinal seam. Sleeves in bearing walls shall be steel or cast iron pipe.

14.14.5 THERMAL INSULATION



General

The SUBCONTRACTOR shall install the insulation on piping as specified below. Installation shall be done as per the following specification. The insulation shall be similar to AFICO (Saudi Arabia) or approved equal.

a. Piping Insulation

- i. Copper Pipes: shall be insulated with $\frac{3}{4}$ " thick closed cells foam plastic insulation and wrapped with selfadhesive waterproofing tape. Condensate Drains: shall be insulated with $\frac{3}{8}$ " (10mm) thick closed cell foam insulation such as Aeroflex or Insulflex (by Superlon).

b. Installation

- ii. Pipe Insulation

No insulation shall be applied to any system of piping until all pipe work has been tested, cleaned out and made tight. All insulation shall be applied in a manner consistent with good practice and methods. All longitudinal joints of pipe shall be at the top and bottom. Insulation shall be continuous through walls, floors, ceiling and partitions etc.

All insulation shall be fixed to the pipe with a good quality, fire resistant, approved adhesive. Insulation shall be continuous and gaps if any shall be filled up with fiberglass yarn scrim and bounded with twine. Circumferential and longitudinal joints of vapor barrier and jacket shall be overlapped at least 50 mm. Soft aluminium bands shall be installed at every 450 mm.

c. Cladding

All insulated pipes on roof shall be provided with a cladding of 26 gauge G.I. or aluminium sheet metal. At all flanges and Valves shall be provided with valve boxes with quick opening clamps.



15. DEMOLITION WORKS

15.1 Scope

The work covered by this section of the specifications pertains to the demolition of the existing retaining walls existing buildings. Foot prints of old buildings, Floors and stone masonry walls below plinth level and consists of furnishing all plant, labor, tools, equipment, appliances and performing all operations as required herein drawings and / or as directed by the EMPLOYER at the proposed site.

15.2 General

The Demolition work of existing structures shall not proceed until the SUBCONTRACTOR makes submittals and gets approved by the EMPLOYER, the methodology of demolition works and drawings of temporary shoring / lateral soil retaining system. Shoring shall be such as to protect workmen, adjacent paving, structures and utilities.

Demolitions shall be performed in an orderly manner and the SUBCONTRACTOR shall take all necessary precautions and expedients to prevent damages to the adjacent structures otherwise he will be responsible for the damages. Any existing utility lines which are not known to the SUBCONTRACTOR in sufficient time to avoid damage, if inadvertently damaged during demolition, shall be repaired by the SUBCONTRACTOR and adjustment in payment will be made as approved by the EMPLOYER.

Explosives shall be used only to blast / excavate bedrock from the site and for no other work. The SUBCONTRACTOR is required to make a detailed submittal regarding rock blasting / excavation for review and approval by EMPLOYER.

Seismic monitoring during blasting shall be done by the SUBCONTRACTOR to avoid damage to adjoining and other nearby structures. A Pre-construction survey of adjoining structures shall be carried out to evaluate their existing condition in order to protect the structures and disputes arising there from.

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

The disposal of debris material shall include loading, unloading, transporting, spreading and leveling. The demolished debris materials from this work shall be disposed off out of Municipal limits at location identified by the SUBCONTRACTOR and approved by the EMPLOYER. The trucking shall be along the most direct route from the boundary of the project site to the disposal area and/or as directed by the EMPLOYER.

All carts, trucks or other vehicles used by the SUBCONTRACTOR for transportation of the Demolished materials shall be suitably constructed or lined so as not to permit any loss 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 as directed by the EMPLOYER.

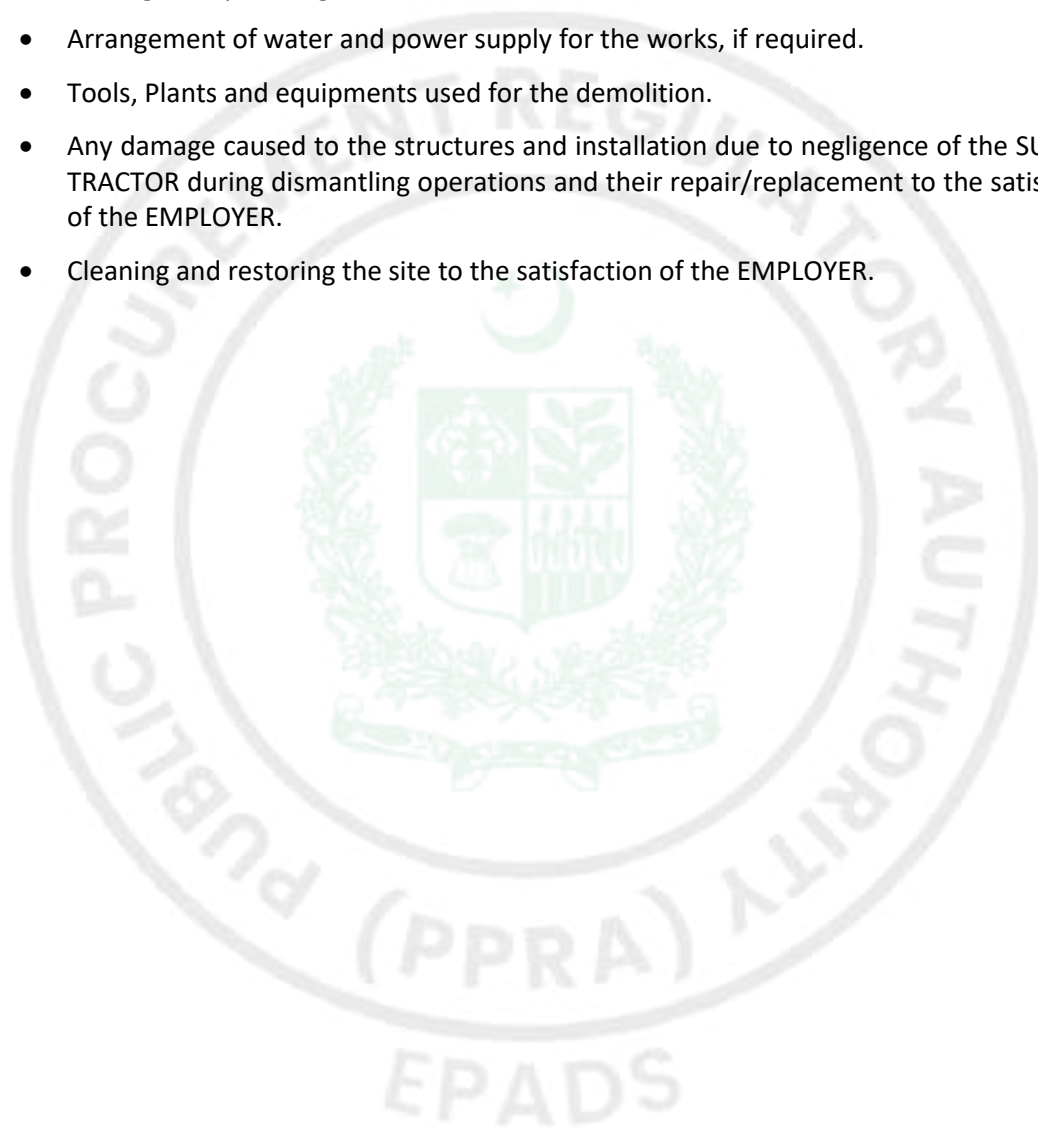
Except otherwise specified herein or elsewhere in the Subcontract Agreement Documents, no measurement and payment will be made for the under-mentioned works related to the relevant BOQ item.

- Timber shoring, planking, strutting and providing slope for upholding the sides of demol-



ished work.

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



16. CLEARING AND GRUBBING

16.1 DESCRIPTION

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 EMPLOYER, stumps, roots, bushes and trees, vegetation, logs, rubbish and other objectionable material except such objects as are designated to remain or are to be removed in accordance with other section of specification.

16.2 CONSTRUCTION REQUIREMENTS

16.2.1 Clearing / Grubbing

All surface objects or any object to the depth of 30 Cm below sub grade level such as stumps, roots, vegetation, bushes, logs, rubbish shall be cleared and/or grubbed as directed by the EMPLOYER. In fill areas where clearing and grubbing is required, same shall be carried out to the depth of 30 cm below natural surface level as described above.

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.

Before bottom layer of fill is placed, SUBCONTRACTOR will grub up and remove without extra payment, any vegetation that may, in the meantime have grown on surface previously cleared and grubbed

All trees above ground and falling within the construction limits shall be felled & removed by the SUBCONTRACTOR. 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 SUBCONTRACTOR for which no extra payment shall be made to him. The trees, stumps and roots remains the property of the EMPLOYER, which shall be delivered at designated place as directed by the EMPLOYER.

16.2.2 Protection and Restoration

The SUBCONTRACTOR shall prevent damage to all pipes, conduits, wires, cables or structure above or below ground. No land monuments, property markers, or official datum points shall be damaged or removed until the EMPLOYER has witnessed or otherwise referenced their locations and approved their removal. The SUBCONTRACTOR 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 SUBCONTRACTOR'S operation shall immediately be rectified by him at his own expense.

No separate payment will be made for Clearing and Grubbing. Compensation for this item will be included in the payment for Earth-fill and Excavation.



17. SEPTIC TANK

17.1 SCOPE OF WORK

The work to be done under this section of the specifications includes furnishing all plant, labor equipment., appliances, material and performing all operations required in connection with construction of septic tank including provision and installation of cast iron cover with frame, C.I inlet and outlet fittings, GI vent pipes, G.I. intercepting trap (if provided) etc., complete as specified herein: as shown on the drawings, or as directed by the EMPLOYER.

17.2 APPLICABLE SECTIONS OF SPECIFICATION

The following specification sections shall be followed for carrying out civil/plumbing works associated with this section:

- Earth work
- Form work
- Reinforcement
- Plain and reinforced concrete
- Plumbing
- Cast iron covers with frames ladder rungs

17.3 CONSTRUCTION

Septic tank shall be of reinforced cement concrete of the sizes, thicknesses and class of concrete as shown on the applicable drawings. Where soil is alkaline sulphate resistant cement shall be used for concrete work. The work of excavation, backfilling, disposal of surplus/rejected earth, plain and reinforced cement concrete, PVC water stopper, formwork, reinforcement and provision and installation of C.I cover with frame, G.I vent pipes, G.I inlet and outlet fittings, C.I intercepting trap (if provided), pipe sleeves, puddle flanges, etc, are to be done under this section and shall be executed in accordance with the specifications as stated above. Inlet and outlet fittings, 0.1 frames and vent pipe shall be well set in place at the time of pouring of concrete.



18. SOAKAGE PIT

18.1 SCOPE OF WORK

The work under this section of the specifications includes furnishing all plant, labor, equipment, appliances, material and performing all operations required in connection with construction of soakage pit including provision and installation of cast iron cover with frame in top slab, etc complete as specified herein, or as shown on drawings, and/or as directed by the EMPLOYER.

18.2 APPLICABLE. SECTIONS OF SPECIFICATIONS

The following specifications shall be followed for carrying out civil/allied works associated with this section:

- Earthwork
- Formwork
- Reinforcement
- Plain & Reinforced Concrete

18.3 FILTER MEDIA

Material for filter media may be crushed stone, gravel, or any other approved material, of the required standard sizes.

The material shall be hard, dense, sound, durable and free from impurities, dust, and dirt and solubility characteristics. The material shall be uniform in size and shape i.e. cubical and free from flat pieces. The quality of filter media shall, conform-to the following: -

Loss Angeles Abrasion Test
Not over 30%, determined as per ASTM C- 131-69

Soundness 5 cycles with sodium sulphate
Not over 10% determined as per ASTM C-88-69

Specific Gravity Not less than 2.60 determined as per ASTM C-127 Water Absorption
Not over 01% determined as per ASTM C-127

18.4 CONSTRUCTION

Soakage pits shall be of open-jointed masonry circular wall resting on cement concrete pad beam. The joints of stones shall be sealed with cement mortar above the inlet connection. The filter media shall be placed as shown on drawings. At top of pit/well, RCC slab of specified class of concrete with RCC cover and frame shall be installed as shown on applicable drawings.

The work of excavation, backfilling, providing and placing filter media, plain and reinforced cement concrete, formwork, reinforcement, open jointed and other stone masonry, pipe connections, providing and installation of CI cover and frame, etc. are to be done under this section and shall be executed in accordance with the specifications as stated above.



19. TERMITE CONTROL TREATMENT

19.1 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.

19.2 APPLICABLE STANDARDS

All methods of termite protection used herein shall be in accordance with the standard practices of Pakistan.

19.3 SUBMITTALS

The SUBCONTRACTOR shall supply samples of all the materials to be used for insecticide control for approval of the EMPLOYER and testing in accordance with the specified standards. Rejected materials shall be removed from the site immediately.

19.4 MATERIAL

An emulsible concentrate 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 the following chemical element and concentrations.

HEPTACHLOR emulsifiable to 0.5% with clean water.

Or

AGENDA 25 EC containing FIPRONIL

Or

BIFLEX with Bifenthrin

Or

DURSBIN

Or

TENEKIL PLUS

Or

Approved Equivalent

All mixing shall be done at site and mixing proportion of insecticide with water shall be in accordance with the approved manufacturer's recommendations and shall be verified by the EMPLOYER.

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



EXECUTION

EXTENT OF APPLICATION

Insecticide solution shall be applied with approved pressure spraying equipment maintaining a pressure of 150 psi to all applications to, on or in earth.

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.

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

Solution shall be applied in amounts of not less than 5 lit/ Sq.M or 5 lit./10.76 Sq.ft. of area. If applied over gravel or sand fill, application shall not be less than 7 lit./ Sq.M or 7 lit./10.76 Sq.ft. of area. Insecticide shall penetrate to a depth of 1 inch minimum in porous earth at bottom and 2 inch to 3 inch at sides of excavations, or as specified by the manufacturer of the approved chemical, which ever is more.

Sides of foundation/retaining wall excavations, grade beam, and similar areas shall be treated with solution at a rate of 0.5 lit per square feet upon inner sides of such excavations or as specified by the - manufacturer of the approved chemical, which ever is more, 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.

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.

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.

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.

QUALITY ASSURANCE

In addition to the requirements of these specifications, comply with manufacturer's instructions and recommendations for the work, including preparation of substrata and application. A professional operator shall be engaged who shall have license in accordance with regulations of governing authorities for application of soil treatment solution.

GUARANTEE

The SUBCONTRACTOR 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 10 years from the date of acceptance of the building.



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



20. DAMPA FALSE CEILING

20.1 SCOPE

The work under this section consists of providing all suspended ceilings as shown on the Drawings.

'DAMPA' CEILINGS

Product: DAMPA Clip-In Tile in Steel DAMPA Clip-In Tile with bevelled edge type ST-15, 600 x 600 x 0.5 mm steel, perforated with 1.8 mm holes, with black acoustic felt bonded to the reverse side of the tiles, painted in DAMPA standard colour white No. 3000-2.

The suspension system can be delivered with the following components:

- Carrier No. 4
- Carrier Splice No. 4
- Coupling Clip No. 1
- Adjustment Clip No. 4
- Hanger No. 5
- Edge Trim No. 36, painted in DAMPA standard colour white No. 3000-2
- Wedge No. 4
- Carrier No. 10, painted in DAMPA standard colour white No. 3000-2. Carrier No. 10 is used as a perimeter detail to support full tiles.

INSTALLATION

Suspension System

Edge Trim No. 36 is fastened to the wall at intervals of maximum 500 mm. At in-turned corners one edge trim ends at the wall, whereas the other edge trim ends at the horizontal flanges of the first edge trim. At out-turned corners the horizontal flanges are mitred.

A primary grid system is installed according to maximum distances described in DAMPA's "Installation of DAMPA Clip-In Tile".

Tiles

Cutting of perimeter tiles are done by a steel plate cutter, e.g. Makita type JN 1601 – or by use of a DAMPA tile cutter.

Cut steel perimeter tiles are supported using Edge Trim No. 36 and held in position with two Wedges No. 4 per tile.

A load spreading plate of e.g. plywood can strengthen tiles, which are influenced by the weight of installation components. The carrying capacity is maximum 2 kg per tile. In case the load limit exceeds a maximum of 2 kg, additional suspension is required for the installation unit.

The finished ceiling is to appear as a uniform and plane ceiling surface in alignment and free of dust and stain (please see "Maintenance").

Besides, the installation is to be made in accordance with the instructions in "Installation of DAMPA Clip-In Tile".

20.2 Mineral Fiber Ceiling



The SUBCONTRACTOR to supply, deliver and or execute all the items under this section as per applicable ASTM / BS standard and furnish the copy of the same along with the brochure from the manufacturer and a certificate of origin / confirmation of the compatibility of the item from the supplier as applicable complete in all respect as per drawings and to the entire satisfaction of the EMPLOYER.

The brief description of the material is as follows:

600mm x 600mm Mineral Fiber false ceiling with metal suspension system and as recommended by the manufacturer



21. ROAD WORKS – ASPHALT

21.1 Granular Base

21.1.1 DESCRIPTION

This item shall consist of furnishing, spreading in one or more layers and compacting granular subbase according to the specifications and drawings and / or as directed by the EMPLOYER.

21.1.2 MATERIAL REQUIREMENTS

Granular subbase material shall consist of natural or processed aggregates such as gravel, sand or stone fragment and shall be clean and free from dirt, organic matter and other deleterious substances, and shall be of such nature that it can be compacted readily under watering and rolling to form a firm, stable subbase.

The material shall comply to the following grading and quality requirements:

- e. The subbase material shall have a gradation curve within the limits for grading A, B, and C given below. However grading A may be allowed by the EMPLOYER in special circumstances.

Grading Requirement for Subbase Material			
Sieve Designation		Mass Percent Passing Grading	
Mm	Inch	A	B
60.000	(2.1/2)	100	
50.000	(2)	90-100	100
25.000	(1)	50-80	55-85
9.500	(3/8)		40-70
4.750	No.4	35-70	30-60
2.000	No.10		20-50
0.425	No.40 No.200		10-30
0.075		2-8	5-15

The Coefficient of Uniformity D₆₀/D₁₀ shall be not less than 3, where D₆₀ and D₁₀ are the particle diameters corresponding to 60% and 10%, respectively, passing (by weight) in a grain size analysis, curve.

- f. The Material shall have a CBR value of at least 50%, determined according to AASHTO T-193. The CBR value shall be obtained at a density corresponding to Ninety eight (98) percent of the maximum dry density determined according to AASHTO T-180 Method-D.
- g. The coarse aggregate material retained on sieve No. 4 shall have a percentage of wear by the Los Angeles Abrasion (AASHTO T-96) of not more than fifty (50) percent.
- h. In order to avoid intrusion of silty and clayey material from the subgrade in the subbase, the ratio D₁₅ (Subbase) / D₈₅ (Subgrade) should be less than 5.



Where D85 and D15 are the particle diameters corresponding to eighty five (85) % and fifteen (15) %, respectively, passing (by weight) in a grain size analysis, curve.

- i. The fraction passing the 0.075 mm (No. 200) sieve shall not be greater than two third of the fraction passing the 0.425 mm (No. 40) sieve. The fraction passing the 0.425 mm sieve shall have a liquid limit of not greater than 25 and a plasticity index of 6 or less.
- j. If over-size is encountered, screening of material at source, shall invariably be done, no hand picking shall be allowed, however hand picking may be allowed by the EMPLOYER, if over-size quantity is less than 5% of the total mass.
- k. Sand equivalent for all classes shall be 25 min.

21.1.3 CONSTRUCTION REQUIREMENTS

21.1.3.1 Spreading

Granular subbase shall be spread on approved subgrade layer as a uniform mixture. Segregation shall be avoided during spreading and the final compacted layer shall be free from concentration of coarse or fine materials.

Granular subbase shall be deposited on the roadbed or shoulders in a quantity which will provide the required compacted thickness without resorting to spotting, picking up or otherwise shifting the subbase material. In case any material is to be added to compensate for levels, the same shall be done after scarifying the existing material, to ensure proper bonding of additional material.

When the required thickness is fifteen (15) cm or less, the aggregates may be spread and compacted as one layer, but in no case shall a layer be less than seven and one half (7.5) centimeters thick. Where the required thickness is more than 15 cm, the aggregates shall be spread and compacted in 2 or more layers of approximately equal thickness, but in any case the maximum compacted thickness of one layer shall not exceed 15 cm. All subsequent layers shall be spread and compacted in a similar manner.

Granular subbase shall be spread with equipment that will provide a uniform layer conforming to the specified item both transversely and longitudinally within the tolerances as specified in Table for Allowable Tolerances" in these specifications. No hauling or placement of material will be permitted when, in the judgment of the EMPLOYER, the weather or road conditions are such that the hauling operation will cause cutting or rutting of subgrade or contamination of sub base material.

21.1.3.2 Compaction Trials

Prior to commencement of granular subbase operation, the SUBCONTRACTOR shall construct a trial length, not to exceed, five hundred (500) meters and not less than two hundred (200) meters with the approved subbase material as will be used during construction to determine the adequacy of the SUBCONTRACTOR'S equipment, loose depth measurement necessary to result in the specified compacted layer depths, the field moisture content, and the relationship between the number of compaction passes and the resulting density of the material. For details, refer to clause 1.20 (General) of these specifications.

21.1.3.3 Compaction



The moisture content of subbase material shall be adjusted prior to compaction, by watering with approved sprinklers mounted on trucks or by drying out, as required, in order to obtain the specified compaction.

The subbase material shall be compacted by means of approved vibrating rollers or steel wheel rollers (rubber tyred rollers may be used as a supplement), progressing gradually from the outside towards the centre, except on superelevated curves, where the roiling shall begin at the low side and progress to the high side. Each succeeding pass shall overlap the previous pass by at least one third of the roller width. While the rolling progresses, the entire surface of each layer shall be properly shaped and dressed with a motor grader, to attain a smooth surface free from ruts or ridges and having proper section and crown.. Rolling shall continue until entire thickness of each layer is thoroughly and uniformly compacted to the specified density.

Any area inaccessible to rolling equipment shall be compacted by means of hand guided rollers, plate compactors or mechanical tampers, where the thickness in loose layer shall not be more than 10 cm. If the layer of subbase material, or part thereof does not conform to the required finish, the SUBCONTRACTOR shall, at his own expense, rework, water, and re-compact the material before succeeding layer of the pavement structure is constructed.

Immediately prior to the placing of first layer of base course the subbase layer (both under the travelled way and the shoulders) shall conform to the required level and shape. Prior to placing the succeeding layers of the material, the top surface of each layer shall be made sufficiently moist to ensure bond between the layers. The edges or edge slopes shall be bladed or otherwise dressed to conform to the lines and dimensions shown on the plans.

No material for construction of the base shall be placed until the subbase has been approved by the EMPLOYER.

21.1.3.4 Compaction requirements

The relative compaction of each layer of the compacted subbase shall not be less than Ninety eight (98) percent of the maximum dry density determined according to AASHTO T-180 Method-D. The field density shall be determined according to AASHTO T-191 or other approved method. For all materials, the field density thus obtained shall be adjusted to account for oversize particles (retained on 19 mm sieve) as 'directed by the EMPLOYER Also for adjustment of any material retained on 4.75 mm sieve, AASHTO Method T-224 shall be used.

21.1.3.5 Moisture Content Determination

As it is customary in the project laboratories that small samples of materials are placed in ovens for moisture determination for proctor, following precautions are necessary to ensure proper compaction results.

- a) Same size of sample is placed in oven for moisture determination in case of laboratory density (Proctor) and field density.
- b) Moisture content for calculation of field density and proctor shall be observed on material passing 4.75 mm sieve.

21.1.3.6 Tolerance

The subbase shall be compacted to the desired level and cross slopes as shown on the draw



ings. The allowable tolerance shall be according to the "Table for Allowable Tolerances" in these specifications.

21.2 AGGREGATE BASE COURSE

21.2.1 DESCRIPTION

This item shall consist of furnishing, spreading and compacting one (1) or more layers of aggregate base on a prepared subgrade, subbase, or existing road surface, in accordance with the specifications and the drawings and / or as directed by the EMPLOYER.

21.2.2 MATERIAL REQUIREMENTS

Material for aggregate base course shall consist of crushed hard durable gravel, rock or stone fragments. It shall be clean and free from organic matters, lumps of clay and other deleterious substances. The material shall be of such a nature that it can be compacted readily under watering and rolling to form a firm, stable base for both flexible and rigid pavements.

The aggregate base shall comply to the following grading and quality requirements.

- a. The gradation curve of the material shall be smooth and within the envelope limits for Grading A or B given below.

Grading Requirement for Aggregate Base Material			
Sieve Designation		Mass Percent Passing Grading	
mm	Inch	A	B
50.000	2	100	100
25.000	1	70-95	75-95
9.500	3/8.	30-65	40-75
4.750	No 4.	25-55	30-60
2.000	No 10.	15-40	20-50
0.425	No 40.	8-20	12-25
0.075	No 200	2-8	5-10

The material shall be well graded such that the coefficient of Uniformity D60/D10 shall be greater than four (4).

- b. Crushed Aggregate (material retained on sieve NO. 4) shall consist of material of which at least ninety (90) percent by weight shall be crushed particles, having a minimum of two (2) fractured faces.
- c. The Coarse aggregate shall have a percentage of wear by the Loss Angeles Abrasion test (AASHTO T-96) of not more than forty (40).
- d. The material shall have a loss of less than twelve (12) percent when subjected to five cycles of the Sodium Sulphate Soundness test according to AASHTO T-104.
- e. The sand equivalent determined according to AASHTO T-176 shall not be less than 45 and the material shall have a Liquid limit of not more than twenty five (25) and a plasticity Index of not more than 6 as determined by AASHTO T-89 and T-90.
- f. The material passing the 19 mm sieve shall have a CBR value of minimum eighty (80)



percent, tested according to the AASHTO T 193. The CBR value shall be obtained at the maximum dry density determined according to AASHTO T 180, Method D.

- g. Laminated material shall not exceed 15% of total volume of Aggregate Base Course.

21.2.2.1 Filler for Blending

If filler, in addition to that naturally present in the aggregate base material is necessary for meeting the grading requirement or for satisfactory bonding of the material, it shall be uniformly blended with the base course material at the crushing plant or in a pugmill unless otherwise approved. The material for such purpose shall be obtained from sources approved by the EMPLOYER. The material shall be free from organic matter, dirt, shale, clay and clay lump or other deleterious matter and shall conform to following requirement.

AASHTO Sieve	Percent Passing
3/8 Inch	100
4	85-100
100	10-30
Plasticity Index (AASHTO T-90) Sand	6 maximum
Equivalent (AASHTO T-176)	30 minimum

However the combined aggregates prepared by mixing the coarse material and filler shall satisfy the requirements as mentioned in clause 202.2 above.

21.2.3 CONSTRUCTION REQUIREMENTS

21.2.3.1 Preparation of surface for Aggregate base course

In case crushed aggregate base is to be laid over prepared sub base course, the subbase course shall not have loose material or moisture in excess to optimum moisture content. Spreading shall conform in all respects to the requirements specified under this heading in Item 201 - Subbase (201.3.1).

21.2.3.2 Compaction

Compaction process shall conform in all respect to the requirements specified under this heading in Item 201 (201.3.3).

21.2.3.3 Compaction Requirement

The relative compaction of each layer of the compacted base shall not be less than 100 percent to the maximum dry density determined according to AASHTO T-1 80, Method D (Modified). The field density shall be determined according to AASHTO T-191 or other approved method. For all materials, the field density thus obtained shall be adjusted to account for oversize particles (retained on 19 mm sieve) as directed by the EMPLOYER. Also for adjustment of any material retained on 4.75 mm sieve, AASHTO Method T224 shall be used

Completed base course shall be maintained in an acceptable condition at all times until prime coat i's applied. When base course is to carry traffic for an indefinite ` length of time before receiving surfacing, the SUBCONTRACTOR shall maintain the surface until final acceptance and shall prevent revelling by wetting, blading, rolling and addition of fines as may be required to keep the base tightly bound and leave a slight excess of material over the entire surface which must be removed and the surface finish restored before application of prime coat.



21.2.3.4 Moisture Content Determination

Moisture content determination shall conform in all respects to the requirements specified under clause 201.3.5 for subbase.

21.2.3.5 Trial Sections

Prior to commencement of aggregate base course operations, a trial section of two hundred (200) meters minimum, but not to exceed five hundred (500) meters shall be prepared by the SUBCONTRACTOR using same material and equipment as will be used at site to determine the adequacy of equipment, loose depth measurement necessary to result in the specified compacted layer depths, field moisture content, and relationship between the number of compaction passes and the resulting density of material. For details refer to clause 1.20 (General) of these specifications.

21.2.3.6 Tolerance

The completed base course shall be tested for required thickness and smoothness before acceptance. Any area having waves, irregularities in excess of one (1) cm in three (3) M or two (2) cm in fifteen (15) M shall be corrected by scarifying the surface, adding approved material, reshaping, re-compacting and finishing as specified. Skin patching of an area without scarifying the surface to permit proper bonding of added material shall not be permitted. The allowable tolerances shall be according to the "Table for Allowable Tolerances" in these specifications.

21.2.3.7 Acceptance, Sampling and Testing

Acceptance of sampling and testing with respect to materials and construction requirements shall be governed by the relevant, "Table for Sampling and Testing Frequency" or as approved by the EMPLOYER.

21.3 ASPHALTIC BASE COURSE PLANT MIX

21.3.1 DESCRIPTION

This work shall consist of furnishing of plant, labor, equipment and material and performing all operations in connection with the construction of an asphaltic plant-mix base course on a previously constructed and accepted subgrade, subbase or base course, subject to terms and conditions of the Subcontract Agreement, and in strict accordance with this Section of the Specification, the Drawings and the directions of the EMPLOYER.

21.3.2 MATERIAL REQUIREMENTS

21.3.2.1 Mineral Aggregate

Mineral aggregate for bituminous base course shall consist of coarse aggregate, fine aggregate and filler material, if required, all conforming with the following requirements:

Coarse aggregate which is the material retained on AASHTO No. 4 sieve shall consist of crushed rock, crushed gravel or crushed boulder. It shall be clean, hard, tough, sound, durable, free from decomposed stones, organic matter, shale, clay lump or other deleterious substances. Rock or boulders from which coarse aggregate is obtained, shall be of uniform quality throughout the quarry.

The crushing shall be so regulated that at least ninety five (95) percent by weight of material retained on AASHTO No. 4 sieve shall consist of pieces with at least two (2) mechanically



fractured faces, and when tested for stability of bituminous mix shall show satisfactory stability.

Fine aggregate which is material passing No. 4 sieve, shall consist of 100% crushed material from rock or boulder. No natural sand will be allowed in the mix.

When the combined grading of the coarse and fine aggregates is deficient in material passing No. 200 sieve, additional filler material shall be added. The filler material shall consist of finely divided rock dust, hydrated lime, hydraulic cement or other suitable mineral matter. However, in case the coarse aggregates are of quartzitic nature, then hydrated lime or a better material shall be allowed. At the time of use, it shall be sufficiently dry to flow freely. Filler material shall conform to following gradation:

US Standard Sieve	Percent Passing by Weight
No.30	100
No.50	95-100
No.200	70-100

The coarse and fine aggregates shall meet the following applicable requirements:

- The percentage of wear by the Los Angeles Abrasion test (AASHTO T 96) shall not be more than forty (40).
- The loss when subject to five cycles of the Sodium Sulphate Soundness test (AASHTO T 104) shall be less than twelve (12) percent.
- The Sand Equivalent (AASHTO T 176) determined after all processing except for addition of asphalt cement shall not be less than forty five (45).
- Fine aggregates shall have a liquid limit not more than 1 twenty five (25) and a Plasticity Index of not more than six (6) as determined by AASHTO T 89 and T-90.
- The portion of aggregate retained on the 9.5 mm (3/8 inch) sieve shall not contain more than 15 percent by weight of flat and / or elongated particles (ratio of maximum to minimum dimensions = 2.5:1).
- Stripping test shall be performed on coarse aggregates as described under AASHTO T-182 and only that material shall be allowed which qualifies the test.
- The coarse aggregates shall be checked if desired by the EMPLOYER for cationic and anionic behaviour so that their affinity with the bitumen to be used is verified.
- Petrographic examination of the coarse aggregate shall be conducted if so directed by the EMPLOYER.



21.3.2.2 Asphaltic Material

Asphalt binder to be mixed with the aggregate to produce asphaltic base shall be asphalt cement having penetration grade 40-50, 60-70 or 80-100 as specified by the EMPLOYER. Generally, it will meet the requirements of AASHTO M-20.

21.3.2.3 Asphalt Concrete Base Course Mixture

The composition of the asphaltic concrete paving mixtures for base course shall conform to Class A and / or Class B shown in the following table:

TABLE

Combined Aggregate Grading Requirements

Mix Designation	Class A	Class B
Use	Levelling/Base	Levelling/Base
Compacted Thickness	70 - 90 mm	50 - 80 mm
U.S. Standard Sieve Size Percent passing by weight		
2" (50 mm)	100	-
1.1/2" (38 mm)	90-100	100
1" (25 mm)	-	75-90
3/4" (19 mm)	56-75	65-80
1/2 (12.5 mm)	-	55-70
3/8 (9.5 mm)	-	45-60
No. 4 (4.75 mm)	23-40	30-45
No. 8 (2.38 mm)	15-30	15-35
No. 50 (0.300 mm)	4-10	5-15
No. 200 (0.075 mm)	3-6	2-7
Asphalt Content weight	3	3
Percent of total mix	(Minimum)	(Minimum)

The asphalt concrete levelling / base course mixture shall meet the following Marshall Test Criteria.

Compaction, number of blows each end of specimen

75

Stability

1000 Kg (Min.)

Flow, 0.25 mm (0.01 in.)

8-14

Percent air voids in mix

4-8

Percent voids in mineral



aggregates
 Loss in Stability

According to Table 5.3 MS-2, Asphalt institute, sixth edition 1993.
 25 percent (Max.)

Mixes composed of larger size aggregates with maximum size upto 38 mm (1.5 inches) will be prepared according to modified Marshall method as per MS-2 Asphalt institute, sixth edition, 1993 or the latest edition. The procedure is basically the same as the original method except for following differences that are due to the larger specimen size that is used:

- a. The hammer weighs 10.2 kg (22.5 lb.) and has a 149.4 mm (5.88 inches) flat tamping face. Only mechanically-operated device is used for the same 457 mm (18 inches) drop height.
- b. The specimen has a 152.4 mm (6 inches) diameter by 95.2 mm (3.75 inches) height.
- c. The batch weights are typically of 4 Kg.
- d. The equipment for compacting and testing (molds and breaking heads) are proportionately larger to accommodate the larger specimens.
- e. The mix is placed in the mold in two approximately equal increments, with spading performed after each increment to avoid honey-combing.
- f. The number of blows needed for the larger specimen is 1.5 times (75 or 112 blows) of that required for the smaller specimen (50 or 75 blows) to obtain equivalent compaction.
- g. The design criteria shall be modified as well, the minimum stability shall be 2.25 times and the range of flow values shall be 1.5 times normal-sized specimens.
- h. Similar to the normal procedure, following values shall be used to convert the measured stability values to an equivalent value for a specimen with a 95.2 mm (3.75 inches) thickness, if the actual thickness varies:

Approximate Height mm (inches)	Specimen Volume (Cubic cm)	Correlation Ratio
88.9 (3 1/2)	1608 to 1626	1.12
90.5 (3 9/16)	1637 to 1665	1.09
92.1 (3 5/8)	1666 to 1694	1.06
93.7 (3 11/16)	1695 to 1723	1.03
95.2 (3 3/4)	1724 to 1752	1.00
96.8 (3 13/16)	1753 to 1781	0.97
98.4 (3 7/8)	1782 to 1810	0.95
100.0 (3 15/16)	1811 to 1839	0.92
101.6 (4)	1840 to 1968.	0.90

21.3.2.4 Job-Mix Formula

At least one (1) week prior to production, a Job-Mix Formula (JMF) for the asphaltic base course to be used for the project, shall be established jointly by the EMPLOYER and the SUB-CONTRACTOR in the project laboratory. Job mix formula shall combine the mineral aggregates and asphalts in such proportion conforming to specification requirements.



The JMF shall be established by MARSHALL Method of Mix Design according to the procedure prescribed in the Asphalt Institute Manual Series No.2 (MS-2), sixth edition 1993, or the latest Edition.

The JMF, with the allowable tolerances shall be within the range specified in Item 203.2.3. Each JMF shall indicate a single percentage of aggregate passing each required sieve size and a single percentage of bitumen to be added to the aggregate.

The ratio of wt. of filler (passing sieve No. 200) to that of asphalt shall range between 1-1.5 for hot climate areas with temperature more than 40 °C.

After the JMF is established, all mixtures furnished for the project represented by samples taken from the asphalt plant during operation, shall conform thereto. Moreover upon receiving the job-mix, approved by the EMPLOYER, the SUBCONTRACTOR shall adjust his plant to proportion the individual aggregates, mineral filler and asphalt to produce a final mix that, when compared to job mix formula shall be within the following limits.

Maximum Variation of Percentage of Materials

Retained	No.4 and larger	±					7.0%
Passing No.4	to	No.	100	sieve	±		4.0%
Passing No.200	±						1.0%

Asphalt Content

Weight percent of total mix ± 0.3%

In addition to meeting the requirements specified in the proceeding items, the mixture as established by the JMF shall also satisfy the following physical property

Loss of Marshall. stability by immersion of specimen in water at sixty (60) degree centigrade for 24 hours as compared with stability measured after immersion in water at 60 degrees centigram for 20 minutes shall not exceeds twenty five (25) percent. If the mixture fails to meet this criterion, JMF shall be modified or an antistripping agent shall be used.

Should a change of sources of materials be made, a new Job Mix Formula shall be established before the new material is used. When unsatisfactory results or other conditions make it necessary, a new Job Mix Formula will be required

21.3.3 CONSTRUCTION REQUIREMENTS

21.3.3.1 Bituminous Mixing Plant

Plants used for the preparation of bituminous mixtures shall be "Batching Plants" conforming to AASHTO M 156, and of adequate capacity, coordinated and operated to produce a mixture within the limits of these specifications. Plant shall have minimum three cold bins and at least 3.5 decks of hot sieves.

21.3.3.2 Preparation of Aggregates

Before being fed to the dryer, aggregates for the asphaltic base courses shall be separated into three or more sizes and stored separately in cold bins. One bin shall contain aggregate of such size that eighty (80) percent will pass sieve No. 4, and the other two bins shall contain aggregate of such sizes that eighty (80) percent will be retained on sieve No. 4. Should fine material, be incorporated in the mix, separate bin shall be provided in addition to the three bins mentioned above. If filler is used as a separate component it will also be storec



and measured separately and accurately before being fed into the mixer through filler screw mechanism.

Asphalt cement shall be heated within a temperature range of hundred and thirty five to hundred and sixty three (135-163) degrees centigrade at the time of mixing. Asphalt cement heated above maximum shown shall be considered overheated and shall be rejected and removed from job site.

Dried aggregate weighed and drawn to pugmill shall be combined with proportionate quantity of asphalt cement according to the job mix formula. Temperature of asphalt, except for temporary fluctuations, shall not be lower than fifteen (15) degrees centigrade below the temperature of the aggregate, at the time, the two materials enter into the pugmill.

For placing the materials in bins or in moving them from bins to the dryer, any method which causes segregation or uncontrolled combination of materials of different grading, shall be discontinued and the segregated or degraded materials shall be prescreened for re-use.

Each aggregate ingredient shall be heated and dried at temperature not to exceed hundred and sixty three (163) degrees centigrade. If aggregate contain sufficient moisture to cause foaming in the mixture or their temperature is in excess of hundred and sixty three (163) degrees centigrade, they shall be removed from the bins and returned to their respective stock piles. In no case, shall the temperature of asphaltic mix exceed 163 degree centigrade when discharged from the pugmill.

Immediately after heating, the aggregates shall be screened to required sizes and stored in separate hot bins for batching and mixing with bituminous material.

Asphalt plant shall have minimum three and half (3 1/2) sieve decks to effectively control the gradation of hot bins.

21.3.3.3 Hauling Equipment

Dump truck used for hauling bituminous mixtures shall have tight, clean, smooth metal beds which have been thinly coated with an approved material to prevent adhering of material to the beds. Each truck shall have a cover of canvas or of other suitable material of sufficient size as to protect the mixture from the weather. The mixture will be delivered on the road at a temperature not less than hundred and thirty (130) degree C. Drivers of dump trucks will ensure that while reversing the vehicles, paver is not pushed back producing a hump.

21.3.3.4 Bituminous Pavers

Bituminous pavers shall be self-contained, power-propelled units, provided with an automatically controlled activated screed or strike-off assembly, heated if necessary, capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and thickness shown on the plans. Pavers used for shoulders and similar construction shall be capable of spreading and finishing course of bituminous plant mix material in widths shown on the plans.

The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The paver shall be equipped with automatic feed controls, properly adjusted to maintain a uniform depth of material ahead of the screed.



The screed or strike-off assembly shall be capable of producing a finished surface of the required evenness and texture without tearing, shoving or gouging the mixture.

When laying the mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture. The paver shall be operated at speeds which will give the best result for the type of power being used.

The mixed material shall be delivered to paver in time to permit completion of spreading, finishing and compaction of mixture during day light hours.

The paver shall be equipped with automatic screed controls with sensors for either or both sides of the paver, capable of sensing grade from an outside reference line, sensing the transverse slope of the screed and providing the automatic signals which operates the screed to maintain the desired grade and transverse slope. The sensor shall be so constructed that it will operate from a reference line or a ski-like arrangement.

The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent variation.

Manual operation will only be permitted in the construction of irregularly shaped and minor areas.

Whenever a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods in order to allow the SUBCONTRACTOR to use the asphalt already produced at the plant or in transit, provided this method of operation will produce results otherwise meeting the specifications.

Reference lines will be required for both outer edges of the travelled way for each main line roadway for vertical control. Horizontal control utilizing the reference line will be permitted. The grade and slope for intermediate lanes shall be controlled automatically from reference lines or by means of a ski and a slope control device or a dual ski arrangement. When the finish of the grade prepared for paving is superior to the established tolerance and, when in the opinion of the EMPLOYER, further improvement to the line, grade, cross sections and smoothness can best be achieved without the use of the reference line, a ski-like arrangement may be substituted subject to the approval of the EMPLOYER. The use of the reference lines shall be reinstated immediately whenever the SUBCONTRACTOR fails to maintain a superior pavement. The SUBCONTRACTOR shall furnish and install all pins, brackets, tensioning devices, wire and accessories necessary for satisfactory operation of the automatic control equipment.

21.3.3.5 Rollers

Rollers shall be steel wheel, pneumatic tyre and vibratory, or a combination thereof. The roller(s) shall be in good condition, capable of reversing without backlash, and shall be operated at speeds slow enough to avoid displacement of the bituminous mixture. The number and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. Vibratory rollers shall be acceptable for bituminous mixture compaction. The use of equipment, which results in excessive crushing of the aggregate will not be permitted.

21.3.3.6 Preparation of Base or Existing Pavement Surface

Before spreading materials, the surface of base or existing pavement on which the mix is to



be placed shall be conditioned by application of a prime or tack coat as specified.

After a prime coat is applied, it shall be left undisturbed not less than twenty four (24) hours. The SUBCONTRACTOR shall maintain the primed surface until the mix material has been placed. This maintenance shall include the spreading of sand or other approved material, if necessary to prevent adherence of the prime coat to the tyres of vehicles using the primed surface, and patching any breaks in the primed surface with additional bituminous material. Any area of primed surface that has become damaged shall be repaired before the mix is placed, to the satisfaction of EMPLOYER. It shall be ensured that primed surface is not in tacky condition, when premix is laid.

After a tack coat is applied, it shall be allowed to dry until it is in the proper condition of tackiness to receive the mix. The tack coat shall be applied only as far in advance of the placing of mix, as is necessary to obtain the proper condition of tackiness. Any breaks in the tack coat shall be repaired.

When the surface of the existing pavement or old base is irregular, it shall be brought to uniform grade and cross-section by levelling course as directed. The levelling course mixture shall conform to the requirements of Item 203.2.

A thin coating of bituminous material shall be sprayed on contact surface of curbing, gutters, manholes, and other structures, prior to the bituminous mixture being placed against them.

21.3.3.7 Spreading and Finishing

The mixture shall be laid upon an approved surface, spread and struck off to the section and elevation established. Bituminous pavers shall be used to distribute the mixture either over the entire width or over such partial width as may be practicable.

The longitudinal joint in one layer shall offset to that in the layer immediately below, by approximately 15.0 cm; however, the joint in the top layer shall be at the centreline of the pavement if the roadway comprises two lanes of width, or at lane lines if the roadway is more than 2 lanes in width.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the mixture shall be spread, raked and luted by hand-tools. For such areas the mixture shall be dumped, spread and screeded to give the required compacted thickness, ensuring even distribution of coarse and fine material.

When production of the mixture can be maintained and wherever practical, pavers shall be used in echelon to place the wearing course in adjacent lanes and compacted to form a surface without lateral joint.

All mixtures shall be spread at a temperature of not less than hundred and thirty (130) degree C and all initial rolling or tamping shall be performed when the temperature of the mixture is such that the sum of the air temperature plus the temperature of the mixture is between 165 degree C and 190 degree C. The mixture shall not be placed on any wet surface or when weather conditions will otherwise prevent its proper handling or finishing.

21.3.3.8 Compaction

After spreading and strike off and as soon as the mix condition permits the rolling to be per-



formed without excessive shoving or tearing, the mixture shall be thoroughly and uniformly compacted. Rolling shall not be prolonged when cracks appear on the surface.

Initial or breakdown rolling shall be done by means of either a tandem steel roller or three wheeled steel roller. Rolling shall begin as soon as the mixture will bear the roller without undue displacement.

The number and weight of rollers shall be sufficient to obtain the required compaction while the mixture is still in workable condition. The sequence of rolling and the selection of roller types shall provide the specified pavement density. Initial rolling with a tandem steel roller or a three-wheeled steel roller shall follow the paver as closely as possible.

Unless otherwise directed, rolling shall begin at the lower side and proceed longitudinally, parallel to the road centerline, each trip overlapping one-half of the roller width, gradually progressing to the crown of the road. When paving in echelon or abutting a previously placed lane, the longitudinal joint should be rolled first followed by the regular rolling procedure. On super elevated curves the rolling shall begin at the low side and progress to the high side by overlapping of longitudinal trips parallel to the centerline. Intermediate rolling with a pneumatic tyred roller shall be done behind the initial rolling. Final rolling shall eliminate marks from previous rolling. In no case shall the temperature be less than hundred and twenty (120) degree C. for initial break down rolling while all other compaction operations shall be completed before the temperature drops down to hundred and ten (110) degree C.

Rollers shall move at a slow but uniform speed with the drive roll or wheels nearest the paver. Rolling shall be continued until all roller marks are eliminated and a minimum density of Ninety seven (97) percent of a laboratory compacted specimen made from asphaltic material obtained for daily Marshall density is achieved.

Any displacement resulting while reversing the direction of a roller, or from other causes, shall be corrected at once by the use of rakes and addition of fresh mixture. when required. Care shall be exercised in rolling not to displace the line and grade of the edges of the bituminous mixture.

To prevent adhesion of the mixture to the rollers, wheels of rollers shall be kept properly moistened with water or water mixed with very small quantities of detergent or other approved material. Excess liquid will not be permitted. Along forms, curbs, headers, walls and other places not accessible to the roller, the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons or with mechanical tampers. On depressed areas, tampers be used or cleated compression strips may be used under the roller to transmit compression to the depressed area.

Any mixture that becomes loose and broken, mixed with dirt, or is in any way defective in finish or density shall be removed and replaced with fresh hot mixture, which shall be compacted to conform with the surrounding area. Any area showing an excess or deficiency of bituminous material shall be removed and replaced.

Sequence of laying and compaction of premix shall be so managed, that a long time does not elapse between successive dump trucks, which may cool down the uncompacted premix, between paver and compacted asphalt below 120o C.

21.3.3.9 Frequency of Testing for Cores



One core shall be taken for each 100 linear meter of each lane of Asphaltic Base, or fraction thereof, in special cases. If the core so taken is failed against the specified 97% density, then two (2) additional cores shall be taken in the longitudinal alignment of the road at an interval of three (3) meters on either side with respect to the failing core and shall be tested against field density. If all the three cores give an average of 97% compaction, and the individual compaction of the core is not less than ninety five (95) percent, then the compaction is acceptable. If average of the cores further fails against compaction, then retake the cores at a distance of fifteen

(15) meters on either side and compaction shall be checked for all the five cores in the same fashion. If average of five cores is 97%, the area will be accepted. In case average is ninety six 96% or more, then EMPLOYER may withhold the payment in full or partly and observe behaviour during maintenance period, for the release of payment or otherwise. In case of failure of the average of these five cores giving average compaction of less than 96%, the failed area shall be removed and subsequently be replaced by specified mix in an approved manner at the expense of the SUBCONTRACTOR.

21.3.3.10 Surface Tolerances

After completion of final rolling, the finished surface shall be tested for smoothness with three (3) meters straightedge by the EMPLOYER at selected locations. The variation of surface from testing edge of straight edge between any two (2) contacts with the surface shall at no point exceed six (6) millimeters when placed either parallel or perpendicular to centre-line of roadway.

Any irregularities that exceed the specified tolerances or that retain water on the surface shall be corrected by removing the defective area and replacing with new asphaltic base course without additional cost to the EMPLOYER.

21.3.3.11 Base Thickness Tolerances

For determination of thickness, one (1) core for each hundred (100) linear meter of each lane shall be taken. Unless, otherwise permitted, cores extracted for thickness measurement shall not be used for density determination and density cores shall not be used for thickness measurements.

When layer thickness of asphaltic base course is deficient by more than five (5) mm from that specified in the Drawings, the deficiency shall be removed with satisfactory base course material and / or made up by additional asphalt concrete wearing course thickness without extra cost to the EMPLOYER. If such remedial action is authorised, revised thickness determinations shall be made by measurements of new cores taken after placing of "Asphaltic Wearing Course" material or as directed by the EMPLOYER. If base course deficiencies are corrected in this manner, full payment for the "Asphaltic Base Course" will be made to the SUBCONTRACTOR, but no additional payment will be made for the increase in thickness of the "Asphaltic Wearing Course".

21.3.3.12 Acceptance Sampling and Testing

Acceptance of samples and testing of materials and construction requirements, shall be governed by the relevant, 'Table for Sampling and Testing Frequency' or as approved by the EMPLOYER.

21.3.3.13 Weather Limitations

Hot asphaltic mixtures shall be placed only when the air temperature is four (4) degrees cen-



tigrade or above and no asphalt shall be laid under foggy or rainy weather or over moist surface.

21.3.3.14 Trial Section

The SUBCONTRACTOR shall prepare a trial section before the start of work in light of procedure given in clause 1.20 (General).

21.4 ASPHALT CONCRETE WEARING COURSE – PLANT MIX

21.4.1 DESCRIPTION

This work shall consist of furnishing aggregates and asphalt binder at a central mixing plant, to a specified mixing temperature, transporting, spreading and compacting the mixture in an approved manner on primed or tacked base, subbase, subgrade, bridge deck or concrete pavement in accordance with these specifications and in conformity with the lines, grades and typical cross-sections shown in the drawings or as directed by the EMPLOYER.

21.4.2 MATERIAL REQUIREMENTS

21.4.2.1 Mineral Aggregates

The Aggregates shall consist of coarse aggregates, fine aggregates and fitter material, if required and shall be clean, hard, tough, durable and sound particles of uniform quality, geology, petrology and free from decomposed material, vegetable matter, soil, clay, lumps and other deleterious substances.

Coarse aggregate which is the material retained on an AASHTO No. 4 Sieve, shall consist of one hundred (100) % crushed rock or crushed gravel having two (2) faces mechanically crushed. The type of source shall be uniform throughout the quarry location from where such a material is obtained. The coarse aggregates shall be free from an excess of flat or/and elongated particles.

Fine aggregate which is the material passing from AASHTO No. 4 sieve, shall consist of 100% crushed material from rock or boulder. Fine aggregate shall be stored separately, and no natural sand will be allowed in the mix.

When the combined grading of the coarse and fine aggregates is deficient in material passing the AASHTO No. 200 sieve, mineral filler material shall be added as approved by the EMPLOYER. The filler shall consist of finely divided mineral matter such as rock dust, hydrated lime, hydraulic, calcined dust cement or other suitable mineral matter free from lumps, balls or other deleterious material and shall conform to the following gradation:

Sieve Designation				Percent Passing by Weight
mm	inch			
0.600	0.300	No.30	No.50	100
0.075		No.200		95-100
				70-100

The coarse and fine aggregates shall meet the following requirements:

- The percent of wear by the Los Angeles Abrasion test (AASHTO T 96) shall not be more than thirty (30).



- b. The loss when subjected to five cycles of the Sodium Sulphate Soundness test (AASHTO T 104) shall be less than twelve (12) percent.
- c. The Sand Equivalent (AASHTO T 176) determined after all processing except for addition of asphalt cement shall not be less than 45.
- d. All aggregates shall have a liquid limit of not more than twenty five (25) and a Plasticity Index of not more than four (4) as determined by AASHTO T-89 and T-90.
- e. The portion of aggregates retained on the 9.5 mm (3/8 inch) sieve shall not contain more than 10 percent by weight of flat and/or elongated particles (ratio of maximum to minimum dimension = 2.5:1).
- f. Stripping test shall be performed on crush aggregates as described under AASHTO-182 and only that material shall be allowed which qualifies the test.
- g. The coarse aggregates shall be checked if desired by the EMPLOYER for cationic and anionic behaviour so that their affinity with the bitumen to be used is verified.
- h. Petrographic examination of the coarse aggregate shall be conducted if so directed by the EMPLOYER.

The percentage of particles having certain proportions between their largest and smallest dimensions (i.e. between the largest distance the particles can fill out between two parallel planes that will permit the particle to pass), shall be determined in the following way:

- i. Form a sample of coarse aggregates, all particles passing No. 4 sieve are eliminated. The sample shall be of sufficient quantity that at least 100 particles remain.
- ii. By means of a sliding calliper, the largest and smallest dimensions, as defined above, are determined for each particle and its proportion calculated (with one decimal).
- iii. The total weights of particles having the proportions two and a half (2.5) or less and three (3) or less, are determined and their percentage in relation to the total sample are calculated.

21.4.2.2 Asphaltic Material

Asphaltic binder to be mixed with the aggregate to produce asphaltic base shall be asphalt cement penetration grade 40-50, 60-70 or 80-100 as specified by the EMPLOYER. Generally, it will meet the requirement of AASHTO M-20.

21.4.2.3 Asphalt Concrete Wearing Course Mixture

The composition of the asphaltic concrete paving mixture for wearing course shall conform to Class A and/or Class B shown in the following table:

Table 305-1
Asphalt Concrete Wearing Course Requirements

Mix Designation	Class A	Class B
Compacted Thickness	50-80 mm	35-60 mm
Combined Aggregate Grading Requirements		

Sieve Designation		Percent Passing by Weight
mm	inch	



25	1	100	-
19	3/4	90-100	100
12.5	½	-	75-90
9.5	3/8	56-70	35-60-80
4.75	No.4	23-35	40-60
1.18	No.8	5-12	20-40
0.075	No.16	2-8	5-15
	No.200		3-8

Asphalt percent of total mix	Content 3.5 (Min.)	3.5 (Min.)	weight
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The asphalt concrete wearing course mixture shall meet the following Marshal Test Criteria:

Compaction, number of blows each end of specimen	75
Stability	1000 Kg (Min)
Flow, 0.25 mm (0.01 inch)	8-14
Percent air voids in mix	4-7
Percent voids in mineral aggregates	according to table 5.3 MS-2 (Asphalt Institute - USA), sixth addition, 1993.
Loss of Stability	20% (Max.)

21.4.2.4 Job Mix Formula

At least one week prior to production, a Job-Mix Formula (JMF) for the asphaltic wearing course mixture or mixtures to be used for the project, shall be established jointly by the EMPLOYER and the SUBCONTRACTOR.

The JMF shall be established by Marshall Method of Mix Design according to the procedure prescribed in the Asphalt Institute Manual Series No. 2 (MS-2), sixth edition 1993 or the latest Edition.

The JMF, with the allowable tolerances, shall be within the master range specified in Table 305-1. Each JMF shall indicate a single percentage of aggregate passing each required sieve and a single percentage of bitumen to be added to the aggregates.

The ratio of weight of filler (Passing No. 200) to that of asphalt shall range between 1 - 1.5 for hot climate areas with temperature more than 40 °C.

After the JMF is established, all mixtures furnished for the project represented by samples taken from the asphalt plant during operation, shall conform thereto with the following ranges of tolerances:

Combined aggregates -gradation	
Retained No. 4 and larger	± 7.0%



Passing No. 4 to No. 100 sieves	± 4.0%
200	± 1.0%
Asphalt Content	
Weight percent of total mix	± 0.3%

In addition to meeting the requirements specified in the preceding items, the mixture as established by the JMF shall also satisfy the following physical property:

Loss of Marshall Stability by immersion of specimen in water at sixty (60) degree C. for twenty four (24) hours as compared with the stability measured after immersion in water at sixty (60) degree C. for twenty (20) minutes shall not exceed twenty (20) percent. If the mixture fails to meet this criterion, the JMF shall be modified or an anti-stripping agent shall be used.

Should a change of sources of materials be made a new Job Mix Formula shall be established before the new material is used. When unsatisfactory results or other conditions make it necessary, a new Job Mix Formula will be required.

21.4.3 CONSTRUCTION REQUIREMENTS

Construction requirements for this Item shall conform with the same as specified for Asphaltic Concrete Base Course Plant Mix under Item 203.3, except as modified in the following sub-items.

21.4.3.1 Preparation of Base Course Surface

Before spreading materials, the surface of the previously constructed and accepted base course on which the mix is to be placed shall be conditioned by application of a tack coat, if directed by the EMPLOYER

21.4.3.2 Pavement Thickness and Tolerances

The asphalt concrete wearing course shall be compacted to the desired level and cross slope as shown on the drawing or as directed by the EMPLOYER.

The tolerances in compacted thickness of the wearing course shall be ± 3 mm from the desired thickness shown on the drawings. For determination of thickness one (1) core per hundred meters of each lane will be taken. If the thickness so determined is deficient by more than three (3) mm, but not more than ten (10) mm, payment will be made at an adjusted price as specified in table-1, clause 305.4.2.(2) of this specification.

The surface of the wearing course shall be tested by the EMPLOYER using a 5 meters straightedge at selected locations. The variation of the surface from the testing edge of the straightedge between any two contacts, longitudinal or transverse with the surface shall at no point exceed five (5) millimeters. The cross fall (camber) shall be with + 0.2 percent of that specified, and the level at any point shall be within + three (3) mm of the level shown on the Drawings. All humps or depressions exceeding the specified tolerance shall be corrected by removing the defective work and replacing it with new material, by overlaying, or by other means satisfactory to the EMPLOYER.

21.4.3.3 Acceptance Sampling and Testing

Acceptance of sampling and testing for this Item with respect to materials and construction requirements, not specified herein, shall be in accordance with the relevant, Tables for Sampling and Testing Frequency" in these specifications.



21.5 CONCRETE KERBS, GUTTERS AND CHANNELS

21.5.1 DESCRIPTION

This work shall consist of kerb, gutter, channel, or combination of kerb and gutter or channel; constructed of the following materials and in accordance with the specifications at the location and of the form, dimensions and designs shown on the Drawings or as directed by the EMPLOYER. The kerb, gutter, channel or in combination may be constructed by one of the following methods.

- i) Cast in place concrete kerbing.
- ii) Precast concrete kerbing.
- iii) Extruded concrete kerbing.

21.5.2 MATERIAL REQUIREMENTS

The concrete for cast in place concrete kerbs, gutters and channels shall be either Class W or class 'C' or as indicated on the Drawings and shall conform to the requirements of that particular class prescribed under item 401.1.1. "Classes of concrete". An air entraining agent, if required, shall be added during mixing an amount to produce five (5) to eight (8) percent air by volume in the mixed concrete.

Precast concrete kerbing units shall consist of class 'C' concrete conforming to the requirement of item 401 and to lengths, shape and other details shown on the Drawings. Kerbing which shows surface irregularities of more than five (5) mm when checked with three meter straight edge or surface pits more than fifteen (15) mm in diameter will be rejected.

Forms to hold the concrete shall be built and set in place as described under item 403-Formwork.

Forms for at least sixty meters of kerb or combination of kerb and gutter or channels shall be in place and checked for alignment and grade before concrete is placed. Curved sections shall have forms of either wood or metal and shall be accurately shaped to radius of curvature shown on the Drawings. Steel Reinforcement if required shall conform to item 404 "Steel Reinforcement".

Expansion joint filler shall be either the performed type conforming to requirement of AASHTO-M 153 or shall be precast fiber board packing.

Joint filler shall consist of one part cement and two parts of approved sand with sufficient quantity of water necessary to obtain the required consistency. The mortar shall be used within thirty (30) minutes after preparation.

The Bonding compound when used shall conform to AASHTO M-200.

21.5.3 CONSTRUCTION REQUIREMENTS

21.5.3.1 Cast-in-Place

a. Excavation and Bedding

Excavation shall be made to the required depth and the base upon which the kerb or combination of kerb and gutter is to be set shall be compacted to a minimum density of ninety (90) percent of the maximum dry density as determined by AASHTO T-191 Method. All soft and unsuitable material shall be removed and replaced with suitable material acceptable to the EMPLOYER.



Where directed by the EMPLOYER, a layer of cinders or clean sand and gravel, or other approved porous material having a minimum compacted thickness, of fifteen (15) cm shall be placed to form a bed for the kerb or combination of kerb and gutter.

b. Placing Concrete

Concrete may be placed in the gutter to the full depth required. The top of the kerb or combination of kerb and gutter shall be floated smooth and the edges rounded to the radii shown on the Drawings. Before finishing, the surface of the gutter shall be tested with a three (3) meter straight-edge and any irregularities of more than five (5) mm in three (3) meters shall be eliminated. In finishing concrete only mortar normally present in the concrete shall be permitted for finishing. The use of a separate mortar finishing coat or the practice of working dry cement into the surface of the concrete will not be permitted.

c. Joints

The kerb and gutter shall be constructed in uniform sections of not more than twenty five (25) meters in length except where shorter sections are required to coincide with the location of weakened planes or contraction joints Of the concrete pavement or for closures but no section shall be less than two (2) meters long. The sections shall be separated by sheet templates set perpendicular to the face and top of the kerb and gutter. The templates shall be approximately five (5) mm in thickness, of the same width as that of the kerb or kerb and gutter and not less than five (5) cm greater than the depth of the kerb or kerb and gutter. Templates shall be set carefully and held firmly during the placing of the concrete and shall be allowed to remain in place until the concrete has set sufficiently to hold its shape, but shall be removed while the forms are still in place. When pre-cut fiber-board packing is used in the expansion joints it may be used in place of the sheet template referred to above, on the approval of the EMPLOYER. In this event the fiber board shall be pre-cut to the shape of the kerb so that its outer edge will be flush with the abutting kerb.

Expansion joints shall be formed in the kerb and gutter at intervals of six (6) to ten (10) meters in order to coincide with the expansion joints of cement concrete pavement or as shown on the Drawing.

d. Dowels at Expansion Joints in Channels

At expansion joints in channels and in the channel portion of kerbs and channel built monolithically, painted dowel bars with slip sleeve shall be provided as a load transfer medium at locations shown on the Drawings.

The size and spacing of the dowel bars shall be as indicated on the Drawings. Each dowel shall be set accurately parallel to the top surface of the gutter and accurately at right angles to the expansion joint.

e. Contraction Joints

Transverse contraction joints shall be provided opposite to all contraction joints in abutting concrete pavement and other locations shown on the Drawing spaced to a maximum of four (4) meters.

The contraction joints shall be provided by forming grooves in the face and surface of structure at right angle to the kerb alignment and kerb surface. The grooves shall be rec-



tangular in cross-section, five (5) cm deep by five (5) cm wide. The grooves shall be formed in the top of all kerbs and in the exposed roadway face of kerb and in the channel surface of monolithic type kerb and channels and in the surface of channels. The edges of the joints shall be tooled and the joints shall be left clean, neat and of specified width and depth.

f. Removal of Forms and Finishing

The forms shall be removed within twenty four (24) hours after concrete has placed except that the, form used against the face of the kerb in a combination of kerb and gutter shall be removed as soon as the concrete has set sufficiently to hold its shape. Minor defects shall be repaired with mortar containing one part of portland cement and two parts of the fine aggregate. Plastering shall not be permitted on the face of a kerb or kerb and gutter and all rejected kerb or gutter shall be removed and replaced without additional compensation. All surfaces which will be exposed in the finished construction of the kerb and gutter shall be finished, while the concrete is still "green" by wetting a wood block of float and rubbing the surface until they are smooth.

g. Curing

During seventy two (72) hours following placing of concrete, the kerbs, channels and gutters shall be protected against premature drying by covering with suitable cotton or Hessian mats and by frequent sprinkling with water, with liquid forming compounds or with waterproof paper or by any other method as mentioned in section 401.3.8-Curing, Concrete and approved by the EMPLOYER.

h. Backfilling

After forms has been removed and concrete has been cured as specified, the excavation of kerbs, gutters or channels shall be backfilled with suitable earth or granular material tamped into place in layers of not more than fifteen (15) cms each until firm and solid.

21.5.3.2 Pre-Cast

a. Excavation and Bedding

Excavation shall be made to the required depth as shown on the Drawings. All soft and unsuitable material shall be removed and replaced with a suitable material acceptable to the EMPLOYER.

Bedding shall consist of Class B Concrete conforming to the requirements of Item 401 and shall be to the section and dimension shown on the Drawings.

b. Placing

The precast concrete kerbs shall be set in 1:3 of cement sand mortar to the line, level and grade as shown on the Drawings or as directed by the EMPLOYER.

c. Joints

Joints between consecutive kerbs shall be three (3) to five (5) mm wide and filled with cement mortar to the full section of the kerb.

d. Backfilling

Backfilling shall meet the requirements of Item 601.3.1 (h).

21.5.3.3 Extruded Concrete Kerbing and Channels



a. Excavation and Bedding

Excavation and bedding shall conform to the requirements as described under item 601.3.1 (a).

b. Placing

Concrete shall be fed to the machine at a uniform rate. The concrete shall be of such consistency that after extrusion it will maintain the shape of the kerb section without support and shall contain the maximum amount of water that will permit this result. The machine shall be operated under sufficient uniform restraint to forward motion to produce a well compacted mass of concrete which requires no further finishing other than light brushing with a brush filled with water only. The forming tube portion of the extrusion machine shall be readily adjustable vertically during the forward motion of the machine. A grade line gauge or pointer shall be attached to the machine so that a continual comparison can be made between the kerb being placed and the established kerb grade as indicated by an offset guideline.

The top end face of the finished kerb shall be true and straight and the top surface of the kerb shall be of uniform width, free from bumps or surface pits larger than fifteen (15) mm in diameter. When a straight-edge three (3) meters long is laid on the top or face of the kerb or surface of the gutter, the surface shall not be more than five (5) mm from the edge of the straightedge except at grade changes or curves.

Where adhesive is used to bond the kerb to an existing pavement, the surface shall be first thoroughly cleaned of all dust, loose material and oil, the cost of which shall be included in other items of work.

c. Joints

Expansion joints shall be constructed by sawing through the kerb section to its full depth. The width of the cut shall be such as to admit the joint filler with a tight fit. Pre-formed joint filler shall conform to the provisions of Item 601.2 and shall be inserted and mortared in place.

If sawing is performed before the concrete has hardened, the adjacent portion of the kerb shall be supported firmly with close fitting shields and the operations of sawing and inserting the joint filler shall be completed before curing the concrete.

Alternatively pre-cut joint fillers shall be permitted to be placed at the location of the expansion joints prior to the placing of the extruded kerb with the approval of the EMPLOYER. The joint fillers shall be set firmly in place in a vertical position to the line and grade of the kerb profile.

d. Curing and Backfilling

Curing and backfilling shall be as described in item 601.3.1(g) and Item 601.3.1 (h).



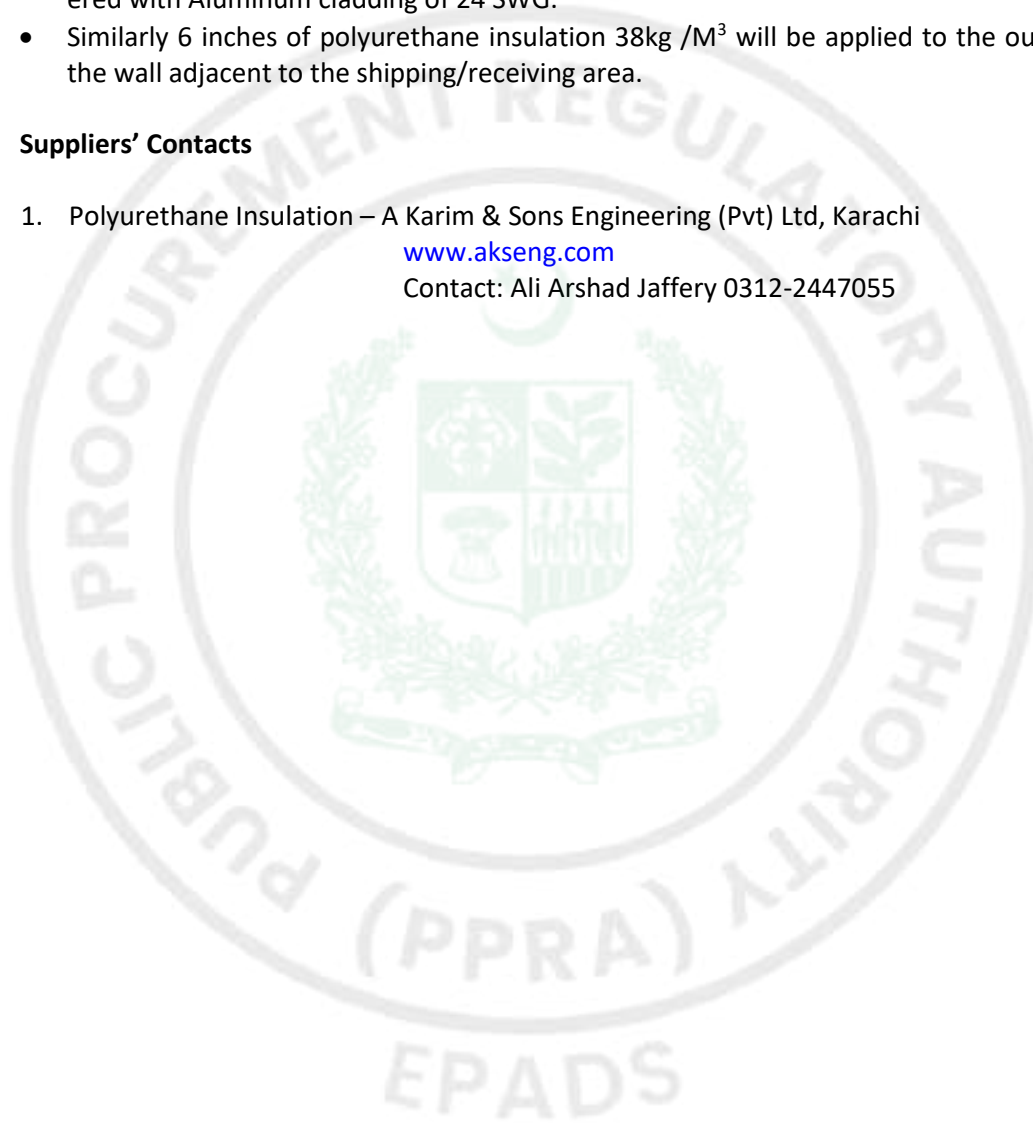
22. COLD STORAGE

22.1 Insulation

- 4" Inches of polyurethane insulation 38kg /M³ will be affixed to the inside of the ceiling except the bottom of the beams may be covered with 2 inches to leave enough clearance for storage and movement of loader.
- 6" Inches of polyurethane insulation 38kg /M³ will also be applied to the outside of the external wall exposed to the sun in the south-west corner. The insulation may be covered with Aluminum cladding of 24 SWG.
- Similarly 6 inches of polyurethane insulation 38kg /M³ will be applied to the outside of the wall adjacent to the shipping/receiving area.

Suppliers' Contacts

1. Polyurethane Insulation – A Karim & Sons Engineering (Pvt) Ltd, Karachi
www.akseng.com
Contact: Ali Arshad Jaffery 0312-2447055



23. FIRE FIGHTING SCOPE

The details for the following fire services installations will be provided in this item:

- Fire services Mains
- Fire Pumps
- Installation of standpipe and hose system
- External fire hydrant with the premises
- Portable fire extinguishers

GENERAL:

- Upon completion of the installations the SUBCONTRACTOR shall perform field tests on all equipments, materials and system. All tests shall be conducted in the presence of the EMPLOYER. In general all tests made by the SUBCONTRACTOR shall be of the nature to assure that the entire installation is sound and that all equipments will function properly and as intended.
- The SUBCONTRACTOR shall furnish and install all tools, instruments, test equipment material etc. and furnish all personnel required for carrying out complete testing.
- The SUBCONTRACTOR shall record all test results and submit the same to the EMPLOYER.

23.1 FIRE SERVICE MAINS

Codes and Regulations

Codes and standards of National Fire Protection Association (NFPA) for the installation of private Fire Mains and their Appurtenances, NFPA-24 shall be followed.

Pipe Materials

The pipe material used for the fire Main will be seamless galvanized 40 black steel pipes or as approved by EMPLOYER. The protective coatings and linings for the pipe shall be performed as per code NFPA-24.

Fittings and Joints

Groove Joining Methods: Pipes joined with grooved fittings shall be joined by a listed combination of fittings, gaskets, and grooves. Other methods specified in NFPA-24 can also be adopted for the fittings and joints or as approved by the EMPLOYER.

Service Main Testing

The service main shall be checked against the following tests:

- **HYDROSTATIC TEST:** All piping and attached appurtenances subjected to system working pressure shall be hydrostatically tested at 200 psi (13.8 bar) or 50 psi (3.5 bar) in excess of the system working pressure, whichever is greater, and shall maintain that pressure at ± 5 psi (0.35 bar) for 2 hours.
- **LEAKAGE TEST:** All piping and attached appurtenances should also be tested for the leakage test. The amount of leakage should also be measured.

All tests shall be conducted in the presence of the EMPLOYER.

23.2 FIRE PUMPS

Codes and Regulations



Codes and standards of National Fire Protection Association (NFPA) for the installation of Fire Pumps, NFPA-20 shall be followed.

Scope of work

- Vertical Multistage Turbine type Fire Pumps (1 duty + 1 stand-by) will be installed at pump room to boost up the water to the required flow and pressure and one jockey pump will be provided to maintain the system pressure.
- Main fire pump will be electric motor driven while the standby fire pump will be provided with Diesel engine drive.

Pump Type

FM-UL listed and NFPA 20 compliance fire pump set comprising of 1 main electric pump (duty) + 1 Diesel Engine Pump (Standby) + jockey pump shall be provided. The capacities of all the pumps should be,

Main pump capacity = 500 GPM at 6.7 bar head (approx.)

Standby pump capacity = 500 GPM at 6.7 bar head (approx.)

Jockey pump duty = 50 GPM at 7.0 bar head (approx.)

23.3 STAND PIPE AND HOSE SYSTEM

Codes and Regulations

Codes and standards of National Fire Protection Association (NFPA) for the installation of Stand pipe and Hose system, NFPA-14 shall be followed.

Scope of work

The scope of work for stand pipe and hose system is an arrangement of piping, valves, hose connections, and allied equipment installed in a building or structure, with the hose connections located in such a manner that water can be discharged in streams or spray patterns through attached hose and nozzles, for the purpose of extinguishing a fire, thereby protecting a building or structure and its contents in addition to protecting the occupants.

Minimum Design pressure

Hydraulically designed standpipe systems shall be designed to provide the water flow rate at a minimum residual pressure of 100 (6.9 bar) at the outlet of the hydraulically most remote 2 1/2 in. (65 mm) hose connection and 65 psi (4.5 bar) at the outlet of the hydraulically most remote 1 1/2 in. (40 mm) hose station.

Fire Hose Cabinet

Fire hose cabinet made of M.S sheet front glass fitted with lock and handle red color power coating along with following equipment:

- 1" diameter 30m high pressure rubber hose reel tested on 30 bar with PRV (Pressure Reducing valve) mounted on swing arm.
- Spare Hose, Nozzle and Extinguisher 2kg 5kg CO2 and 4.5 kg dry powder extinguisher.
- Brass gate valve 1" dia.

Construction Requirements

- Hose connections and hose cabinets shall be unobstructed and shall be located not less than 3 ft (0.9 m) or more than 5 ft (1.5 m) above the floor.
- The hose connection shall not be obstructed by the closed or open door or other ob



jects on the landing.

23.4 FIRE HYDRANT

A 3 way fire hydrant of cast iron body as per BS 1452 with copper alloy outlets as per BS 1400 shall be provided.

23.5 FIRE EXTINGUISHER

Scope of Work

This item shall consist of providing and fixing portable fire extinguisher at location shown on drawing and plans as directed by the EMPLOYER.

Material

Portable fire extinguishers dry chemical powder type, including brackets, screws and all other accessories required for fixing of fire extinguishers on walls and columns etc. as indicated on the plans or as directed by the EMPLOYER.

General Purpose Fire Extinguisher Model :- DC-SP-6 Capacity 6 KG Tested to 25 Kg/Sq.cm (350 Lbs. Sq. Inch)

Standards

Manufactured to NFPA-10 BS 5423 BS EN ISO 9001:2000 Quality Control System

Operation

- a. Keep Extinguisher up-right during operation.
- b. Pull out safety pin.
- c. Squeeze the operation lever completely.
- d. Spray the gas at base of flame with fan like movement.

Construction Requirements

- a. The fire extinguishers shall be fixed at prominent locations which easily accessible to the fire fighters and the work staff present in building during working hours.
- b. Fire extinguishers shall be located along normal paths of travel, including exits from areas.
- c. Fire extinguishers shall not be obstructed or obscured from view.
- d. Fire extinguishers having a gross weight not exceeding 40 lb (18.14 kg) shall be installed so that the top of the fire extinguisher is not more than 5 ft (1.53 m) above the floor.
- e) Fire extinguishers having a gross weight greater than 40 lb (18.14 kg) (except wheeled types) shall be installed so that the top of the fire extinguisher is not more than 3 1/2 ft (1.07 m) above the floor.

23.6 FIRE DEPARTMENT CONNECTION

Wall-Type, Fire Department Connection: UL 405, 175-psig (1200-kPa) minimum pressure rating; with corrosion-resistant-metal body with brass inlets, brass wall escutcheon plate, brass lugged caps with gaskets and brass chains, and brass lugged swivel connections. Include inlets with threads matching local fire department sizes and threads, outlet with pipe threads, extension pipe nipples, check devices or clappers for inlets, and escutcheon plate with marking similar to "STANDPIPE".



GLOSSORY OF ABBREVIATIONS AND TERMS

A.C	Asbestos Cement.
AASHTO	American Association of State Highway and Transportation Officials.
B.D.L.	Below Detection Limit.
B.S.	British Standard.
B.S.S.	British Standard Specifications.
BOD	Oxygen Demand.
C.I.	Cast Iron.
CBR	California Bearing Ratio.
Cm	Centimeter
Cm	Cubic meter
Co2	Carbon dioxide.
COD	Oxygen Demand.
Cusec	cubic feet per second.
E.I.A.	Environment Impact Assessment.
Ft	foot/ feet
G.N.P.	Gross National Product.
gped	gallons per capita per day.
ha	hectacre.
i.e.	that is
i/d	Internal Diameter.
In.	inch.
k.m	Kilo Meter.
K.N.	Kilo Newton.
Kg.	Kilo gram.
km/h	kilometer per hour.
Ltd.	Limited
M.G.D.	Million gallons per day
M/s	Messers
M3/d	cubic meter per day.
Mg/l	Milligram per liter.
MIE	Multan Industrial Estate.
Mm	millimeter.



P.E.	Polyethylene.
P.S.I.	Pounds per square inch.
PCC.	Plain Cement Concrete.
Pt	Point
Pvt	Private.
RCC	Reinforced Cement Concrete.
RS.	Rupees.
Sft	Square feet.
SN	Structural Number.
T.D.S.	Total Dissolved Solids.
T.S.S.	Total Suspended Solids.
T.S.T.	Triple Surface Treatment.
TRL	Tropical
UPVC	Unpolish Polyvenyle Choloride.
WHO	World Health Organization.
%	Percentage.
&	and

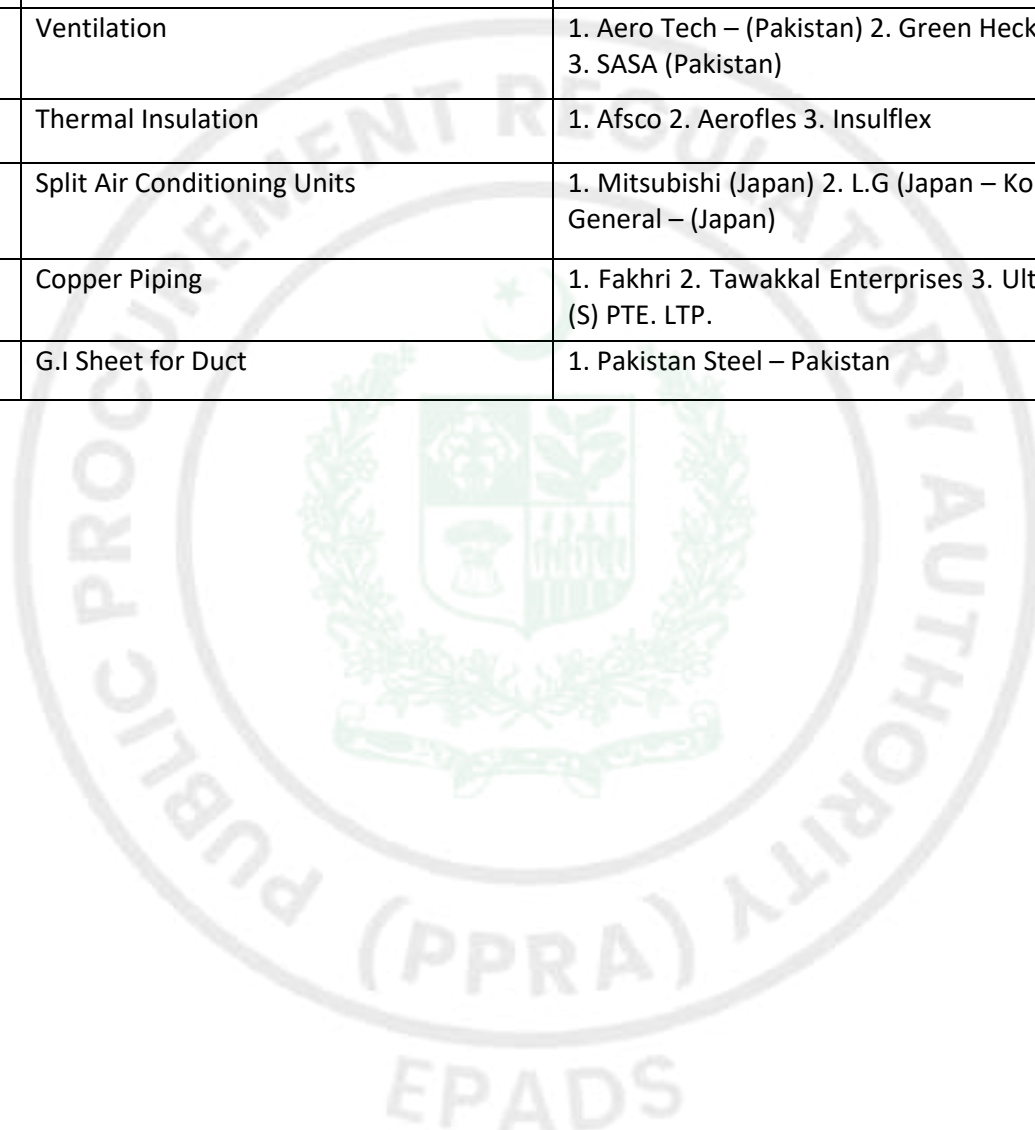


LIST OF STANDARD/RELIABLE MANUFACTURERS

All items to be the heaviest commercial grade available. List of item numbers to be provided by CDM.

S No	Item	Manufacturers/Suppliers
1.	G. I Pipes	1. I.I.L. (Medium) 2. Jamal
2.	Pipes and fittings in Polypropylene Random (PPR)	1. Plastherm
3.	G.I Pipes (Specials)	1. HE China
4.	Gate Valves and Sluice Valves	1. Mughal
5.	Cast Iron (Spun) pipes & Fittings and Fixtures	1. Teepu
6.	Asbestos Pipe	1. Dadex
7.	Upvc Pipes and Fittings	1. Dadex 2. Beta 3. Popular 4. Bilal
8.	A.C Pipe	1. Dadex
8.	Fire Extinguishers	2. Haseen Habib (Pvt,) Ltd
9.	Sanitary Fixtures (Wares)	1. Forte 2. ICL 3. Porta 4. Master
10.	Sanitary Fittings	1. Master 2. Sonex 3. Faisal
11.	Pumps	1. KSB
12.	Light Fixture	1. Philips 2. Clipsal Pakistan
13.	Cables and Wires	1. Pakistan Cables 2. Pioneer Cables 3. New-age Cables
14.	PVC Conduits/ Ducts and accessories	1. Beta 2. Adamjee
15.	Steel Conduits & Accessories	1. IIL
16.	Fans	1. Pak 2. Millat 3. Asia
17.	MCCB, MCB's	1. Fuji (Japan)
		2. Mitsubishi (Japan) 3. Siemens (Germany) 4. Terrasaki (Japan)
18.	Distribution Boards, Main and Sub-Main Panel Boards	1. Electrich 2. JEI
19.	Switches, Sockets etc.	1. Clipsal 2. Bush
20.	Back Boxes, Pull Boxes etc.	1. Clipsal 2. Bush
21.	Telephone Cables	1. Siemens Germany 2. Pakistan Cables Limited 3. Newage Cables
22.	Telephone Junction Boxes	1. JEI 2. Electrich
23.	Generator Set	1. Caterpillar 2. Siemens 3. Perkins
24.	Transformers	1. Siemens 2. PEL
25.	Coaxial Cable	1. Pakistan Cables 2. Pioneer Cables 3. 3M
26.	Paints and Varnishes	1. ICI 2. Berger
27.	Ceramic Tiles	1. Master 2. Emco 3. Forte

S No	Item	Manufacturers/Suppliers
28.	Iron Mongery Locks	1. Yale (Italy) 2. UNION (U.K.) 3. Kale (Turkey)
29.	Door Hinges & Handles	1. Star 2. Kings 3. Umbrella
30.	Sewerage Pipes (RCC)	1. Shalimar 2. Pak Construction
31.	Cement	1. Askari 2. Bestway 3. Fecto 4. DG 5. Maple Leaf 6. Fauji
32.	Concrete Blocks	1. Izhar 2. NLC/ Redco
33.	Ventilation	1. Aero Tech – (Pakistan) 2. Green Heck (USA) 3. SASA (Pakistan)
34.	Thermal Insulation	1. Afsco 2. Aerofles 3. Insulflex
35.	Split Air Conditioning Units	1. Mitsubishi (Japan) 2. L.G (Japan – Korea) 3. General – (Japan)
36.	Copper Piping	1. Fakhri 2. Tawakkal Enterprises 3. Ultra Tex (S) PTE. LTP.
37.	G.I Sheet for Duct	1. Pakistan Steel – Pakistan





پاکستان سول ایوی ایشن اتھارٹی

PAKISTAN CIVIL AVIATION AUTHORITY

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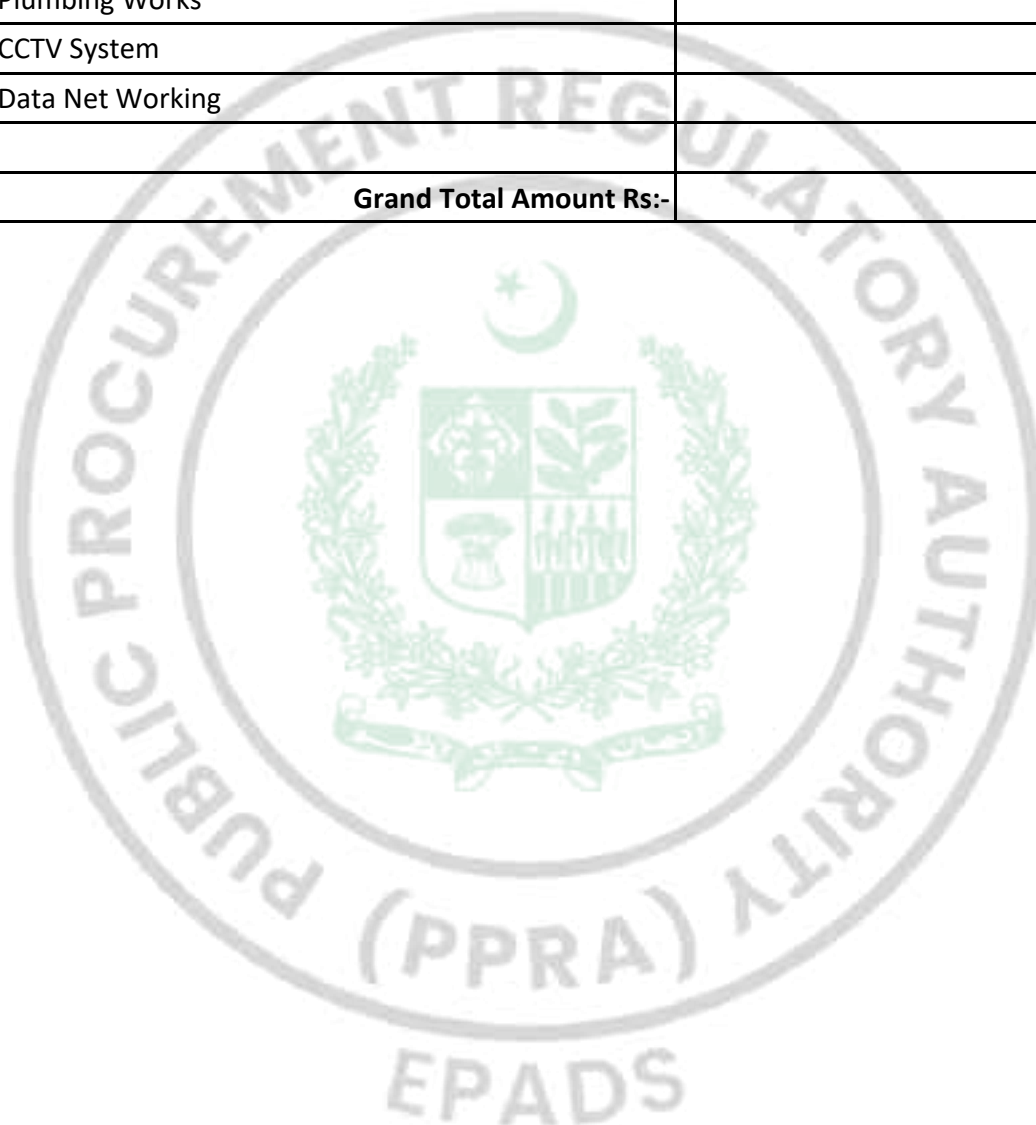
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**PEL EXAMINATION CENTER KARACHI
MAIN SUMMARY
BILL OF QUANTITIES**

S.No.	Description	Total Cost
1.2	Civil Works	
1.3	Electrical Works	
1.5	Plumbing Works	
1.5	CCTV System	
1.6	Data Net Working	
	Grand Total Amount Rs:-	



**CIVIL AVIATION AUTHORITY
PEL EXAMINATION CENTER KARACHI
CIVIL WORKS
ENGINEER'S ESTIMATE**

S.No.	CSR Sindh 2024	Description	Unit	Quantity	Rate	Amount
						(Pak Rs)
		A- EARTH WORK				
1	1.1	Clearing and grubbing the site by cutting, uprooting and removing all rubbish and shrubs including disposal to (outside limits) designated places.	Sft	3500		
2	1-18-b	Excavation in foundation of Building Bridges and other structure including daggelling dressing, refilling ramming lead upto 5 ft. , lead upto one chain (30 metre) and lift upto 5 ft (1.5 metre)	Cft.	10500		
3	1-22	Filling, watering and ramming earth under floor with new earth (Excavated from outside) lift upto 5 ft and lead upto 10 miles including cost of earth.	Cft.	16570		
4	NSI	Providing and filling local sandy soil approved quality in set back, trenches, plinth/under floor or any section of work including dressing, watering, consolidation in layers not exceeding 9" in depth at least 95% Modified AASHTO specifications complete in all respect as per specification and as directed by the Engineer,	Cft.	760		
5	18-101	Filling watering & ramming sweet earth excavated from outside lead upto 10 miles and lift upto 5ft.including cost of sweet earth	Cft.	650		
					Sub Total A	
		B-TERMITE PROOFING				
5	18-92A	Providing Anti-termite treatment by spraying/ sprinkling / spreading Neptachlar 0.5% Emulsion as an over all pre construction treatment in slab type construction under the slab and along attached perches or entrances etc, complete as per directions of Engineer	Sft.	10650	1	
					Sub Total B	
		C- SUB & SUPER STRUCTURE				

**PEL EXAMINATION CENTER KARACHI
CIVIL WORKS
ENGINEER'S ESTIMATE**

S.No.	CSR Sindh 2024	Description	Unit	Quantity	Rate	Amount
						(Pak Rs)
6	4-5-i	Cement concrete plain including placing compacting, finishing and curing, complete including screening and washing at stone aggregate without shuttering. 1:4:8	Cft.	690		
7	4-5-h	Cement concrete plain including placing compacting, finishing and curing, complete including screening and washing at stone aggregate without shuttering. 1:3:6	Cft.	2618		
8	4-6-a-i	Reinforced cement concrete work including all labour and material except the cost of steel reinforcement and its labour for bending and binding which will be paid separately. This rate also includes all kinds of forms moulds, lifting, centering, shuttering and curing. (including screening and washing of shingle.) a) R.C.C work in roof slab, beams, column, rafts, lintels and other structural members laid in situ or precast laid in position complete in all respects. (i) Ratio 1:2:4 90 Lbs of cement, 2 Cft sand and 4 Cft shingle 1/8" to 3/4" gauge.	Cft	6076		
9	4-6-a-ii	Reinforced cement concrete work including all labour and material except the cost of steel reinforcement and its labour for bending and binding which will be paid separately. This rate also includes all kinds of forms moulds: lifting shuttering and curing (including screening and washing of shingle.) (a) R.C.C work in roof slab, beams, column, rafts, lintels and other structural members laid in situ or precast laid in position complete in all respects. (ii) (II) Ratio 1:1-1/2:3 90 Lbs of cement, 1 1/2 Cft sand and 4 Cft shingle 1/8" to 3/4" gauge.	Cft	1767		

**PEL EXAMINATION CENTER KARACHI
CIVIL WORKS
ENGINEER'S ESTIMATE**

S.No.	CSR Sindh 2024	Description	Unit	Quantity	Rate	Amount
						(Pak Rs)
10	4-8-a-i	Fabrication of deformed steel reinforcement for cement concrete including cutting,bending, laying in position, making joints and fastenings including cost of binding wire (also includes removal of rust from bars.) a) Deformed bar i) Grade 60	Kg	27276		
					Sub Total C	
		D - MASONARY				
11	,4-24	Providing and laying 1 : 3 : 6 cement concrete solid block masonry wall 6" and below in thickness set in 1: 6 cement mortar in ground floor Super Structure including raking out joints & curring etc, complet	Cft	1360		
12	,4-24-32	Providing and laying 1 : 3 : 6 cement concrete solid block masonry wall 6" and below in thickness set in 1: 6 cement mortar in First floor Super Structure including raking out joints & curring etc, complet	Cft	1640		
					Sub Total D	
		E - JOINERY and CABINET				
13		Flush Door				
	10-9	Providing and fixing in position doors of first class deodar wood frames, and 1-3/4" thick comercial ply veneer shuttersof first class deodar skeleton (Solid Door) and commercial plywood (3ply) on both sides includinghold fasts, hinges, iron tower bolts, handles and cleats with cord and one Mortice lockand hooks	Sft	60.00		
14		Solid Door				
	10-7-i-2	First Class deodar wood wrought joinery in doors 2" thick panelled or glazed or fully glazed fixed in position including chowkhat, holdfast, hinges, towerbolt rubber stop cleats/Glclamp, handles and chord with hooks etc. complete (excluding sliding bolts or lock)	Sft	116.00		

**PEL EXAMINATION CENTER KARACHI
CIVIL WORKS
ENGINEER'S ESTIMATE**

S.No.	CSR Sindh 2024	Description	Unit	Quantity	Rate	Amount
						(Pak Rs)
15	18-118	Door Lock P/F approved quality of mortice lock.	Nos.	8		
16	18-117	Door Closer P/F approved quality of door closer in/c fixing on door with screws and adjusting speed on required etc complete.	Nos.	5		
17	NSI	Wooden Beading Providing & fixing up to 3" wide best quality wood beading plain / decorative as approved design on doors or where required complete in all respect in any floor at any height i/c cost of enamel painting or polishing as per instruction of Engineer	Rft	306.00		
					Sub Total E	
17		F- METAL WORK				
	17-29	Providing and fixing G.I frames /Choukhats of size 10" x 2" or 4 1/2" x 3" for door using 16 gauge G.I sheet I/c welded hinges and fixing at site with necessary hold fasts, filling with cement sand slurry of ratio 1:6 and repairing the jambs. The cost also i/c all carriage tools and plants used in making and fixing.	Rft	153.00		
18	18-110	Providing and fixing stainless steel nickle coated staircase railing of 3-1/2" consisting of horizontal 2-1/2"x2-1/2" at bottom and 1-1/2"x1-1/2" vertical tube 12" center to center and 3" steel tube with round ball as directed by engineer / incharge.	Rft	29.00		
19	17-30	Providi Providing and fixing iron steel grill using solid square bars of size 1/2" x 1/2" placed at 4" I/c and frame of flat iron patti of 3/4" x 3/4" I/c circle shape at 1-0 apart equivalent fitted with screws are pins I/c painting 3 coats with 1st coat of red oxide paint etc.	Sft	1417.60		

**PEL EXAMINATION CENTER KARACHI
CIVIL WORKS
ENGINEER'S ESTIMATE**

S.No.	CSR Sindh 2024	Description	Unit	Quantity	Rate	Amount
						(Pak Rs)
18	18-110	Providing and fixing Glass Railing of Terrace including all the accessories complete in all respects as per drawing, Specifications and as instructed by the Engineer.	Rft	20.00		
19	Nsi	Providing and fixing of MS emergency Stair Complete in all respects as per drawings, Specifications and as instructed by the Engineer	Job	1.00		
					Sub Total F	
		G- ALUMINIUM WORK				
20	NSI	Supplying & fixing in position Aluminum channels framing 2mm thick for sliding windows & ventilators of made with 8 mm thick tinted glass glazing etc. Complete.	Sft	1417.60		
21	NSI	Supplying & fixing in position Aluminum channels framing 2mm thick for hinged doors or made with 8mm thick tinted glass glazing and Alpha locks I/c handles, stoppers etc. Hydraulic Door Closer and complete accessories,	Sft	192.00		
					Sub Total G	
		H- WALL FINISHES				
22	9.11.C	Cement plaster 1:4 upto 12' height. 3/4" thick	Sft.	6300.00		
23	8-25	Laying floors of approved coloured glazed tiles 1/4" thick dado tiles of approved color & size jointing in white cement and laid over 1:2 cement sand mortar 3/4" thick including grouting with matching color and finishing	Sft	485.63		
					Sub Total H	
		I - FLOORING & FINISHING				
24	6-22	Crushing stone ballast by machine	Cft	1210		

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**PEL EXAMINATION CENTER KARACHI
CIVIL WORKS
ENGINEER'S ESTIMATE**

S.No.	CSR Sindh 2024	Description	Unit	Quantity	Rate	Amount
						(Pak Rs)
31	NSI	Providing and applying water proofing on roof including surface preparation and plaster the salb with 1:4 cement sand mortar 3/4" thick, bitumincoating, insulation comprising of self extinguishing extruded closed cell polystyrene board 2" thick (35Kg/M3) , minimum 1-1/2" thick screed 1:2:4 as per slope mentioned in drawing, Aquafin IC, 1 kg per Sq. meter or as per manufactured recemondation and on the top 12"x12"x3/4" thick Cement Concrete tiles including insulation fixed with 1:4 cement sand mator complete including the water proofing of the parapets complete in all respects as per drawings, specifications and as instructed by the Employer's Representative.	Sft.	2400.00		
32	7-18	Khuras, on roof size 2' x 2' x 4" (600 x 600 x 100mm)	No	4		
					Sub Total J	
		K - FALSE CEILING				
33	10-52	Supplying and fixing false ceiling of plaster of paris in pannels including making frame work of deodar wood i/c painting With soliginum paint.	Sft.	1860.00		
34	NSI	Supplying and fixing 2'x2' PVC false ceiling of plaster of paris in pannels including Adjustable imported sypension system complete in all respects	Sft	2560.00		
					Sub Total K	
		L - PAINTING AND POLISHING				
34		Plastic Emulsion				
	9.11.C	Preparing the surface and painting with plastic emulsion paint of approved make I/c rubbing the surface with sand Paper, filling the voids with chalk/ plaster of paris and then painting etc. complete. A Three Coat	Sft	6300.00		

S.No.	CSR Sindh 2024	Description	Unit	Quantity	Rate	Amount
						(Pak Rs)
35	9-36A	Preparing the surface and painting with matt finish l/c rubbing the surface with Bathy (silicon carbide rubbing brick) filling the voids with zink /chalk / plaster of parismixture, applying first coat premix, making the surface smooth and then painting 3 coats with matt finish ofapproved makeetc:complete.(new surface)	Sft	650		
36	9-38-A	Preparing the surface and painting with weather coat l/c rubbing the surface with rubbing brick / sand Paper, filling the voids with chalk/ plaster of Paris and then painting with weather coat of approved make	Sft	7790.00		
37	9-43	Preparing the surface and applying rockwall / shield (Naturalwalltexture) coating to provide durable crust towall, thickness b/w 2mm to 32mm(1/8")with acrylic co-polymer emulsion, selected marble chips, adhesive and bactericides.	Sft	1200		
38	18-70	Vertical damp proof course of 3/4" thick cement plaster 1: 2with bitumen at (20 Lbs. Per % Sft.	Sft	2500		
					Sub Total L	
		M- EXTERNAL FINISH				
39	9.11.C	Cement plaster 1:4 upto 12' height.3/4" thick	Sft	7790.00		
					Sub Total M	
		GRAND TOTAL OF CIVIL WORK (A+B+C+D+E+F+G+H+I+J+K+L+M) :-			Rs.	

PEL EXAMINATION CENTER KARACHI
ELECTRICAL WORKS
ENGINEER'S ESTIMATE

Sr. No.	CSR Sindh 2024	Description of Items	Unit	Total Quantity	Rate (Rs.)	Total Cost (Rs.)	Remarks
1	D-22	Providing & laying (Main or Sub Main) PVC insulated with size 3-3/.029 copper conductor in ¾" dia PVC conduit recessed in the wall or column as required.	Rft	4,320.00			
2	D-23	Providing & laying (Main or Sub Main) PVC insulated with size 2-3/.036 copper conductor in ¾" Dia PVC conduit recessed in the wall or column as required.	Rft	2,400.00			
3	D-24	Providing & laying (MAIN or SUB MAIN) PVC insulated with size 3-7/.029 copper conductor in ¾" Dia PVC conduit recessed in the wall or column as required.	Rft	600.00			
4	D-25	Providing & laying (MAIN or SUB MAIN) PVC insulated with size 3-7/.036 copper conductor in ¾" Dia PVC conduit recessed in the wall or column as required.	Rft	540.00			
5	P-90	Providing & laying (MAIN or SUB MAIN) PVC insulated & PVC sheeted with 4 core Armoured copper conductor 600/1000 volts size 16mm2	Rft	550.00			
6	P-91	Providing & laying (MAIN or SUB MAIN) PVC insulated & PVC sheeted with 4 core Armoured copper conductor 600/1000 volts size 25mm2	Rft	450.00			
7	NSI	Providing and Fixing flush type, 6/10 Amps flush type 2-pin piano socket fitted on given sheet all kind of board i/c connection as required.	Each	19.00			
8	A-89	Providing & fixing Two pin 10/15amp plug & socket	Each	19.00			
9	A-190	Providing & fixing three pin 10/15amp plug & socket flush type	Each	60.00			
10	A-190	Providing & fixing three pin 20amp plug for AC	Each	12.00			

PEL EXAMINATION CENTER KARACHI
ELECTRICAL WORKS
ENGINEER'S ESTIMATE

Sr. No.	CSR Sindh 2024	Description of Items	Unit	Total Quantity	Rate (Rs.)	Total Cost (Rs.)	Remarks
11	NSI	Supply and install distribution board, 18 SWG steel sheet 18"x24" enclosure, suitable for recess mounting, comprising one incoming MCCB-TP/100A, Outgoing 9 single phase MCB of various capacity with internal wiring earthing, neutral link etc. alongwith three Digital Amp. meters with lights.	Each	2.00			
12	A-178	Providing & fixing circuit breaker 6, 10, 15, 20,30,40,50&63 SP (TB-5S)on prepared board as required	Each	20.00			
13	P-162	Providing & fixing acrylic cover for 125 watts light @ as per site requirement & instruction of engineer in charge	Each	45.00			
14	P-163	Providing & fixing acrylic cover for 250 watts light @ as per site requirement & instruction of engineer in charge	Each	3.00			
15	NSI	Providing and Fising of Recess Mounted LED Panel Light 24"X24" (40W)including fixing in false ceiling complete in all respects as per drawings, Specifications and as instructed by the Engineer.	Each	39.00			
16	P-147	Providing & fixing 125 watts (HPMV) chowk @ the height as per site requirement & instruction of engineer in charge	Each	2.00			
17	C-195	Providing & fixing A.C Electric Ceiling fan 56" (good quality)	Each	25.00			
18	C-196	Providing & fixing A.C Electric Wall Bracket fan 18" (good quality)	Each	2.00			
		19 NSI Supply and install 10" (250 mm) sweep exhaust fan including plastic louvers.	Each	4.00			
20	NSI	Supply and Installation of (24000 BTU) Split AC with complete Condenser copper Pipe , outdoor unit installation stand,Drain Pipe and cable.Complete in all respect as approved by Engineer Incharge.	No	12.00			

PEL EXAMINATION CENTER KARACHI
ELECTRICAL WORKS
ENGINEER'S ESTIMATE

Sr. No.	CSR Sindh 2024	Description of Items	Unit	Total Quantity	Rate (Rs.)	Total Cost (Rs.)	Remarks
21	P-252	Providing & fixing earthing set (1'x1') copper plet i/c excavation of rock earth 12' depth or if water comes out i/c salt/choracale mixed with G.I pipe with nut bolt testing topping etc complete.	Job	1.00			
		Total Amount					



**PEL EXAMINATION CENTER KARACHI
PLUMBING WORKS
ENGINEER'S ESTIMATE**

S.No.	CSR Sindh 2024	Description	Quantity	Unit	Rate	Amount
						(Pak Rs)
1	NSI	Providing and fixing European type white glazed earthen ware wash down W.C. pan complete with & including the cost of white / black plastic seat (Best quality) and lid with C.P. brass hinges best quality and buffers 3 gallons white glazed earthen ware low level flushing cistem with siphon fitting 1½ " dia white porcelain enameled flush bend dia and making requisite number of holes in walls , plinth & floor for pipe connection & making good in cement concrete 1:2:4, Imported, Porta or equivalent complete in all respects as per drawings, Specifications and as instructed by the Engineer.	3	each		
3	NSI	Providing and fixing 24x18" lavatory basin in white glazed earthen ware complete with & including the cost of W.I. or C.I. cantilever bracket 6 inches built into wall, painted white in two coats after a primary coat of red lead paint, a pair of ½" dia chrome plated pillar taps, 1-1/2" rubber plug & chrome plated brass chain 1-1/4" dia malleable iron or C.P. brass traps malleable iron or brass unions and making requisite number of holes in walls, plinth & floor for pipe connection & making good in cement concrete 1:2:4 Imported, Porta or equivalent complete in all respects as per drawings, Specifications and as instructed by the Engineer.				
		i) white, with pedestal	2	each		
	NSi	Supplying & fixing Wash Hand basin Mixer of superior quality and design with fine finishing with C.P. screws etc. complete Grohi or Equivalent	2	each		
5	NSi	Supplying & fixing soap tray of superior quality and design with fine finishing with C.P. screws etc. complete of Grohi or Equivalent	2	each		
6	NSi	Providing & fixing of CP toilet paper holder of approved type and fixing with cp screw complete in all respect. Of Grohi or Equivalent	3	each		
7	2-1-1b	Towel rail 36" long 3/4" dia round or Sq:	2	each		
8	2-3-2.1	Providing & fixing 24"x18" beveled edge mirror completed with 1/8" thick hard and C.P. screws fixed to wooden cleats (Standard pattern).	2	each		
9	NSi	P Supplying & fixing C.P muslim shower with double bib cock and ring pipe etc. complete of Grohi or Equivalent	3	Nos.		
10	NSi	Providing and fixing superior quality C.P. bib cock of approved make of Grohi or Equivalent 1/2" (12 mm) dia.	4	each		

11	NSi	Providing and fixing C.P. stop-cock of superior quality of approved make of Grohi or Equivalent 1/2" (12 mm) dia.	3	each		
12		NSi Providing and Fixing Handle Value of Kitz 3/4" dia.	3	each		
		1" dia.	3	each		
13	NSI	Providing and fixing floor trap of approved self cleaning design with screwed down grating with or without a vent arm with and including making requisite number of holes in walls, plinth and floor for pipe connection and making good. C.I. floor trap 6" x 2" and 6" x 3" size with grating.	6	each		
14	NSI	Providing and fixing 'P' trap including concrete chamber and C.I. grating. Cast iron 4" (100 mm) size	6	each		
16	II-D-4	Providing, Laying uPVC pipes of Class 'B' fixing in trench/cutting, fitting and jointing with solvent cement i/c testing with water to a head of 61 meter or 200 ft.				
		i) 3" dia	50	Rft		
		ii) 4" dia	90	Rft		
		iii) 6" dia	190	Rft		
17	NSI	Gyser 50 gallons capacity	1	Each		
19	4-1	Providing G.I. pipes specials and clamps etc. including fixing cutting and fittings complete with and including the cost of breaking through walls and roof making good etc. painting 2 coats after cleaning the pipe etc. with white zinc paint with pigment to match the colour of the building and testing with water to a pressure head of 200 feet and handling				
		1/2" dia.	150	Rft.		
		3/4" dia.	125	Rft.		
		1" dia.	150	Rft.		
		1-1/2" dia.	250	Rft.		
		2" dia.	350	Rft.		
20	NSI	P/F Ejector Pump of specified Suction and Delivery heads, coupled with Single Phase Seimen Electric Motor of required rating for water supply i/c the cost of connection charges, necessary wire, PVC pipes etc complete in all respect as approved and directed by the Engineer Incharge.				
		G-IV (2-1/2"x2") with 2.5 HP Electric Motor, 38-Mtr Suction and 38 M delivery head	1	Each		
21		NSi Fire Extinguisher 6 Kg DCP	12	Each		
		Total Amount (Rs.) :				

PEL EXAMINATION CENTER KARACHI

CCTV System

Item No.	Description	Unit	Quantity	Rate	Amount in PKR
3.01	Wiring for CCTV IP Cameras				
	Wiring for each CCTV IP Cameras to be installed on walls / slabs or on false ceiling with 4 pair Cat. 6, UTP cable with pure copper conductor PVC insulated PVC sheathed manufactured by M/s. Molex, Clipsal and 3M in prelaidd 1" dia PVC conduit heavy duty, including cost of all necessary accessories and materials, complete in all respects.				
	- Ground Floor and F-Floor	Nos.	18		
3.02	PTZ Camera				
	Supply at site, installation, testing and commissioning of Pan/tilt/zoom (x18) camera. Auto-iris, automatic day/night, and auto-focus zoom lens. Up to 4CIF resolution at 30 fps frame rate. Simultaneous MPEG-4 and Motion JPEG. I/O for alarm/event handling. Two-way Audio full duplex with power supply and outdoor housing and mounting. Model:AXIS 214PTZ or approved equivalent.				
	- Ground Floor and F-Floor	No.	15		
3.03	PTZ Controller				
	Supply at site, installation, testing and commissioning of Professional joystick for accurate control over network of all Axis pan/tilt/zoom and dome network cameras. Connects to PC workstation over USB. Features a three-axis Hall Effect joystick with X/Y-axis for positioning and turning knob for zoom, and twelve programmable push-buttons. Model AXIS 295 or approved equivalent.				
	- Ground Floor	No.	1		
3.05	Hybrid Video Surveillance DVR				
	Supply at site, installation, testing and commissioning of Hybrid Video Surveillance DVR 32 Channel IP and analog. DVD writer. Two USB 2.0. One E-SATA. Embedded Linux Operating system. Jog Shuttle, Function Keypad, PTZ Controls, Power Switch Extender, LCM Display. Supports 4 SATA HDD. RS 485 & RS 232 Communication Ports. 1x - 10/100/1000 Base-T Ethernet, RJ-45. Operating Interface USB mouse, USB PC keyboard, Remote controller. Operating Temperature 32 ° to 104 °F. Remote DVR connectivity are WebViewer (MS Internet Explorer only), Remote Console Java Viewer, PDAViewer. Software PTZ Control Zoom-in/Zoom-out, Focus-in/Focus-out, Direction, Autopan. Power supply; 100-240 VAC 50/60 Hz. Model AVERMEDIA EH5116 Pro or Approved Equivalent including cost of all necessary accessories and materials, complete in all respects. HDD mxm capacity available in market but total should be 40TB				
	- Ground Floor	Nos.	1		
3.06	Colored Monitors				

	Supply at site, installation, testing and commissioning of 19 inch colored monitors. Model Samsung or Approved Equivalent including cost of all necessary accessories and materials, complete in all respects.				
-	Ground Floor	Nos.	2		
	Total Cost				

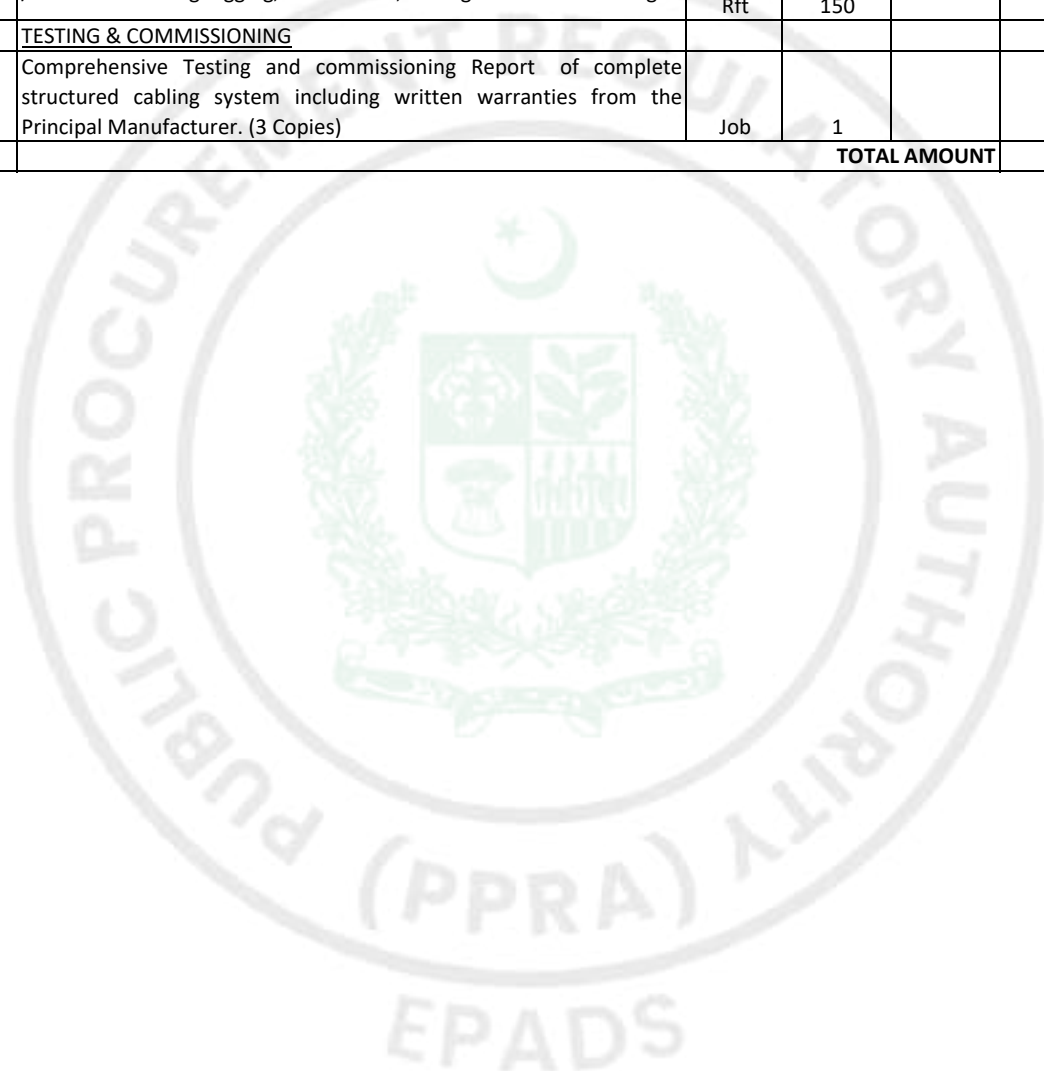


PEL EXAMINATION CENTER KARACHI
DATA COMMUNICATION SYSTEM

Item No.	Description	Unit	Quantity	Rate	Amount in PKR
	Supply, installation , testing and commissioning of following items for voice and data communication system including all material , labor , tools , accessories etc. Complete in all respects. Item includes termination of all cables at respective patch panels / racks / TJBs as shown in the drawings and instructed by consultant.				
	<u>DATA CABLING</u>				
1	12 core fiber optical fiber cabel from existing data room to new PEL building data room in 50mm dia PVC conduits under flooror as shown in the layout plan and schematic diagrams. Work includes all terminations, management and tagging at both ends.	Rft	328		
1	Category 6 , UTP Cables, for data communication system at local workstations in 25mm dia PVC conduits under floor as shown in the layout plan and schematic diagrams. Work includes all terminations, management and tagging at both ends.	Rft	4440		
	<u>INFORMATION OUTLETS</u>				
2	Workstation wall mounted Information outlet having Duplex Face plate with 1No. CAT-6 RJ-45 socket for data communication system including shuttered click-ins, labels, jacks etc. Complete in all respects with cable identification tags.	No.	38		
3	Workstation wall mounted Information outlet having Duplex Face plate with 1No. CAT-6 RJ-45 socket for data & 1 No. CAT-5e RJ-45 socket for voice communication system including shuttered click-ins, labels, jacks etc. Complete in all respects with cable identification tags.	No.	5		
4	Workstation wall mounted Information outlet having Duplex Face plate with 1No. CAT-5e RJ-45 socket for voice communication system including shuttered click-ins, labels, jacks etc. Complete in all respects with cable identification tags.	No.	5		
	<u>PATCH PANELS & CABLE MANANGEMENT</u>				
7	48 Port , Layer layer 2 manageable switch including labeling complete in all respect.	No.	1		
8	Front & Rear Cable Management for above patch panels.	No.	4		
9	6 Port Optical Fiber Patch Panel / Connecting Block	No.	2		
10	12 Port Optical Fiber Patch Panel / Connecting Block	No.	1		
	<u>MDF & TELEPHONE JUNCTION BOXES</u>				
11	MDF-PTCL Main digital Telephone Exchange of approved make including 16SWG powder coated MS sheet, weather proof housing having 50 pair fused links including surge protectors for each pair.	No.	1		
14	TJB (TELEPHONE JUNCTION BOXES) Following Telephone Junction Boxes (TJBs) made with 16 SWG Sheet Steel Housing powder coated having connecting strips for horizontal voice cabling.				
a	10 Pair	No.	2		
	<u>PATCH CORDS</u>				
	Category-6 Factory Certified tangle free RJ-45 to RJ-45 type patch / drop cords in required colors having following lengths for interconnection of switches and patch panels.				

PEL EXAMINATION CENTER KARACHI
DATA COMMUNICATION SYSTEM

Item No.	Description	Unit	Quantity	Rate	Amount in PKR
15	1 meter long patch cords for data	No.	50		
16	3 meter long drop cord for data	No.	50		
	<u>BACKBONE CABLING</u>				
17	50 pair, 0.6 mm Armored Cat-3 Telephone Cable from MDF-PTCL to MDF-Consumer in already laid UPVC Conduit including tagging, termination, testing and commissioning at both ends.	Rft	250		
18	50 pair, 0.5 mm Cat-3 Telephone Cable from MDF Consumer to PABX and back to MDF Consumer in already provided pvc conduits / trench / channel including tagging, termination, testing and commissioning.	Rft	150		
	<u>TESTING & COMMISSIONING</u>				
19	Comprehensive Testing and commissioning Report of complete structured cabling system including written warranties from the Principal Manufacturer. (3 Copies)	Job	1		
	TOTAL AMOUNT				



PAKISTAN CIVIL AVIATION AUTHORITY

B-6, KDA Scheme-1, Karsaz Karachi, Pakistan.



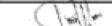
ARCHITECTURAL DRAWINGS

(KARACHI PEL EXAMINATION CENTRE)

Consultancy Services for Design and Supervision of Construction of
PEL Examination Centres at Karachi & Lahore

ARCHITECTURE DRAWINGS FOR PEL EXAMINATION CENTER KARACHI



DESIGN: UMAR MUNSHI ASSOCIATES CONSULTING ENGINEERS, ARCHITECTS & PLANNERS HEAD OFFICE A-102, BLOCK-13-A, RAILWAYS EMPLOYEES COOPERATIVE HOUSING SOCIETY, GULSHAN-E-JOHAL KARACHI-75300 PAKISTAN PHONE: (021) 34983541, 34980304, F-AX: (02-21) 34980305 EMAIL: info@umaconsult.com, URL: www.umaconsult.com	CLIENT: PAKISTAN CIVIL AVIATION AUTHORITY پاکستان سولہ ایوی ایشن اتھارٹی	PROJECT: PEL EXAMINATION CENTER KARACHI	Checked By	M. Hasnat Yaqoob		Tender Drawings	TITLE		Job No.	
			Drawing By	Habib ur Rehman					Dwg. No.	
				Kamran Kalam					AR-00	
			Design By	Farooq Azam Fareed					REV.	DATE.
M. Sadeeq		ORIGINAL SIZE A3						APRIL- 2026		

LIST OF DRAWINGS

PEL EXAMINATION CENTER ARCHITECTURAL WORKING DRAWINGS

SN:	DISCRIPTION	SHEET NO
01-	TITLE PAGE	AR-00
02-	LIST OF DRAWINGS	AR-01
03-	PROPOSED SITE	AR-02
04-	MASTER PLAN	AR-03
05-	EXAMINATION CENTER 3D-1	AR-04
06-	EXAMINATION CENTER 3D-2	AR-05
07-	INTERIOR RENDER 01	AR-08
08-	INTERIOR RENDER 02	AR-09
09-	INTERIOR RENDER 03	AR-10
10-	INTERIOR RENDER 04	AR-11
11-	INTERIOR RENDER 05	AR-12
12-	FURNITURE LAYOUT PLAN (GROUND FLOOR)	AR-13
13-	FURNITURE LAYOUT PLAN (FIRST FLOOR)	AR-14
14-	WORKING PLAN (GROUND FLOOR)	AR-15
15-	WORKING PLAN (FIRST FLOOR)	AR-16
16-	WORKING PLAN (ROOF)	AR-17
17-	GROUND FLOOR (CEILING PLAN)	AR-18
18-	FIRST FLOOR (CEILING PLAN)	AR-19
19-	CELLING DETALI	AR-20
20-	TAGS PLAN (GROUND FLOOR)	AR-21
21-	TAGS PLAN (FIRST FLOOR)	AR-22

LIST OF DRAWINGS

PEL EXAMINATION CENTER ARCHITECTURAL WORKING DRAWINGS

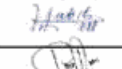
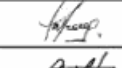
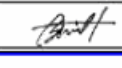
SN:	DISCRIPTION	SHEET NO
22-	SCHEDULE OF OPENING	AR-23
23-	FRONT ELEVATION	AR-24
24-	REAR ELEVATION	AR-25
25-	RIGHT SIDE ELEVATION	AR-26
26-	LEFT SIDE ELEVATION	AR-27
27-	SECTION A-A	AR-28
28-	SECTION B-B	AR-29
29-	STAIR DETAILS	AR-30
30-	DETAILS 1 AND 2	AR-31



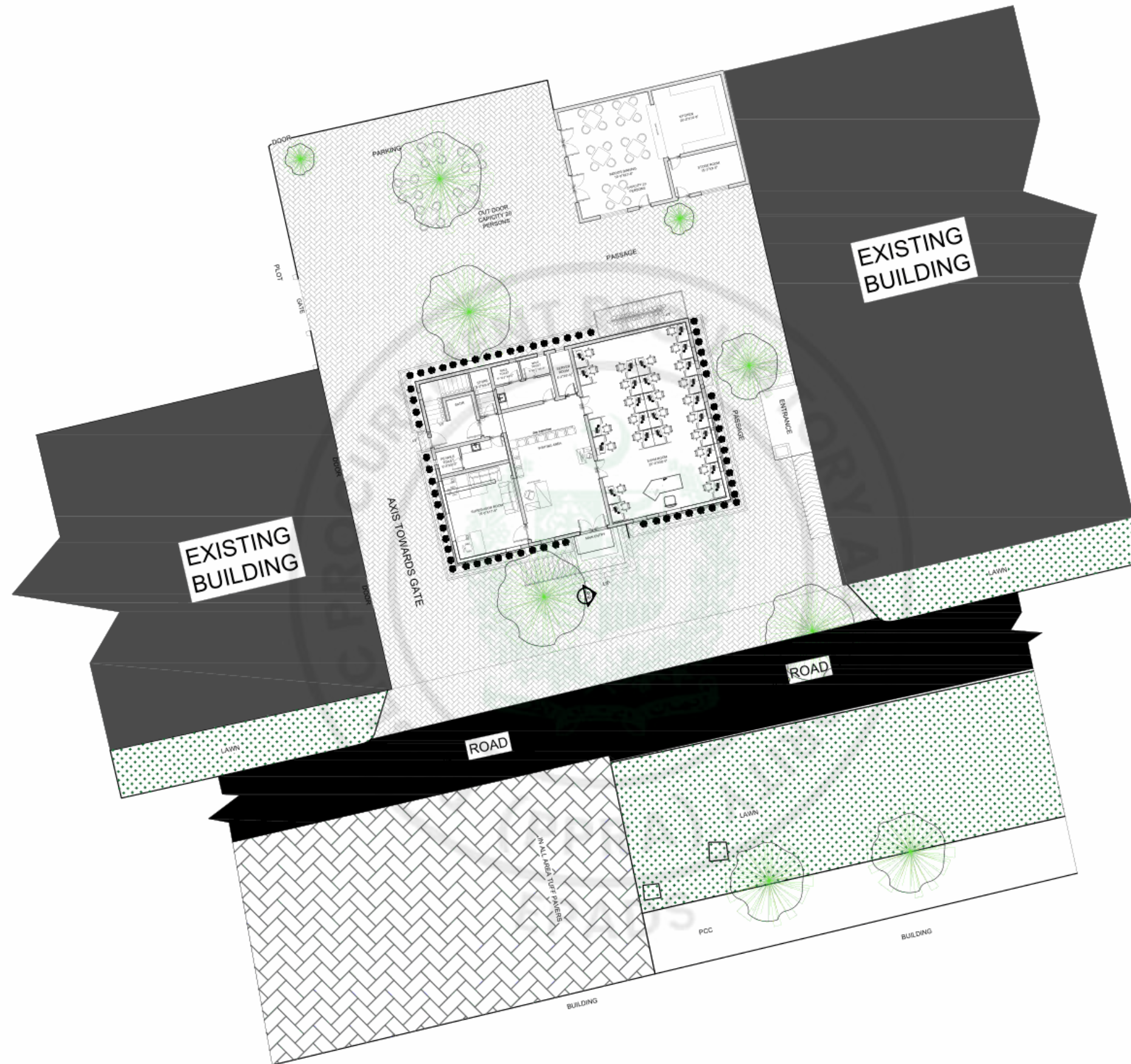
DESIGN:
 **UMAR MUNSHI ASSOCIATES**
 CONSULTING ENGINEERS, ARCHITECTS
 & PLANNERS
 HEAD OFFICE: A-102, BLOCK-13-A, RAILWAYS EMPLOYEES CO-OPERATIVE
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CLIENT:
 **PAKISTAN CIVIL AVIATION AUTHORITY**
 پاکستان کیوی اوی اٹھارٹی

PROJECT:
 PEL EXAMINATION CENTER KARACHI

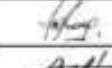
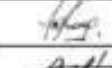
Checked By	M. Hasnat Yaqoob	
Drawing By	Habib ur Rehman	
	Kamran Kalam	
Design By	Farooq Azam Fareed	
	M. Sadeeq	

Tender Drawings		TITLE		Job No.
		LIST OF DRAWING		Dwg. No. AR-02
REV.	DATE	DESCRIPTION	SCALE	AS SHOWN
ORIGINAL SIZE A3				
				Date APRIL- 2026

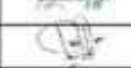
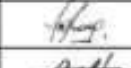
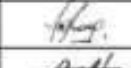


DESIGN: HEAD OFFICE UMAR MUNSHI ASSOCIATES CONSULTING ENGINEERS, ARCHITECTS & PLANNERS A-102, BLOCK-13-A, RAILWAYS EMPLOYEES COOPERATIVE HOUSING SOCIETY, GULSHAN-E-JOBRAI, KARACHI-75300 PAKISTAN PHONE: (021) 34983541, 34980304, F-AX: (02-21) 34980305 EMAIL: info-o@umacconsult.com, URL: www.umacconsult.com	CLIENT: PAKISTAN CIVIL AVIATION AUTHORITY پاکستان کیو ایو اے اے	PROJECT: PEL EXAMINATION CENTER KARACHI	Checked By	M. Hasnat Yaqoob		Tender Drawings	TITLE MASTER PLAN		Job No.
			Drawing By	Habib ur Rehman					Dwg. No.
				Kamran Kalam					AR-03
			Design By	Farooq Azam Fareed		REV.	DATE.	DESCRIPTION	SCALE
M. Sadeeq		ORIGINAL SIZE A3						APRIL- 2026	



DESIGN:  UMAR MUNSHI ASSOCIATES CONSULTING ENGINEERS, ARCHITECTS & PLANNERS A REG. BLDG. STAL. REG. BAYLE EMPLOYED COOPERATIVE HOUSING SOCIETY, QULWAP 6, KDA, KARACHI-7526 PACISTAN PHONE: (021) 34862541, 34862542 FAX: (021) 34862543 EMAIL: info@umamunshi.com URL: www.umamunshi.com		CLIENT:  PAKISTAN CIVIL AVIATION AUTHORITY پاکستان کیلویشن اتھارٹی	PROJECT: PEL EXAMINATION CENTER KARACHI	Checked By M. Hasnat Yaqoob 	Drawing By Habib ur Rehman  Kamran Kalam 	Design By Farooq Azam Fareed  M. Sadeeq 	Tender Drawings	TITLE PEL EXAMINATION CENTER 3D VIEW	Job No. -	Dwg. No. AR-04	Date APRIL - 2026
							REV. DATE. DESCRIPTION SCALE AS SHOWN				
							ORIGINAL SIZE A3				



DESIGN:  UMAR MUNSHI ASSOCIATES CONSULTING ENGINEERS, ARCHITECTS & PLANNERS HEAD OFFICE: A-102, BLOCK-17-AL, RAJAWADE EMPLOYEES CO-OPERATIVE HOUSING SOCIETY, GULSHAN-E-IGDAL, KARACHI-75300 PAKISTAN PHONE: (021) 34862541, 34862542 FAX: (021) 34862543 EMAIL: info@umamunshi.com URL: www.umamunshi.com	CLIENT:  PAKISTAN CIVIL AVIATION AUTHORITY	PROJECT: PEL EXAMINATION CENTER KARACHI	Checked By	M. Hasnat Yaqoob		Tender Drawings	TITLE		Job No.
			Drawing By	Habib ur Rehman			PEL EXAMINATION CENTER 3D VIEW		Dwg. No.
				Kamran Kalam					AR-05
			Design By	Farooq Azam Fareed		REV.	DATE.	DESCRIPTION	SCALE
M. Sadeeq		ORIGINAL SIZE A3						APRIL - 2026	



DESIGN:

UMAR MUNSHI ASSOCIATES
CONSULTING ENGINEERS, ARCHITECTS
& PLANNERS

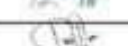
HEAD OFFICE: A-102, BLOCK-13, A, RAILWAYS EMPLOYEES CO-OPERATIVE
HOUSING SOCIETY, GULSHAN-E-QUWAH, KARACHI-75300
PAKISTAN PHONE: (021) 3496241, 3496242 FAX:
(021) 3496243
EMAIL: info@umashin.com URL: www.umashin.com

CLIENT:

 **PAKISTAN CIVIL AVIATION AUTHORITY**

PROJECT:

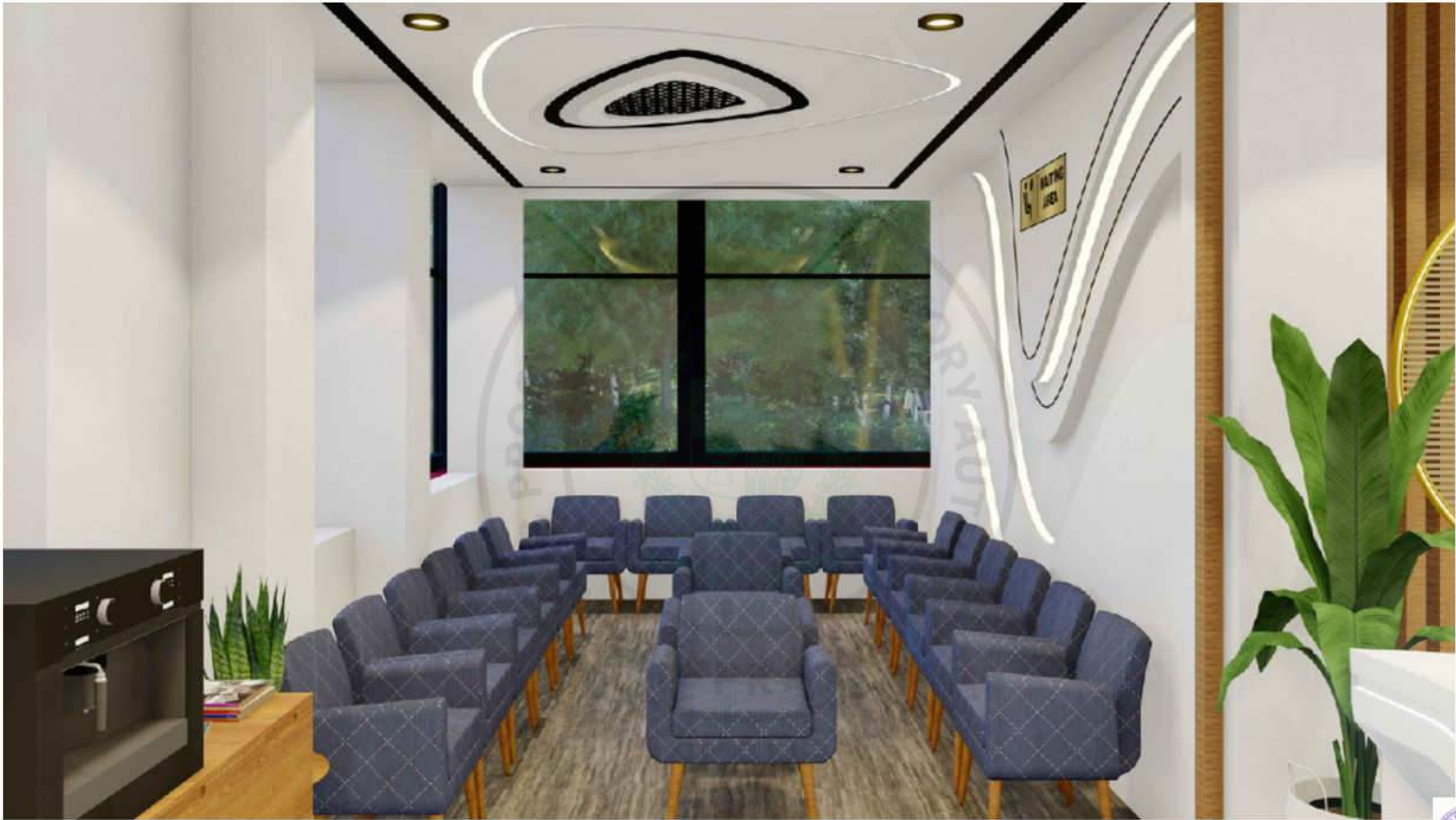
PEL EXAMINATION CENTER KARACHI

Checked By	M. Hasnat Yaqoob	
Drawing By	Habib ur Rehman	
	Kamran Kalam	
Design By	Farooq Azam Fareed	
	M. Sadeeq	

Tender Drawings			TITLE		Job No.
			INTERIOR RENDER		Dwg. No. AR-08
REV	DATE	DESCRIPTION	SCALE	AS SHOWN	Date
ORIGINAL SIZE A3					
					APRIL - 2026



DESIGN: UMAR MUNSHI ASSOCIATES CONSULTING ENGINEERS, ARCHITECTS & PLANNERS HEAD OFFICE: A-172, BLOCK-11-A, RAILWAYS EMPLOYEES CO-OPERATIVE HOUSING SOCIETY, GULSHAN E AZAM, KARACHI-75300 PAKISTAN PHONE: (021) 3496241, 3496242 FAX: (021) 3496243 EMAIL: info@umunshi.com URL: www.umunshi.com			CLIENT: PAKISTAN CIVIL AVIATION AUTHORITY			PROJECT: PEL EXAMINATION CENTER KARACHI			<table><tr><td>Checked By</td><td>M. Hasnat Yaqoob</td><td></td></tr><tr><td rowspan="2">Drawing By</td><td>Habib ur Rehman</td><td></td></tr><tr><td>Kamran Kalam</td><td></td></tr><tr><td rowspan="2">Design By</td><td>Farooq Azam Fareed</td><td></td></tr><tr><td>M. Sadeeq</td><td></td></tr></table>		Checked By	M. Hasnat Yaqoob		Drawing By	Habib ur Rehman		Kamran Kalam		Design By	Farooq Azam Fareed		M. Sadeeq		<table><tr><td colspan="3" rowspan="2">Tender Drawings</td><td colspan="2">TITLE</td></tr><tr><td colspan="2">INTERIOR RENDER</td></tr><tr><td>REV</td><td>DATE</td><td>DESCRIPTION</td><td>SCALE</td><td>AS SHOWN</td></tr><tr><td colspan="3"></td><td colspan="2">ORIGINAL SIZE A3</td></tr></table>		Tender Drawings			TITLE		INTERIOR RENDER		REV	DATE	DESCRIPTION	SCALE	AS SHOWN				ORIGINAL SIZE A3		<table><tr><td>Job No.</td></tr><tr><td>Dwg. No.</td></tr><tr><td>AR-09</td></tr><tr><td>Date</td></tr><tr><td>APRIL - 2026</td></tr></table>		Job No.	Dwg. No.	AR-09	Date	APRIL - 2026
Checked By	M. Hasnat Yaqoob																																																
Drawing By	Habib ur Rehman																																																
	Kamran Kalam																																																
Design By	Farooq Azam Fareed																																																
	M. Sadeeq																																																
Tender Drawings			TITLE																																														
			INTERIOR RENDER																																														
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			ORIGINAL SIZE A3																																														
Job No.																																																	
Dwg. No.																																																	
AR-09																																																	
Date																																																	
APRIL - 2026																																																	



DESIGN:
 **UMAR MUNSHI ASSOCIATES**
 CONSULTING ENGINEERS, ARCHITECTS
 & PLANNERS
 HEAD OFFICE: 41-D2, BLOCK-13-A, RAILWAYS EMPLOYEES CO-OPERATIVE
 HOUSING SOCIETY, GULSHAN-E-NOOR, KARACHI-75300
 PAKISTAN PHONE: (021) 3496241, 3496242 FAX:
 (021) 3496243
 EMAIL: info@umamunshi.com URL: www.umamunshi.com

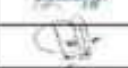
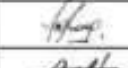
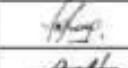
CLIENT:
 **PAKISTAN CIVIL AVIATION AUTHORITY**

PROJECT:
PEL EXAMINATION CENTER KARACHI

Checked By	M. Hasnat Yaqoob	
Drawing By	Habib ur Rehman	
	Kamran Kalam	
Design By	Farooq Azam Fareed	
	M. Sadeeq	

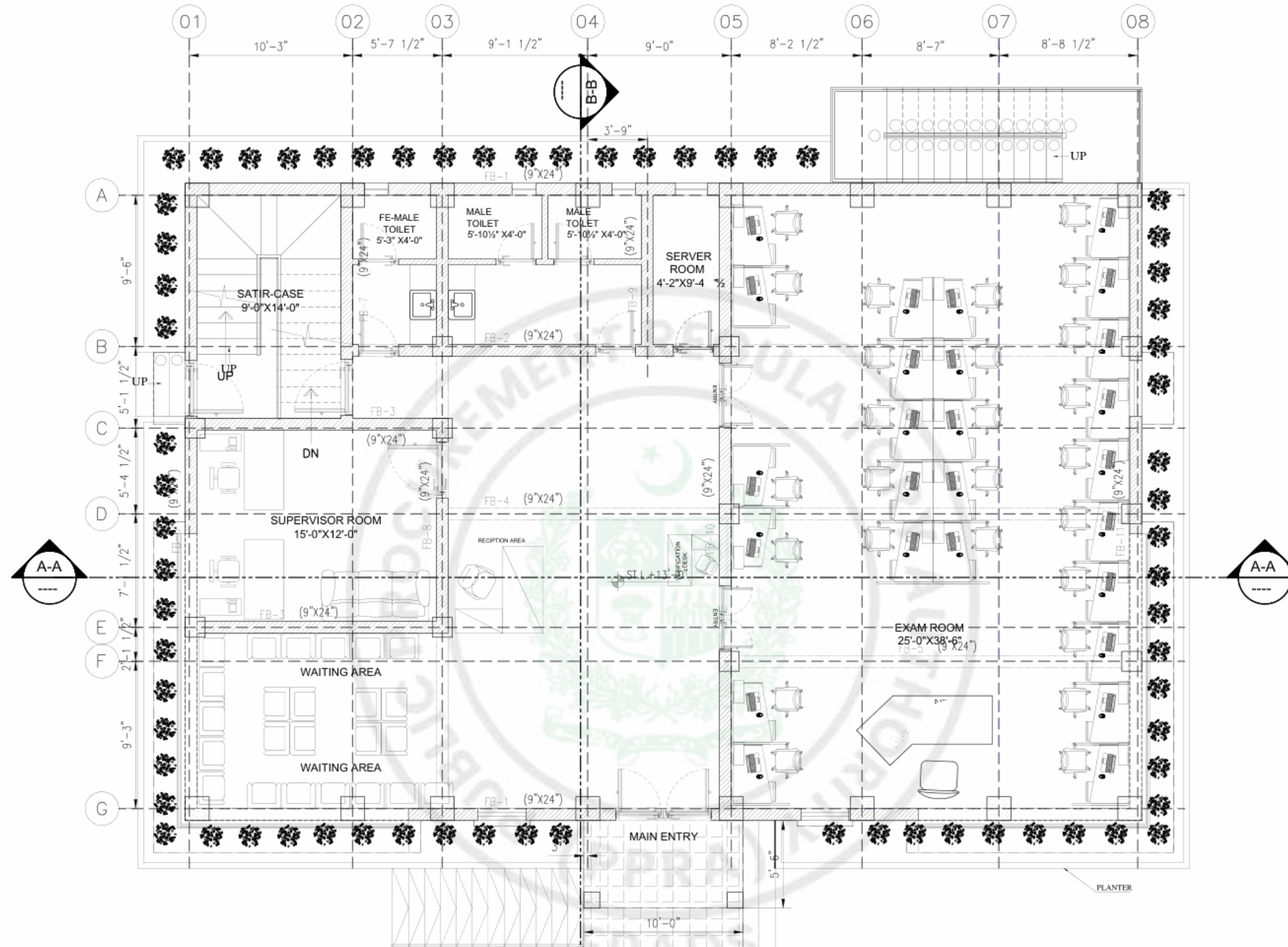
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			INTERIOR RENDER		Dwg. No. AR-10
REV	DATE	DESCRIPTION	SCALE	AS SHOWN	Date
ORIGINAL SIZE A3					APRIL - 2026



DESIGN:  UMAR MUNSHI ASSOCIATES CONSULTING ENGINEERS, ARCHITECTS & PLANNERS HEAD OFFICE: 4/102, BUCKLE 11-A, RAILWAYS EMPLOYEES CO-OPERATIVE HOUSING SOCIETY, GULSHAN E AZAM, KARACHI-75300 PAKISTAN PHONE: (021) 3496241, 3496242 FAX: (021) 3496243 EMAIL: info@umamunshi.com URL: www.umamunshi.com	CLIENT:  PAKISTAN CIVIL AVIATION AUTHORITY	PROJECT: PEL EXAMINATION CENTER KARACHI	Checked By	M. Hasnat Yaqoob		Tender Drawings	TITLE INTERIOR RENDER		Job No.
			Drawing By	Habib ur Rehman					Dwg. No.
				Kamran Kalam					AR-11
			Design By	Farooq Azam Fareed		REV.	DATE	DESCRIPTION	SCALE
M. Sadeeq		ORIGINAL SIZE A3						APRIL - 2026	



DESIGN:  UMAR MUNSHI ASSOCIATES CONSULTING ENGINEERS, ARCHITECTS & PLANNERS HEAD OFFICE: F-102, BLOCK-11-A, RAILWAYS EMPLOYEES CO-OPERATIVE HOUSING SOCIETY, GULSHAN-E-NOJVA, KARACHI-75300 PAKISTAN PHONE: (021) 3496241, 3496242 FAX: (021) 3496243 EMAIL: info@umamunshi.com URL: www.umamunshi.com	CLIENT:  PAKISTAN CIVIL AVIATION AUTHORITY	PROJECT: PEL EXAMINATION CENTER KARACHI	Checked By	M. Hasnat Yaqoob		Tender Drawings	TITLE INTERIOR RENDER		Job No.			
			Drawing By	Habib ur Rehman					Dwg. No.	AR-12		
				Kamran Kalam								
			Design By	Farooq Azam Fareed		REV	DATE	DESCRIPTION	SCALE	AS SHOWN	Date	APRIL- 2026
				M. Sadeeq		ORIGINAL SIZE A3						



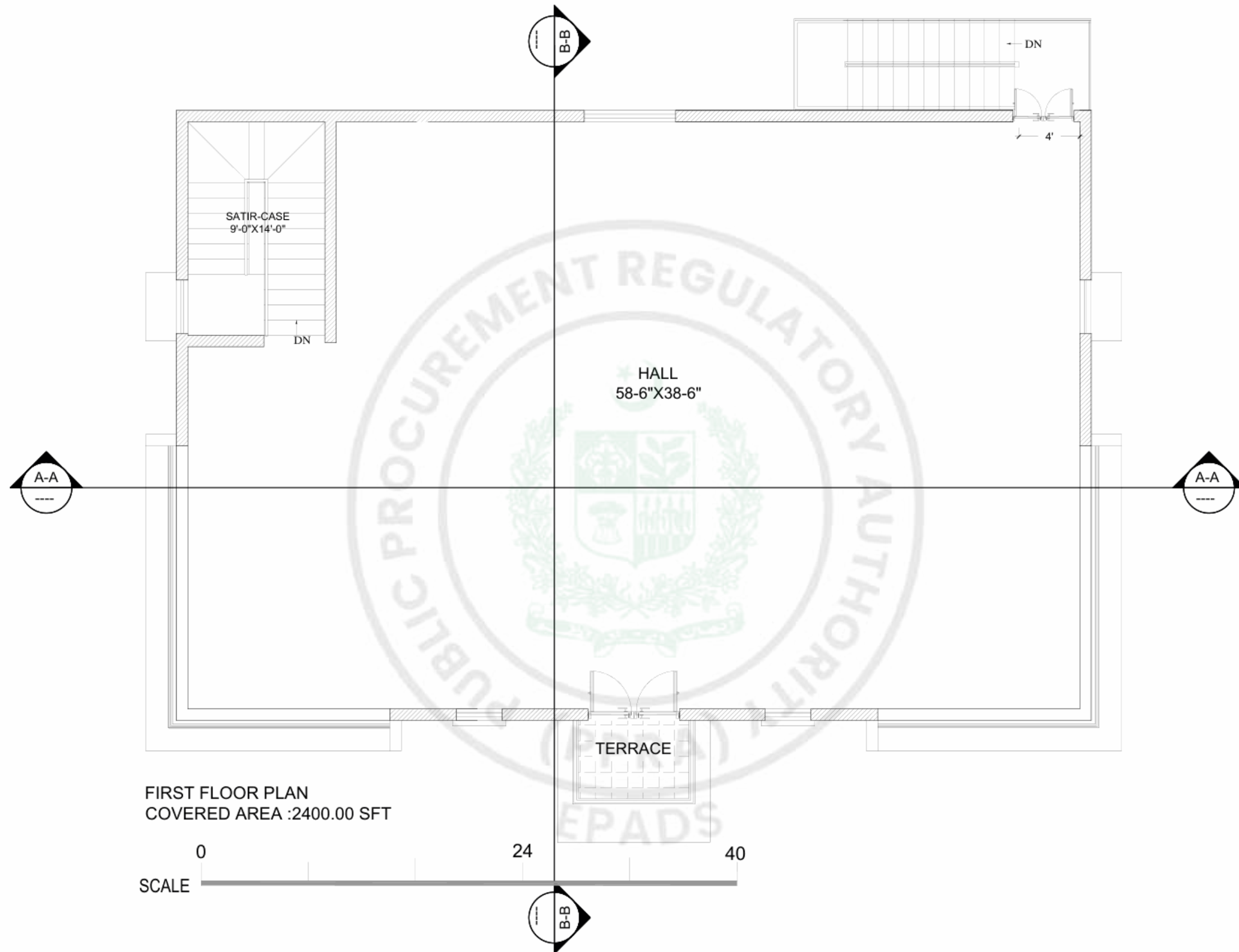
DESIGN:
UMAR MUNSHI ASSOCIATES
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& PLANNERS
HEAD OFFICE
A-102, BLOCK-13-A, RAILWAYS EMPLOYEES CO-OPERATIVE
HOUSING SOCIETY, GULSHAN-E-NOBAL KARACHI-75300
PAKISTAN PHONE: (021) 34983541, 34983304, F-AK:
(02-21) 34980305
EMAIL: info@umacconsult.com, URL: www.umacconsult.com

CLIENT:
PAKISTAN CIVIL AVIATION AUTHORITY

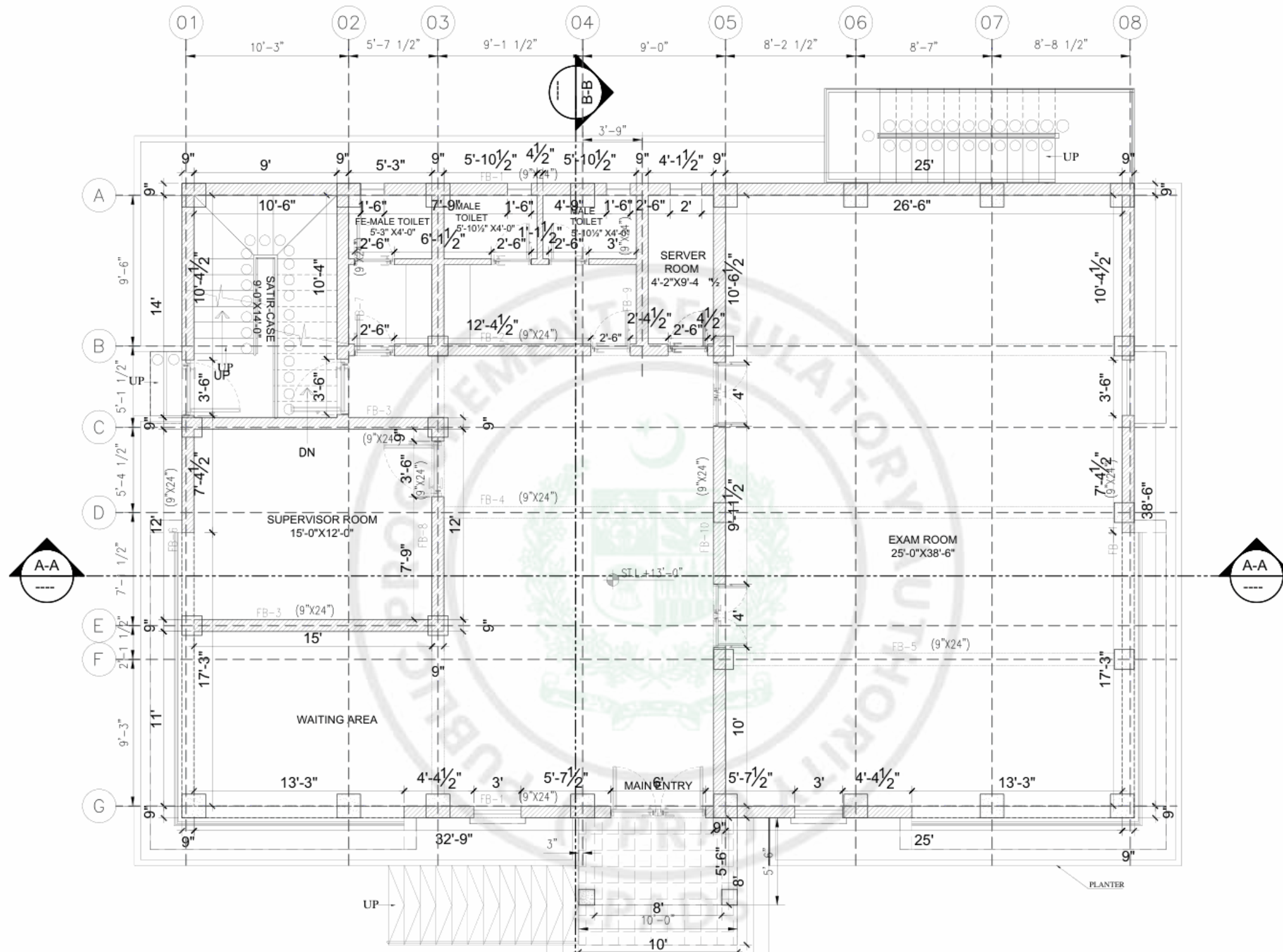
PROJECT:
PEL EXAMINATION CENTER KARACHI

Checked By	M. Hasnat Yaqoob	
Drawing By	Habib ur Rehman	
	Kamran Kalam	
Design By	Farooq Azam Fareed	
	M. Sadeeq	

Tender Drawings		TITLE GROUND FLOOR FURNITURE PLAN		Job No. -
				Dwg. No. AR-13
REV.	DATE	DESCRIPTION	SCALE	Date APRIL- 2026
		AS SHOWN		
ORIGINAL SIZE A3				



DESIGN: UMAR MUNSHI ASSOCIATES CONSULTING ENGINEERS, ARCHITECTS & PLANNERS HEAD OFFICE A-102, BLOCK-13-A, RAILWAYS EMPLOYEES COOPERATIVE HOUSING SOCIETY, GULSHAN-E-JOBAL KARACHI-75300 PAKISTAN PHONE: (021) 34983541, 34980304, F-AX: (02-21) 34980305 EMAIL: info@umaconsult.com, URL: www.umaconsult.com	CLIENT: PAKISTAN CIVIL AVIATION AUTHORITY پاکستان سولہ ایوی ایشن اتھارٹی	PROJECT: PEL EXAMINATION CENTER KARACHI	Checked By	M. Hasnat Yaqoob		Tender Drawings				TITLE		Job No.
			Drawing By	Habib ur Rehman								Dwg. No.
				Kamran Kalam								AR-14
			Design By	Farooq Azam Fareed		REV.	DATE.	DESCRIPTION	SCALE	AS SHOWN	Date	
M. Sadeeq		ORIGINAL SIZE A3						APRIL- 2026				



GROUND FLOOR PLAN
COVERED AREA :2473.00 SFT

FIRST FLOOR FRAMING PLAN

ALL SLABS 6" THICK EXCEPT NOTED OTHERWISE.

0

24

40

DESIGN:



UMAR MUNSHI ASSOCIATES
CONSULTING ENGINEERS, ARCHITECTS
& PLANNERS

A-102, BLOCK-13-A, RAILWAYS EMPLOYEES CO-OPERATIVE
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PAKISTAN PHONE: (021) 34983541, 34983304, FAX:
(02-21) 34983305
EMAIL: info@umacconsult.com, URL: www.umacconsult.com

CLIENT:



PAKISTAN CIVIL AVIATION AUTHORITY

PROJECT:

PEL EXAMINATION CENTER KARACHI

Checked By

M. Hasnat Yaqoob

Drawing By

Habib ur Rehman

Kamran Kalam

Design By

Farooq Azam Fareed

M. Sadeeq

Tender Drawings

TITLE

GROUND FLOOR
WORKING PLAN

Job No.

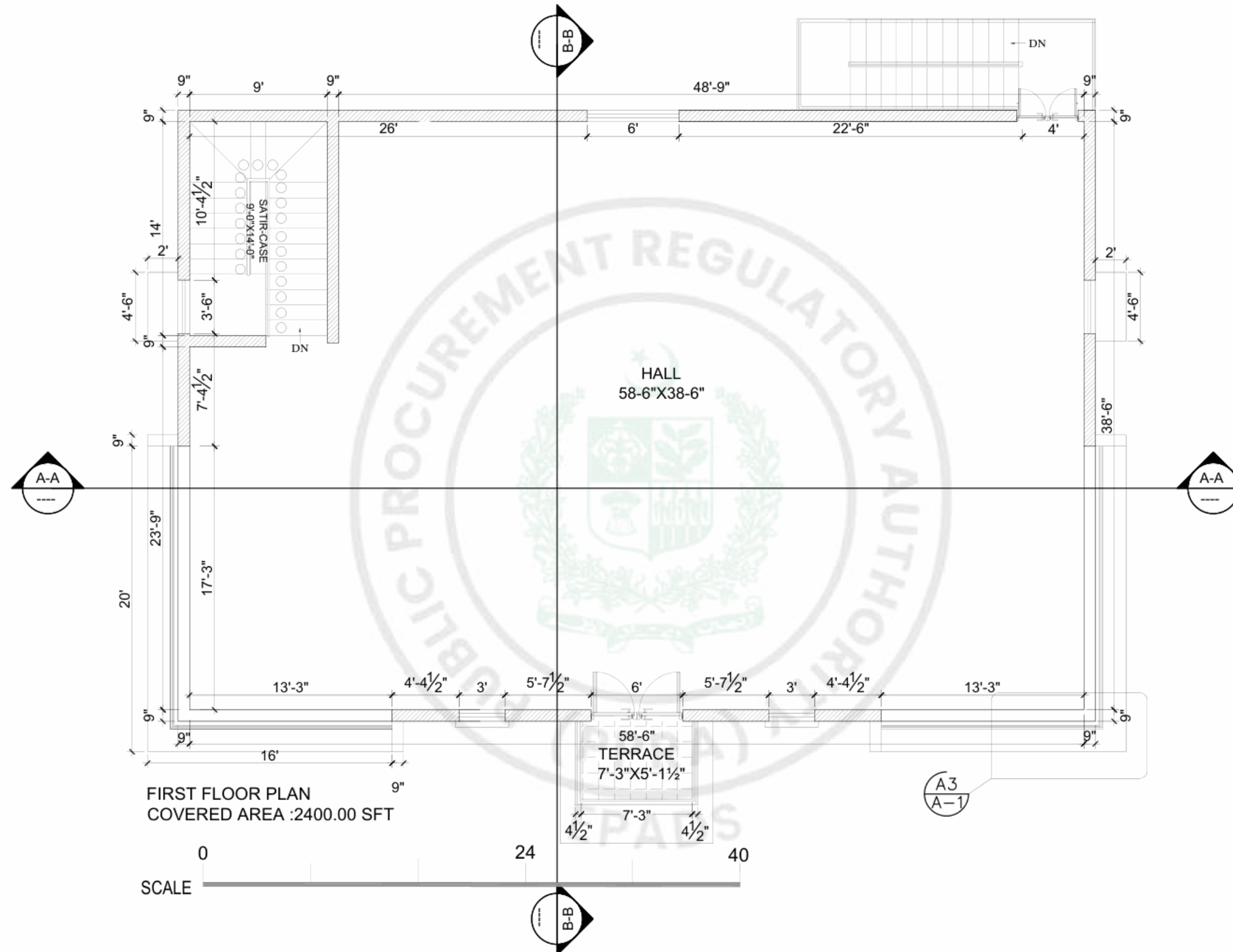
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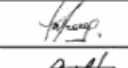
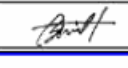
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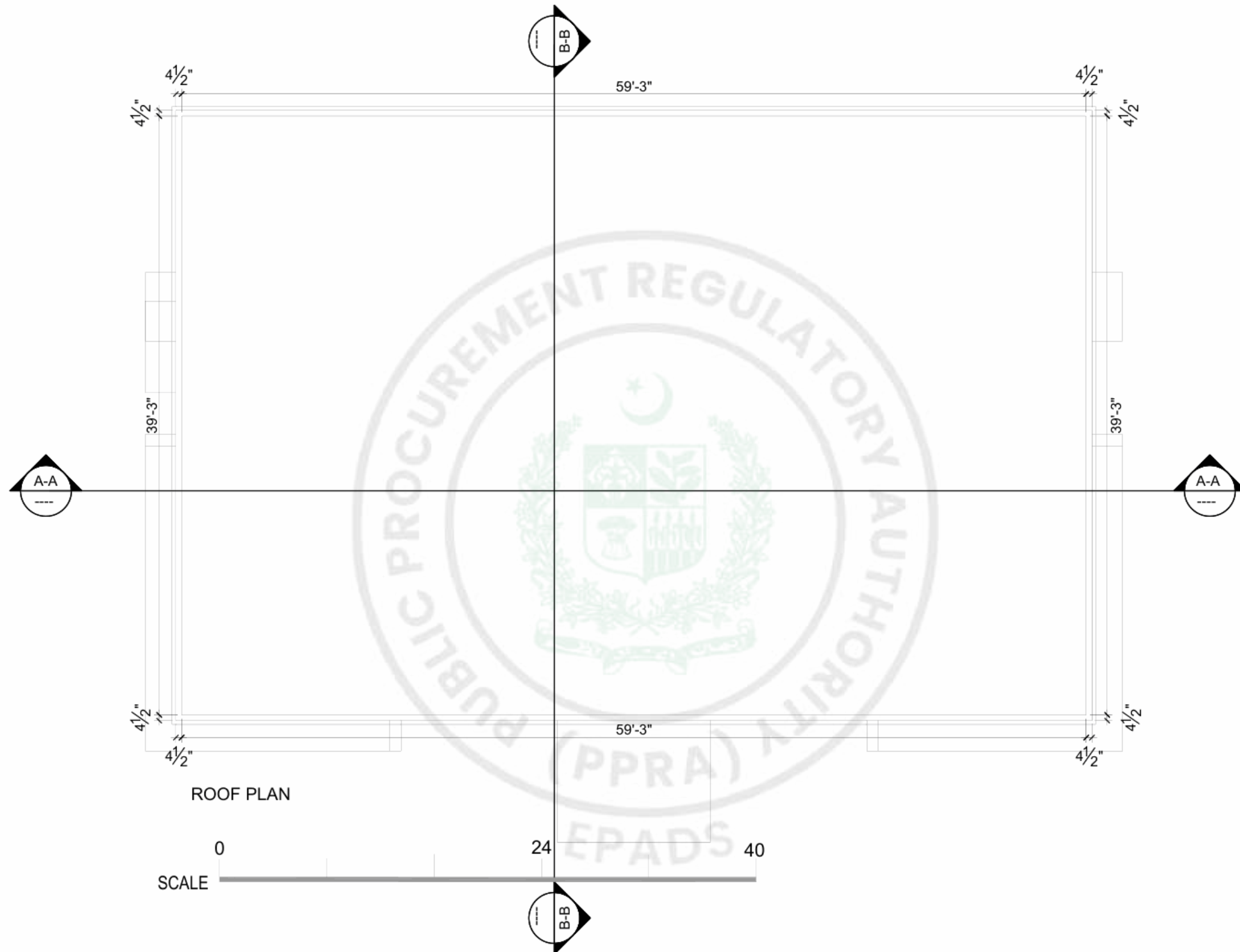
Date

APRIL- 2026

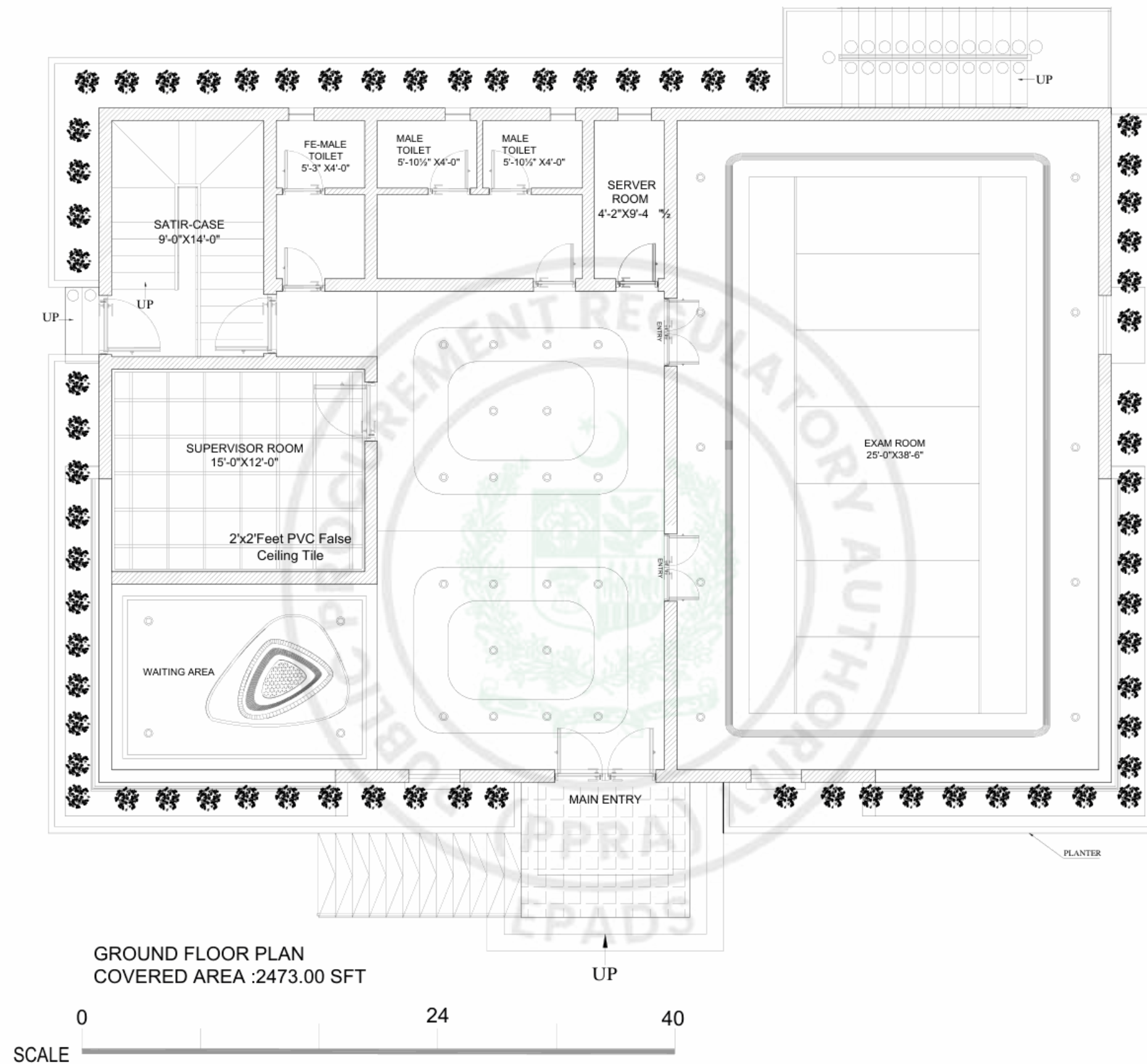
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ORIGINAL SIZE A3				



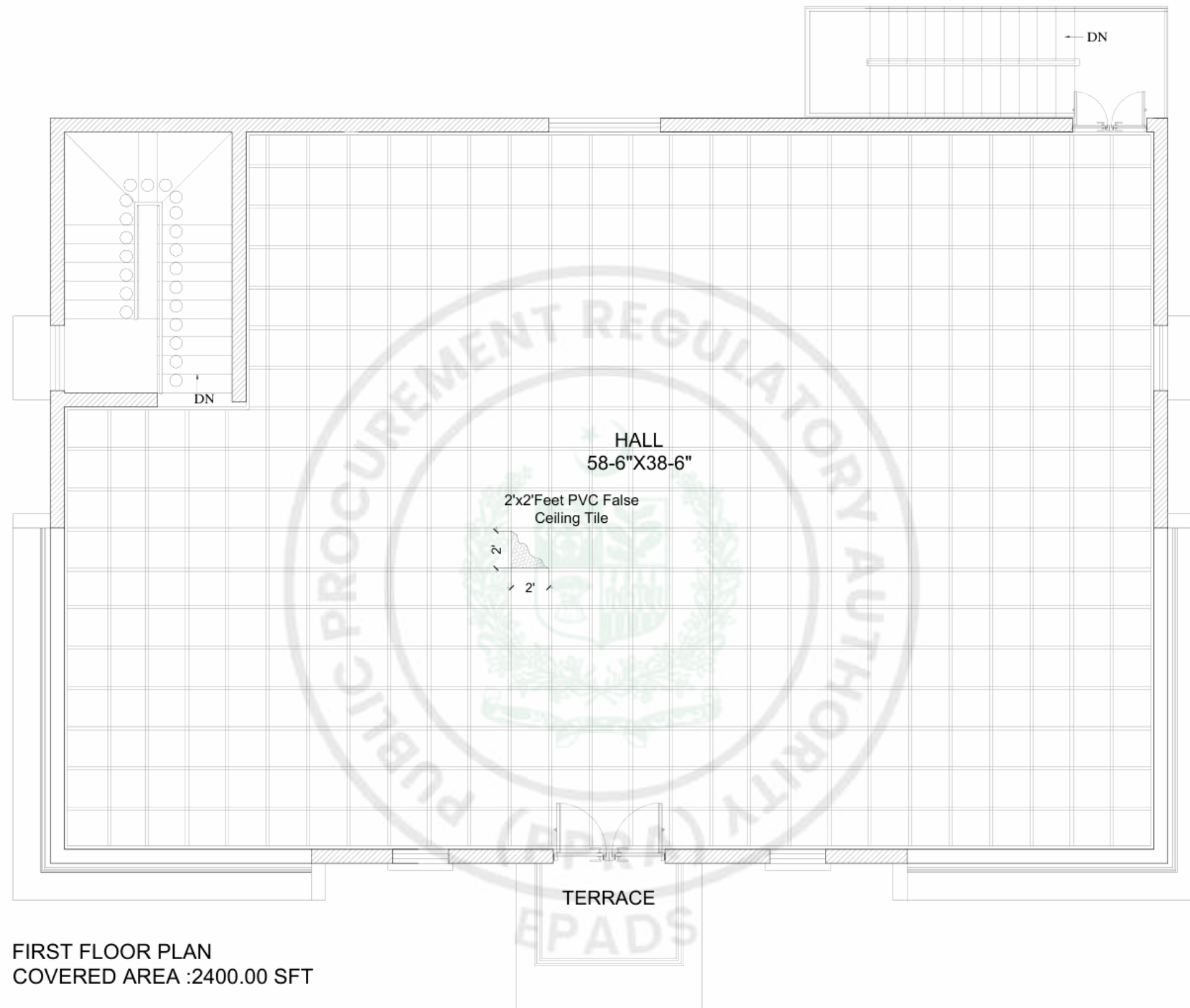
DESIGN:  UMAR MUNSHI ASSOCIATES CONSULTING ENGINEERS, ARCHITECTS & PLANNERS HEAD OFFICE: A-102, BLOCK-13-A, RAILWAYS EMPLOYEES CO-OPERATIVE HOUSING SOCIETY, GULSHAN-E-TOBAL KARACHI-75300 PAKISTAN PHONE: (021) 34983541, 34983304, F-AX: (02-21) 3498305 EMAIL: info@umaconsult.com, URL: www.umaconsult.com	CLIENT:  PAKISTAN CIVIL AVIATION AUTHORITY	PROJECT: PEL EXAMINATION CENTER KARACHI	Checked By M. Hasnat Yaqoob		Tender Drawings	TITLE FIRST FLOOR WORKING PLAN	Job No.
			Drawing By Habib ur Rehman Kamran Kalam	 			Dwg. No. AR-16
			Design By Farooq Azam Fareed M. Sadeeq	 	REV. DATE. DESCRIPTION SCALE AS SHOWN	ORIGINAL SIZE A3	Date APRIL- 2026



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			Drawing By	Habib ur Rehman								Dwg. No.
				Kamran Kalam								AR-17
			Design By	Farooq Azam Fareed		REV.	DATE.	DESCRIPTION	SCALE	AS SHOWN	Date	
M. Sadeeq		ORIGINAL SIZE A3						APRIL- 2026				



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			Drawing By	Habib ur Rehman							Dwg. No.
				Kamran Kalam							AR-18
			Design By	Farooq Azam Fareed		REV.	DATE.	DESCRIPTION	SCALE	AS SHOWN	Date
M. Sadeeq		ORIGINAL SIZE A3						APRIL- 2026			



FIRST FLOOR PLAN
COVERED AREA :2400.00 SFT



DESIGN:
UMAR MUNSHI ASSOCIATES
CONSULTING ENGINEERS, ARCHITECTS
& PLANNERS
HEAD OFFICE
A-102, BLOCK-13-A, RAILWAYS EMPLOYEES COOPERATIVE
HOUSING SOCIETY, GULSHAN-E-IGRAL KARACHI-75300
PAKISTAN PHONE: (021) 34983541, 34983304, F-AX:
(02-21) 34980305
EMAIL: info@umaconsult.com, URL: www.umaconsult.com

CLIENT:

PAKISTAN CIVIL AVIATION AUTHORITY

PROJECT:
PEL EXAMINATION CENTER KARACHI

Checked By	M. Hasnat Yaqoob	
Drawing By	Habib ur Rehman	
	Kamran Kalam	
Design By	Farooq Azam Fareed	
	M. Sadeeq	

Tender Drawings				TITLE	Job No.
				FIRST FLOOR CEILING PLAN	Dwg. No. AR-19
REV.	DATE	DESCRIPTION	SCALE	AS SHOWN	Date
ORIGINAL SIZE A3					APRIL- 2026



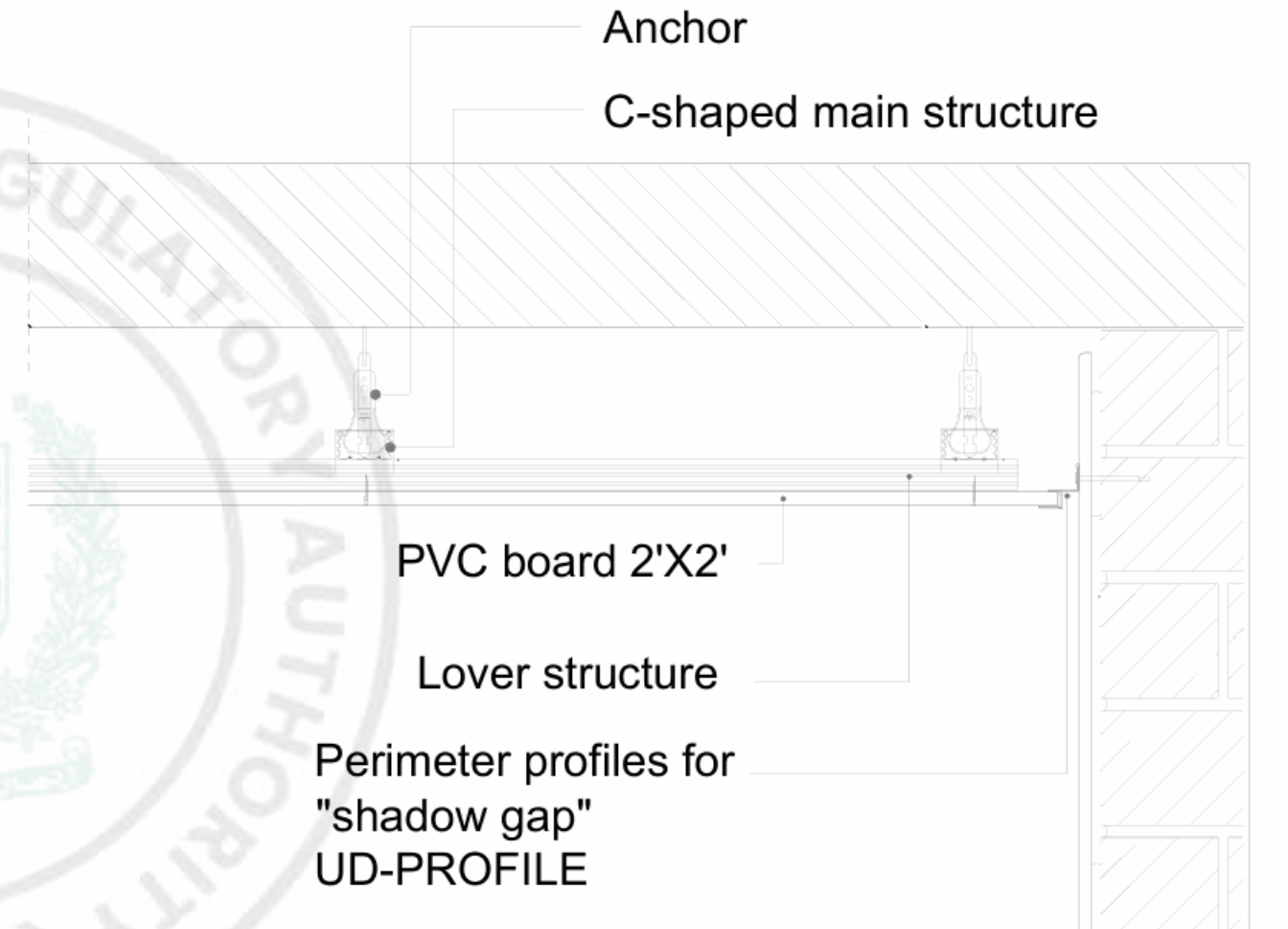
GROUND FLOOR EXAM HALL
CEILING DETAIL



GROUND FLOOR SUPERVISOR
ROOM CEILING DETAIL



GROUND FLOOR RECEPTION
AREA CEILING DETAIL



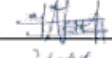
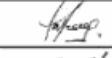
FIRST FLOOR CEILING DETAIL



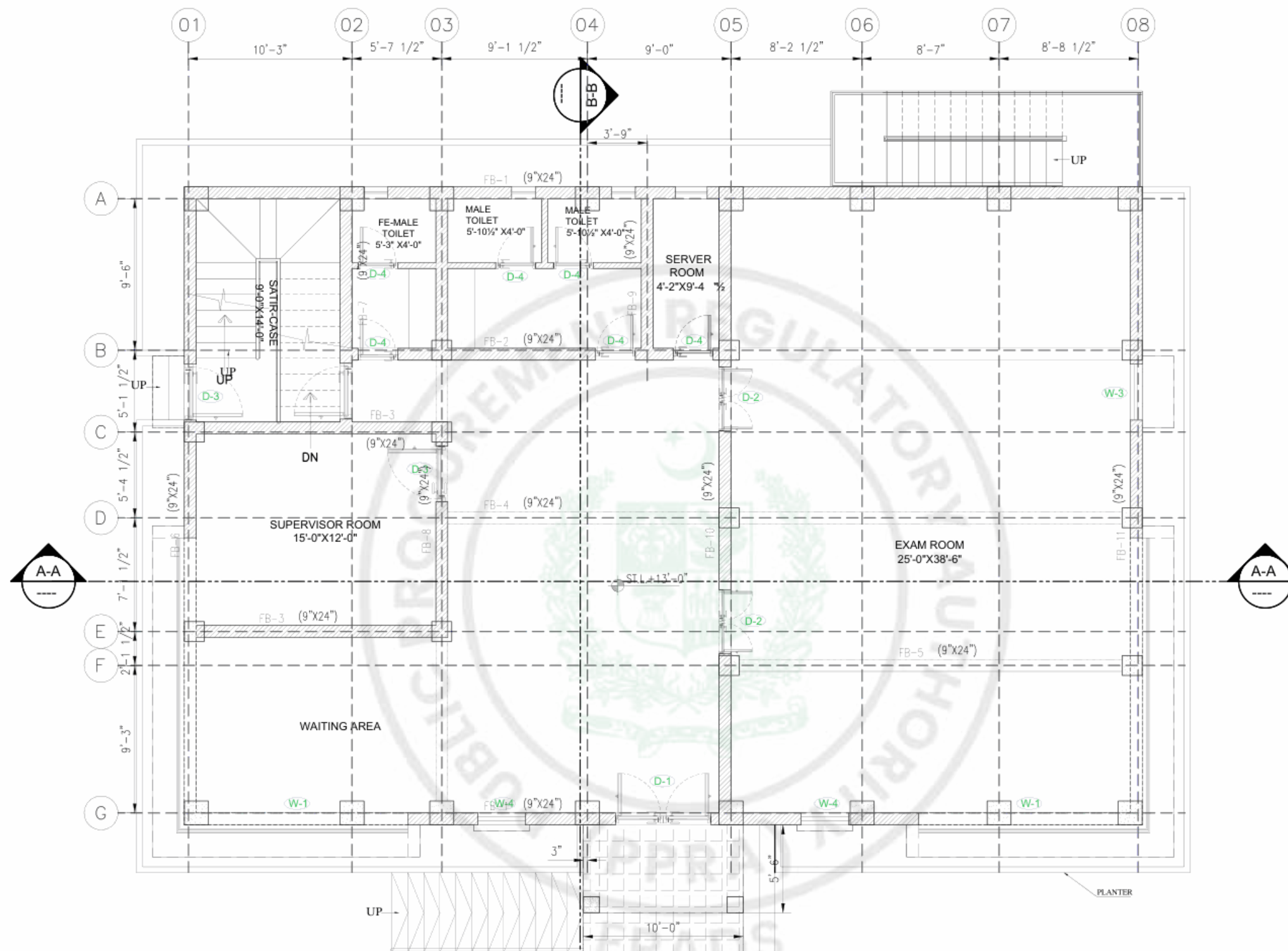
DESIGN:
 **UMAR MUNSHI ASSOCIATES**
CONSULTING ENGINEERS, ARCHITECTS
& PLANNERS
HEAD OFFICE: A-102, BLOCK-13-A, RAILWAYS EMPLOYEES COOPERATIVE
HOUSING SOCIETY, GULSHAN-E-IGRAL KARACHI-75300
PAKISTAN PHONE: (021) 34983541, 34983304, F-AX:
(02-21) 3498305
EMAIL: info@umaconsult.com, URL: www.umaconsult.com

CLIENT:
 **PAKISTAN CIVIL AVIATION AUTHORITY**

PROJECT:
PEL EXAMINATION CENTER KARACHI

Checked By	M. Hasnat Yaqoob	
Drawing By	Habib ur Rehman	
	Kamran Kalam	
Design By	Farooq Azam Fareed	
	M. Sadeeq	

Tender Drawings				TITLE		Job No.
				CEILING DETAIL		Dwg. No. AR-20
REV.	DATE	DESCRIPTION	SCALE	AS SHOWN	Date	
ORIGINAL SIZE A3						APRIL- 2026



GROUND FLOOR PLAN
COVERED AREA :2473.00 SFT

FIRST FLOOR FRAMING PLAN

ALL SLABS 6" THICK EXCEPT NOTED OTHERWISE.



DESIGN:
UMAR MUNSHI ASSOCIATES
CONSULTING ENGINEERS, ARCHITECTS
& PLANNERS
HEAD OFFICE
A-102, BLOCK-13-A, RAILWAYS EMPLOYEES COOPERATIVE
HOUSING SOCIETY, GULSHAN-E-TOBAL KARACHI-75300
PAKISTAN PHONE: (021) 34983541, 34983304, F-AX:
(02-21) 34980305
EMAIL: info@umacconsult.com, URL: www.umacconsult.com

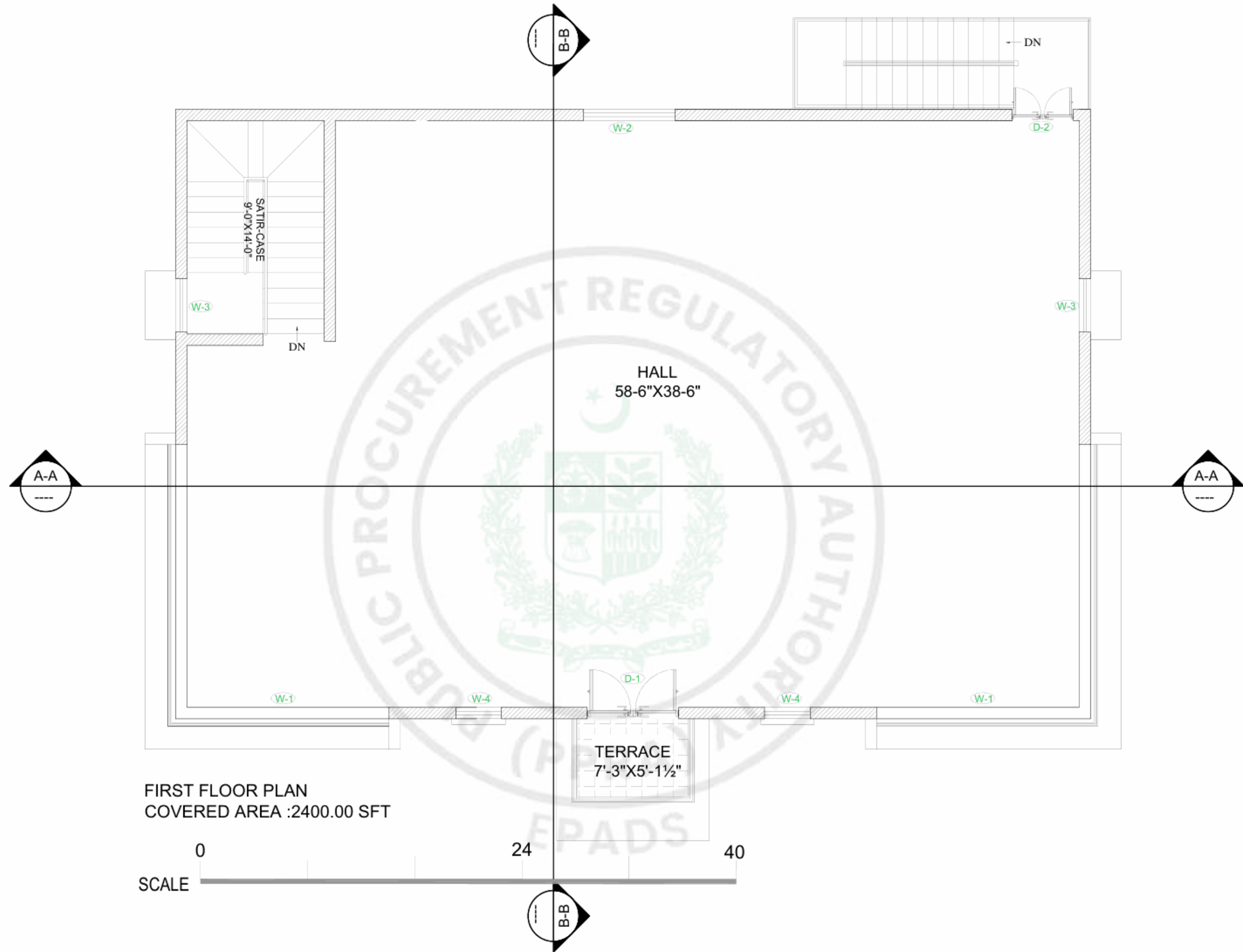
CLIENT:

PAKISTAN CIVIL AVIATION AUTHORITY
پاکستان سول اوی اٹھارٹی

PROJECT:
PEL EXAMINATION CENTER KARACHI

Checked By	M. Hasnat Yaqoob	
Drawing By	Habib ur Rehman Kamran Kalam	
Design By	Farooq Azam Fareed M. Sadeeq	

Tender Drawings				TITLE GROUND FLOOR TAGS PLAN	Job No. -
					Dwg. No. AR-21
REV.	DATE	DESCRIPTION	SCALE	AS SHOWN	Date APRIL- 2026
ORIGINAL SIZE A3					



DESIGN:
UMAR MUNSHI ASSOCIATES
CONSULTING ENGINEERS, ARCHITECTS
& PLANNERS
HEAD OFFICE
A-102, BLOCK-13-A, RAILWAYS EMPLOYEES COOPERATIVE
HOUSING SOCIETY, GULSHAN-E-TOBAL KARACHI-75300
PAKISTAN PHONE: (021) 34983541, 34983304, F-AX:
(02-21) 34980305
EMAIL: info@umaconsult.com, URL: www.umaconsult.com

CLIENT:

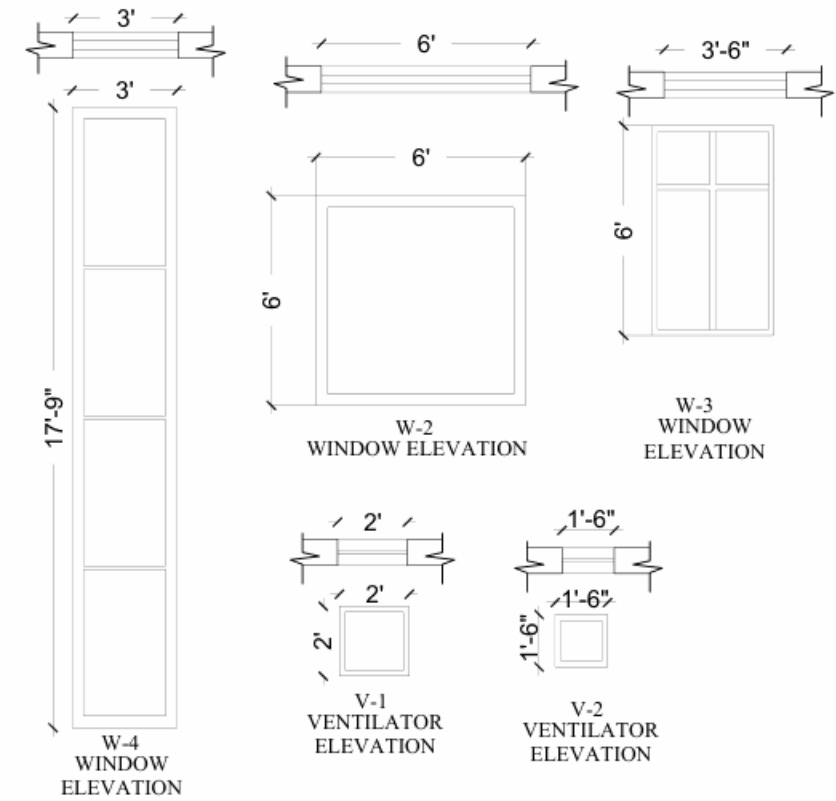
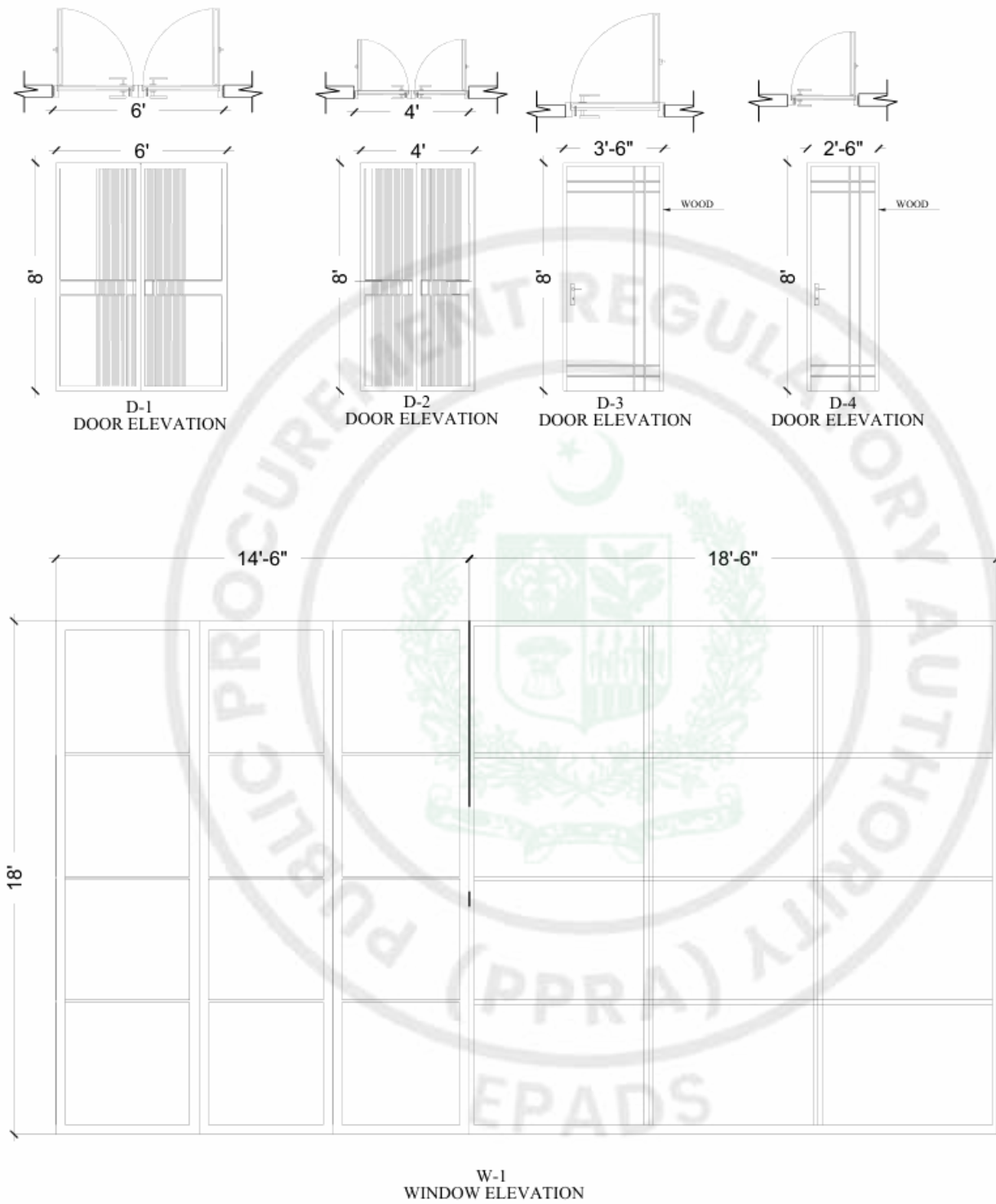
PAKISTAN CIVIL AVIATION AUTHORITY

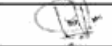
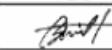
PROJECT:
PEL EXAMINATION CENTER KARACHI

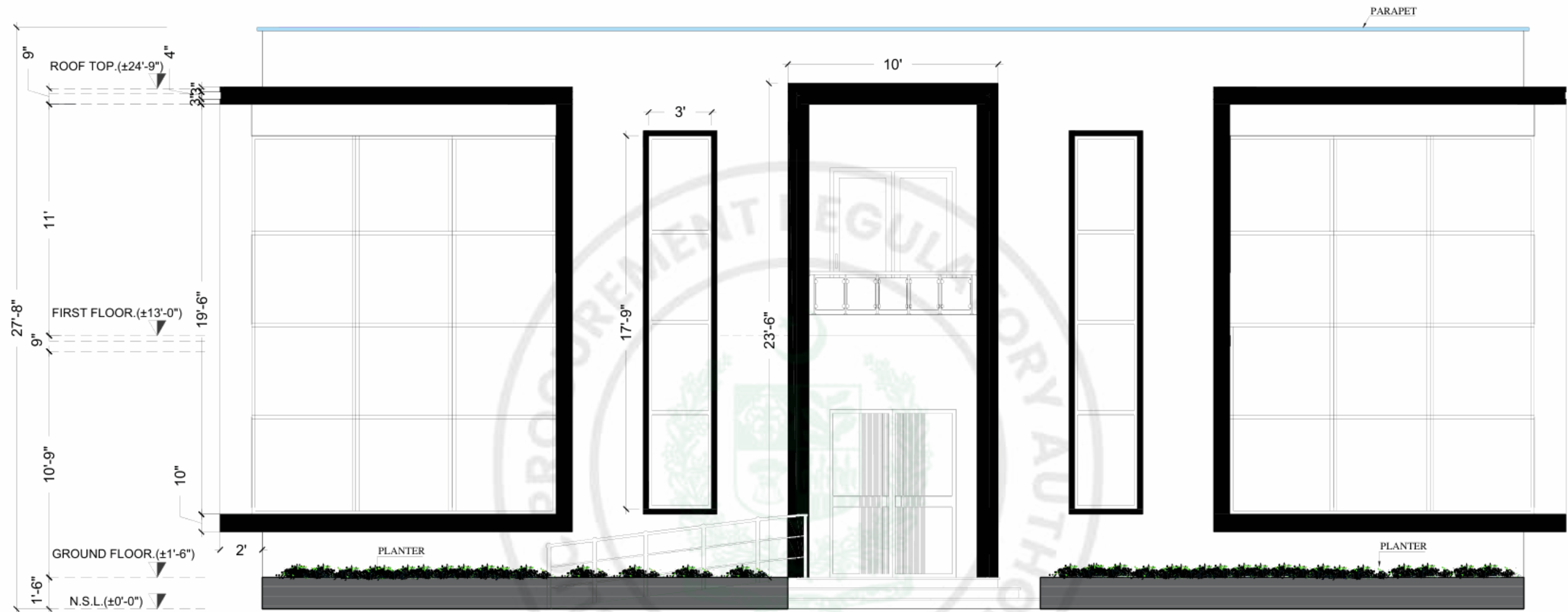
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Drawing By	Habib ur Rehman Kamran Kalam	
Design By	Farooq Azam Fareed M. Sadeeq	

Tender Drawings		TITLE ROOF FLOOR TAGS PLAN		Job No. -
				Dwg. No. AR-22
REV.	DATE	DESCRIPTION	SCALE	Date APRIL- 2026
		AS SHOWN		
ORIGINAL SIZE A3				

SCHEDULE OF OPENING					
S.NO	ITEM	QTY	SIZE	DESCRIPTION	SILL HEIGHT
01.	D-1	02	6'-0"X8'-0"	GLASS DOOR	0'-0"
02.	D-2	03	4'-0"X8'-0"	GLAZED GLASS DOOR	0'-0"
03.	D-3	02	3'-6"X8'-0"	WOODEN DOOR	0'-0"
04.	D-4	06	2'-6"X8'-0"	WOODEN DOOR	0'-0"
05.	W-1	02	14'-6"+18'-8"X18'-0"	ALUMINUM WINDOW	3'-0"
06.	W-2	01	6'-0"X6'-0"	ALUMINUM WINDOW	3'-0"
07.	W-3	03	3'-6"X6'-0"	ALUMINUM WINDOW	3'-0"
08.	W-4	02	3'-0"X17'-9"	ALUMINUM WINDOW	3'-0"
09.	V-1	01	2'-0"X2'-0"	ALUMINUM VENTILATOR	7'-0"
10.	V-2	04	1'-6"X2'-4"	ALUMINUM VENTILATOR	7'-0"



DESIGN: UMAR MUNSHI ASSOCIATES CONSULTING ENGINEERS, ARCHITECTS & PLANNERS HEAD OFFICE A-102, BLOCK-13-A, RAILWAYS EMPLOYEES COOPERATIVE HOUSING SOCIETY, GULSHAN-E-JOBAL KARACHI-75300 PAKISTAN PHONE: (021) 34983541, 34980304, F-AX: (02-21) 34980305 EMAIL: info@umaconsult.com, URL: www.umaconsult.com	CLIENT: PAKISTAN CIVIL AVIATION AUTHORITY پاکستان سولہ ایوی ایشن اتھارٹی	PROJECT: PEL EXAMINATION CENTER KARACHI	Checked By M. Hasnat Yaqoob 	Tender Drawings	TITLE SCHEDULE OF OPENING		Job No. -
			Drawing By Habib ur Rehman 				Dwg. No. AR-23
			Kamran Kalam 				
			Design By Farooq Azam Fareed 	M. Sadeeq 	REV. DATE. DESCRIPTION	SCALE	AS SHOWN
ORIGINAL SIZE A3							

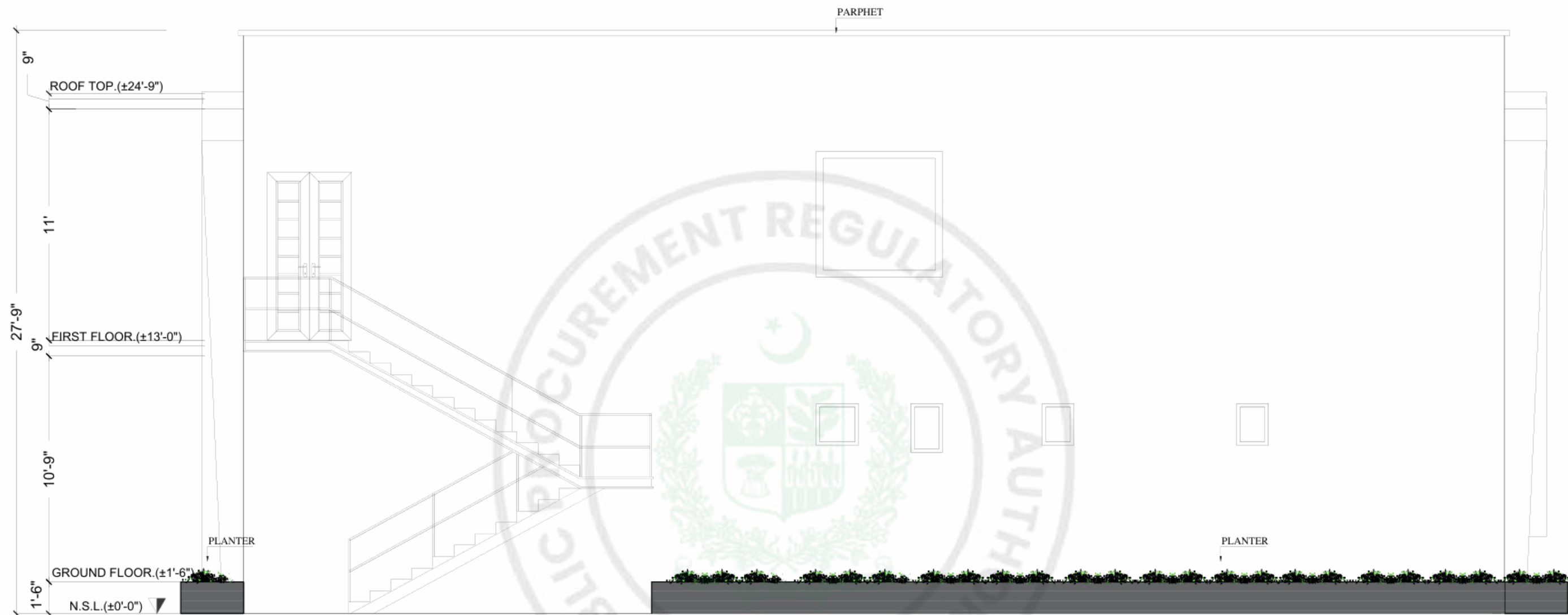


FRONT ELEVATION

SCALE - 3/16" = 1'-0"



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			Drawing By Habib ur Rehman Kamran Kalam			FRONT ELEVATION		Dwg. No.
			Design By Farooq Azam Fareed M. Sadeeq			AS SHOWN		AR-24
				REV		LE	AS SHOWN	Date
						ZE A3		APRIL- 2026



REAR ELEVATION

SCALE - 3/16" = 1'-0"



DESIGN:

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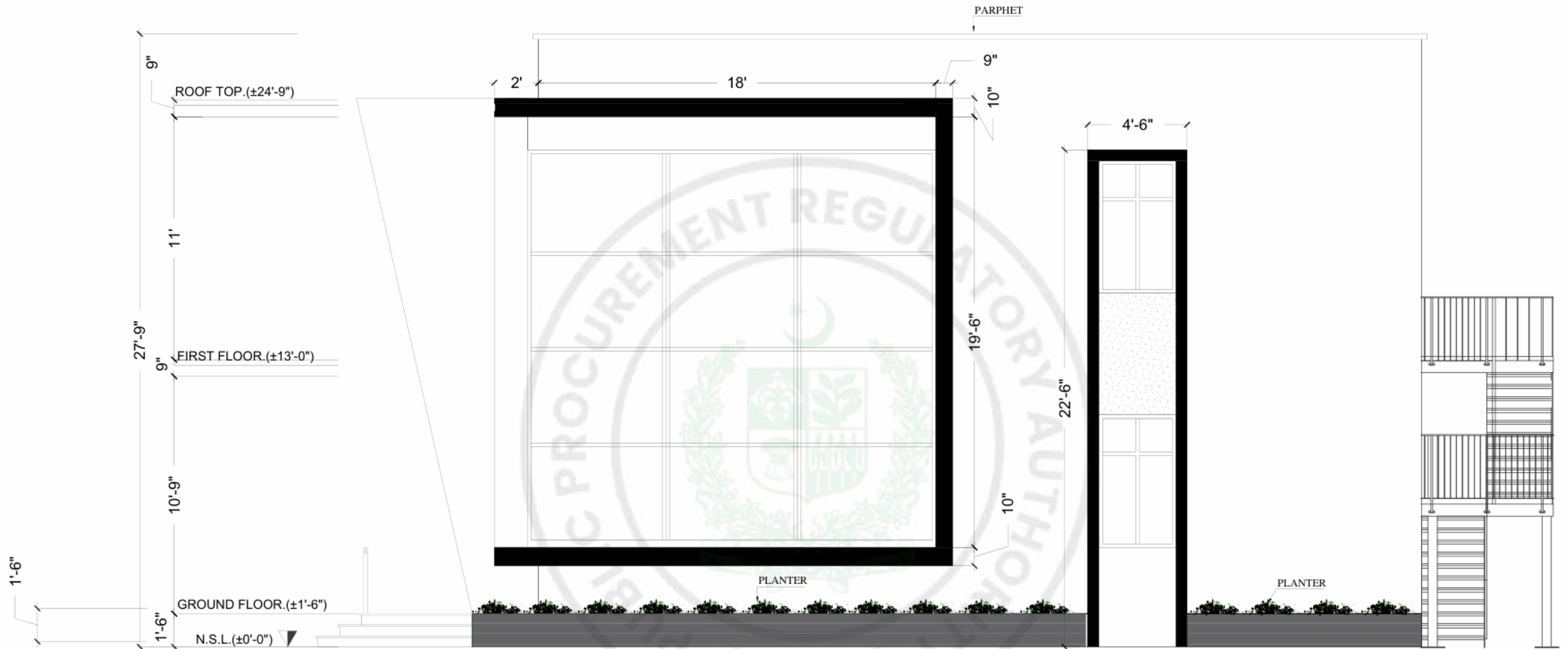
PROJECT:

PEL EXAMINATION CENTER KARACHI

Checked By	M. Hasnat Yaqoob	
Drawing By	Habib ur Rehman	
	Kamran Kalam	
Design By	Farooq Azam Fareed	
	M. Sadeeq	

Tender Drawings				TITLE	Job No.
				RARE ELEVATION	-
					Dwg. No.
					AR-25
REV.	DATE.	DESCRIPTION	SCALE	AS SHOWN	Date
					APRIL- 2026

ORIGINAL SIZE A3



DESIGN:



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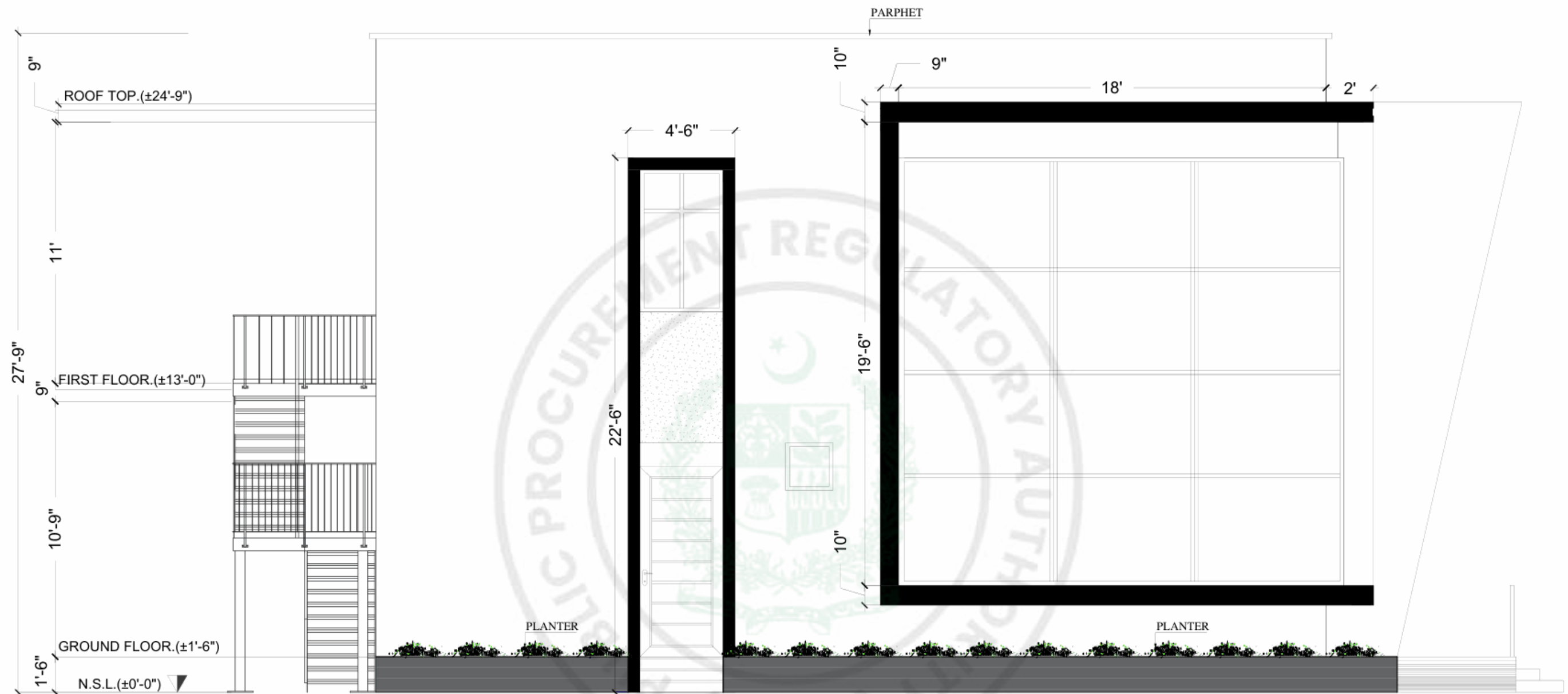
PAKISTAN CIVIL AVIATION AUTHORITY

PROJECT:

PEL EXAMINATION CENTER KARACHI

Checked By	M. Hasnat Yaqoob	
Drawing By	Habib ur Rehman	
	Kamran Kalam	
Design By	Farooq Azam Fareed	
	M. Sadeeq	

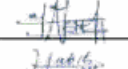
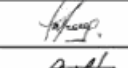
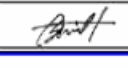
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						AR-26
REV.	DATE.	DESCRIPTION	SCALE	AS SHOWN	Date	
				ORIGINAL SIZE A3		APRIL- 2026

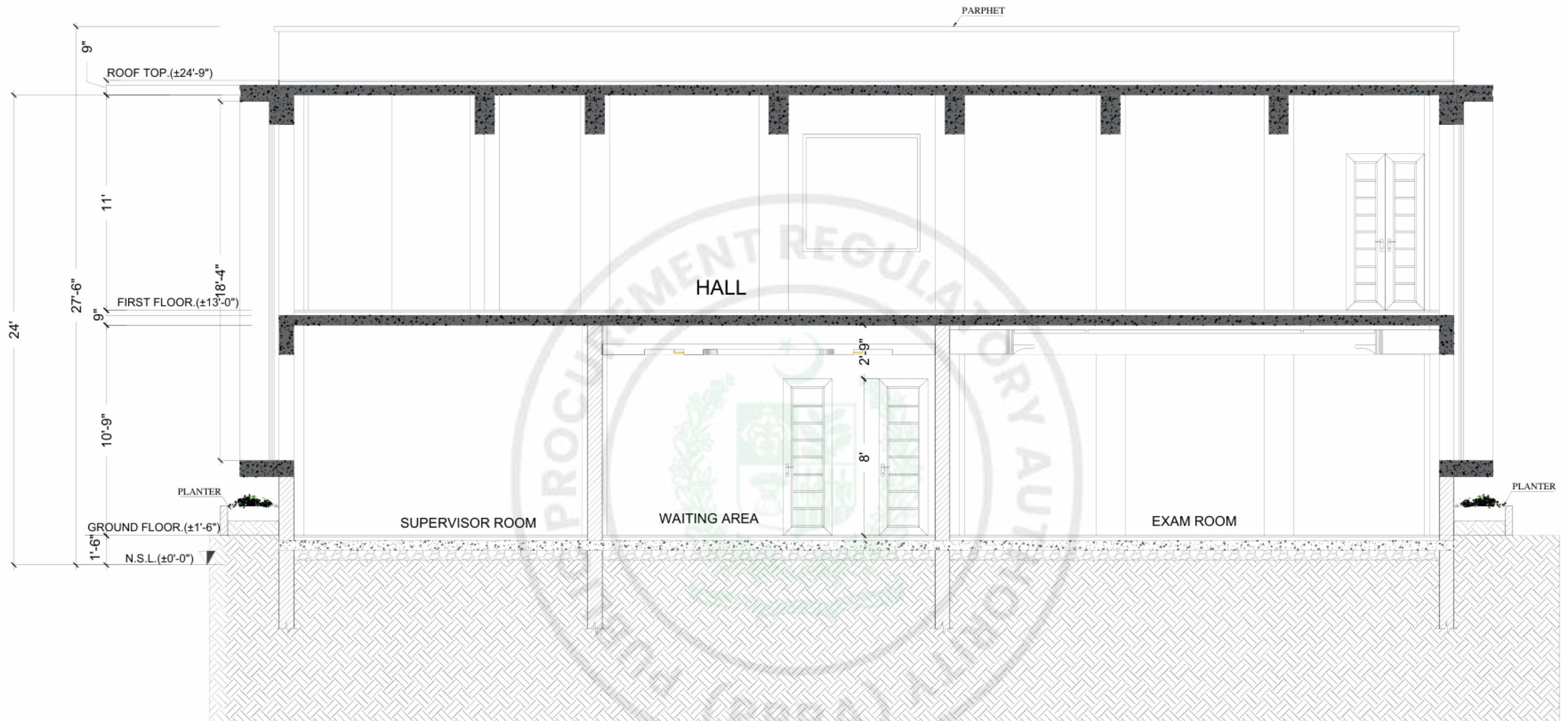


LEFT ELEVATION

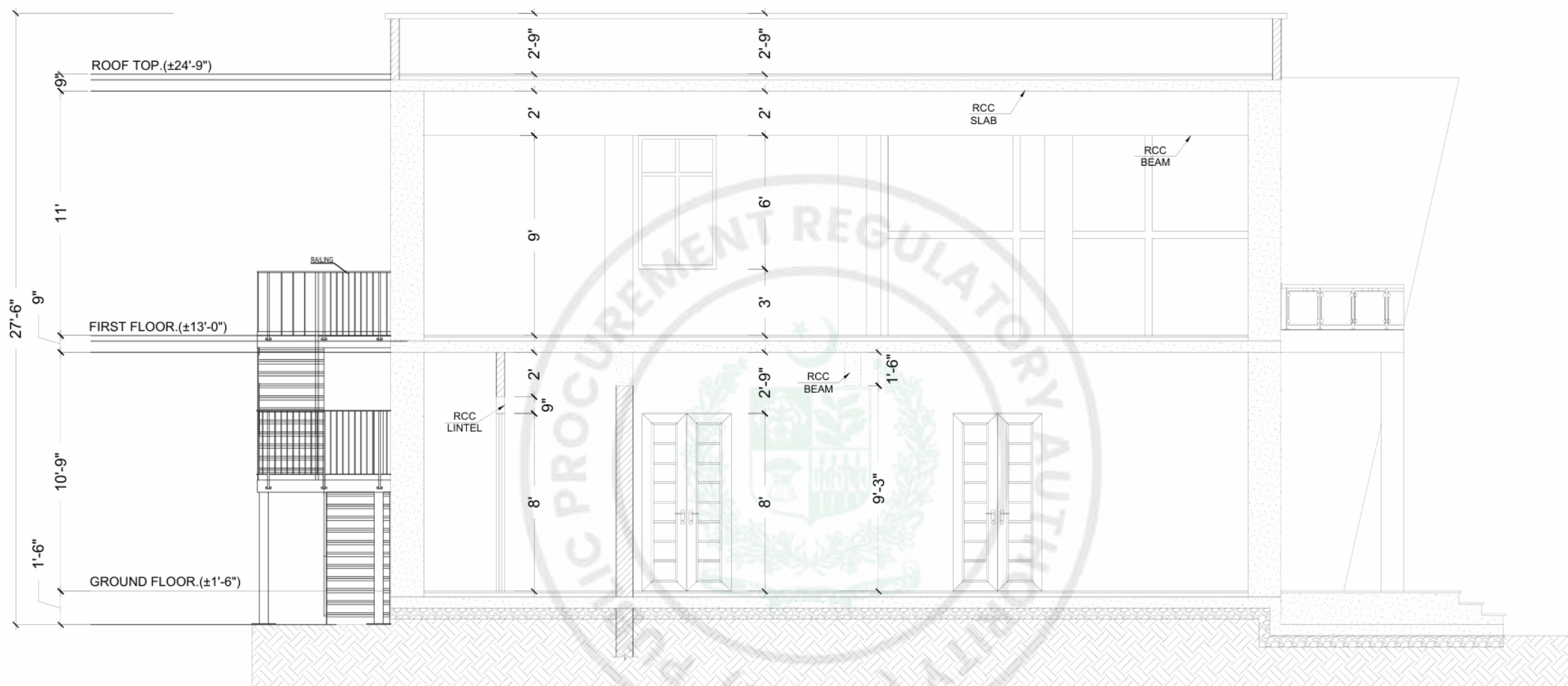
SCALE - 3/16" = 1'-0"



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			Drawing By Habib ur Rehman Kamran Kalam	 			
			Design By Farooq Azam Fareed M. Sadeeq	 	REV. DATE DESCRIPTION SCALE AS SHOWN ORIGINAL SIZE A3	Date APRIL- 2026	Dwg. No. AR-27



DESIGN:		CLIENT:		PROJECT:		Checked By		M. Hasnat Yaqoob				Tender Drawings		TITLE		Job No.							
UMAR MUNSHI ASSOCIATES CONSULTING ENGINEERS, ARCHITECTS & PLANNERS HEAD OFFICE A-102, BLOCK-13-A, RAILWAYS EMPLOYEES COOPERATIVE HOUSING SOCIETY, GULSHAN-E-TOBAL, KARACHI-75300 PAKISTAN PHONE: (021) 34983541, 34980304, F-AX: (92-21) 34980305 EMAIL: info@umaconsult.com, URL: www.umaconsult.com		PAKISTAN CIVIL AVIATION AUTHORITY پاکستان سیویل ایوی ایشن اتھارٹی		PEL EXAMINATION CENTER KARACHI		Drawing By		Habib ur Rehman								SECTION AT A-A		Dwg. No.					
								Kamran Kalam										AR-28					
						Design By		Farooq Azam Fareed				REV.		DATE.		DESCRIPTION		SCALE		AS SHOWN		Date	
								M. Sadeeq				ORIGINAL SIZE A3										APRIL- 2026	



SECTION B-B

SCALE - 3/16" = 1'-0"

SCALE



DESIGN:



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PAKISTAN CIVIL AVIATION AUTHORITY

PROJECT:

PEL EXAMINATION CENTER KARACHI

Checked By

M. Hasnat Yaqoob

Drawing By

Habib ur Rehman

Kamran Kalam

Design By

Farooq Azam Fareed

M. Sadeeq

Tender Drawings

TITLE

SECTION AT B-B

Job No.

Dwg. No.

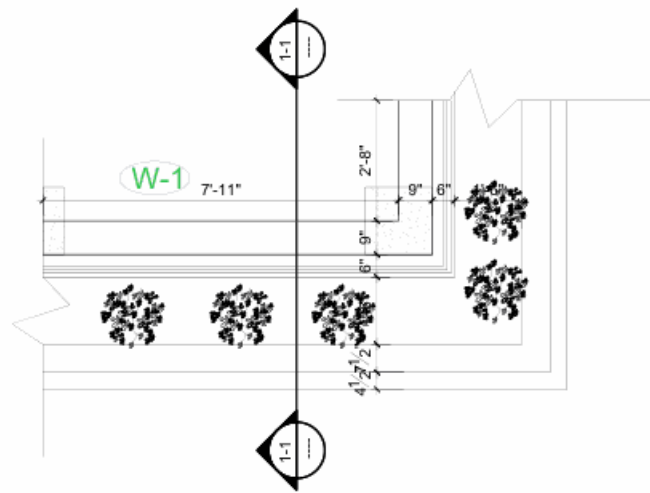
AR-29

Date

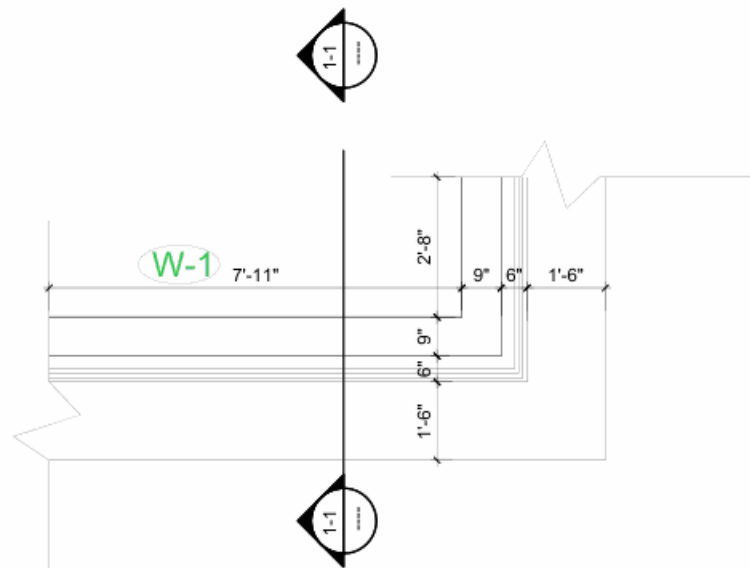
APRIL- 2026

REV.	DATE.	DESCRIPTION	SCALE	AS SHOWN

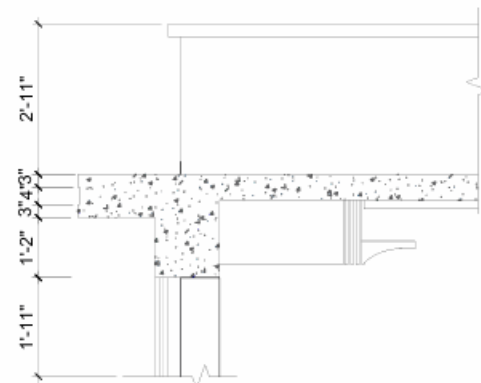
ORIGINAL SIZE A3



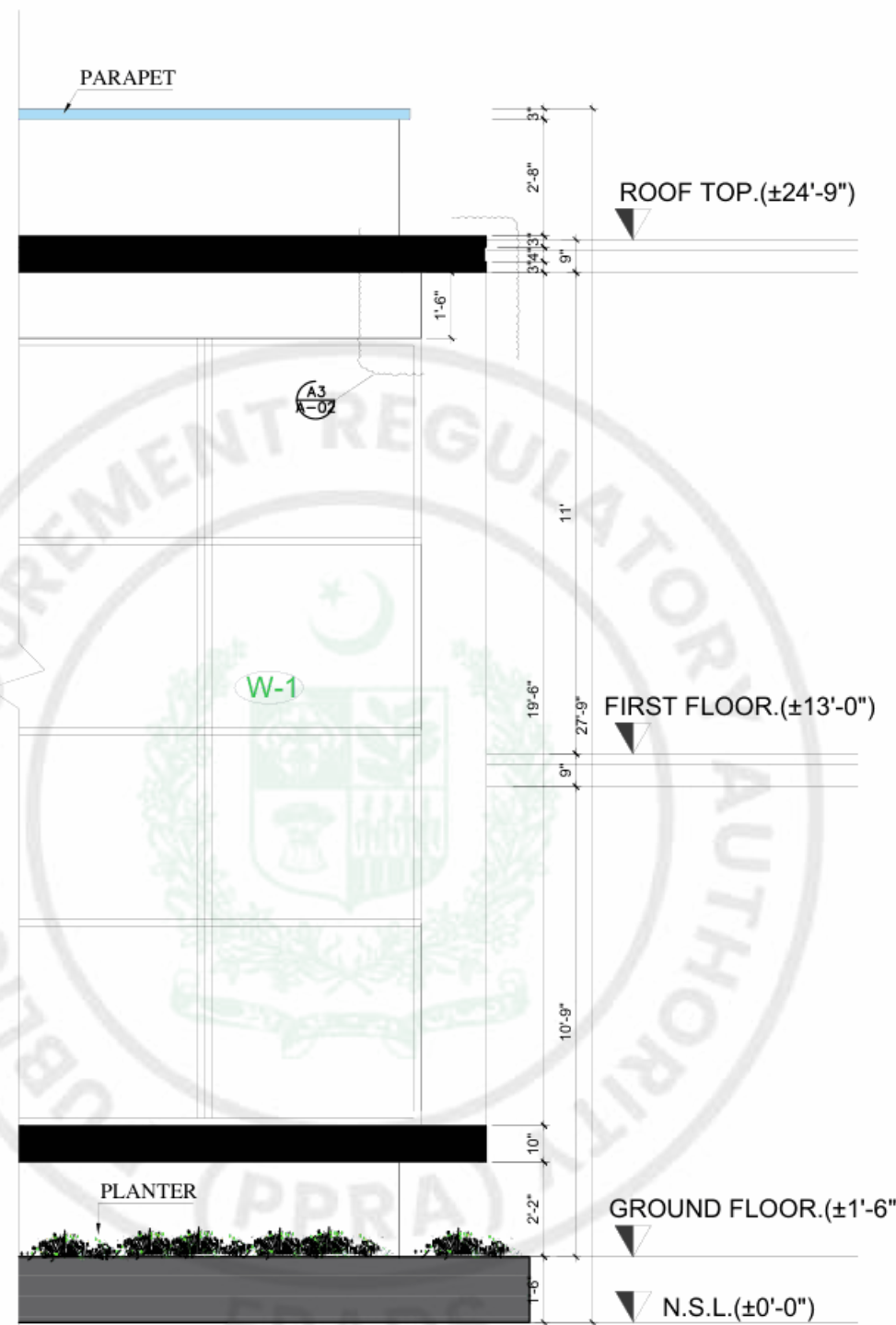
GROUND FLOOR PLAN
SCALE - 1/4" = 1'-0"



FIRST FLOOR PLAN
SCALE - 1/4" = 1'-0"

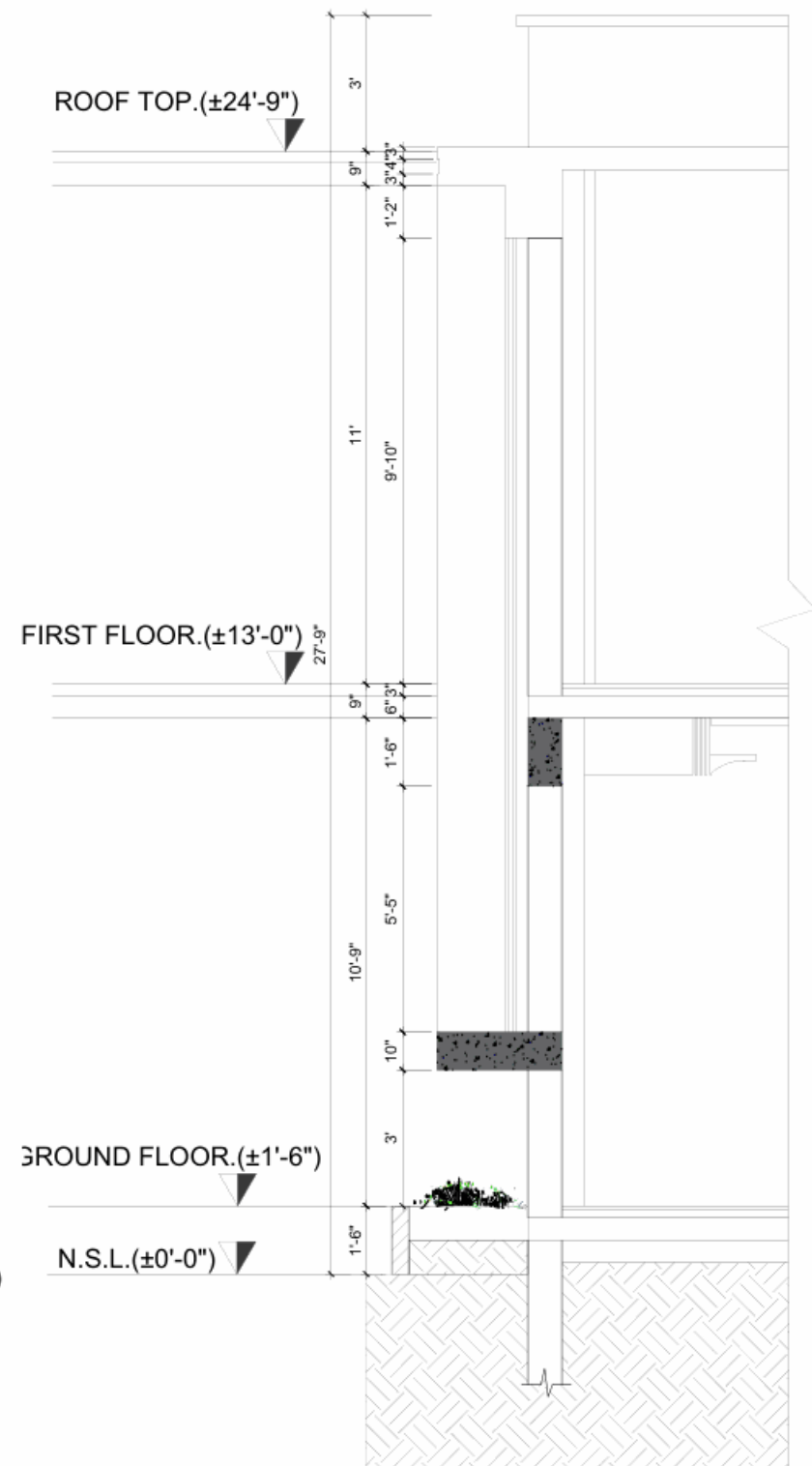


DETAIL-02



ELEVATION FLOOR PLAN
SCALE - 1/4" = 1'-0"

DETAIL-01



SECTION
SCALE - 1/4" = 1'-0"



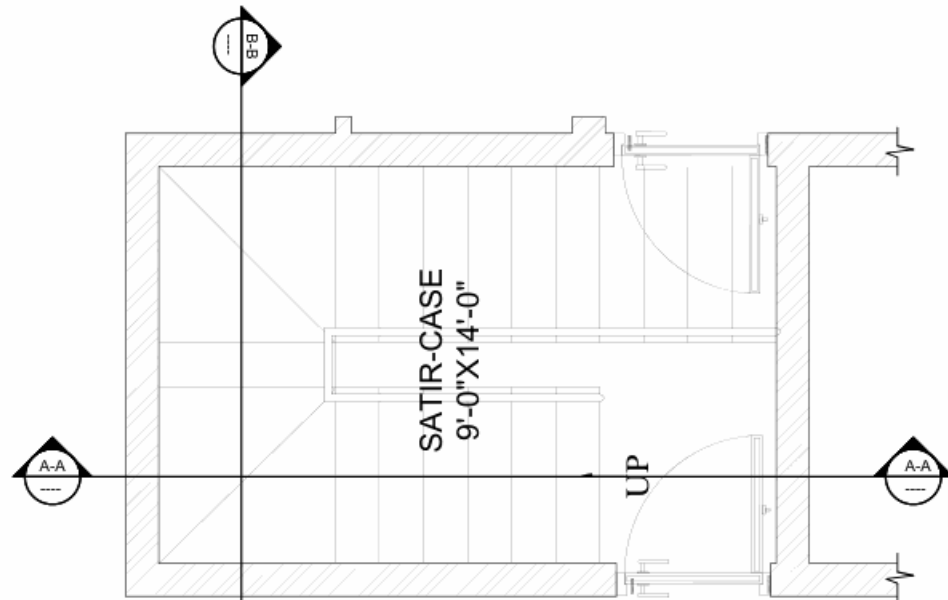
DESIGN:
UMAR MUNSHI ASSOCIATES
CONSULTING ENGINEERS, ARCHITECTS
& PLANNERS
HEAD OFFICE: A-102, BLOCK-13-A, RAILWAYS EMPLOYEES COOPERATIVE
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CLIENT:
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پاکستان سولہ ایوی ایشن اتھارٹی

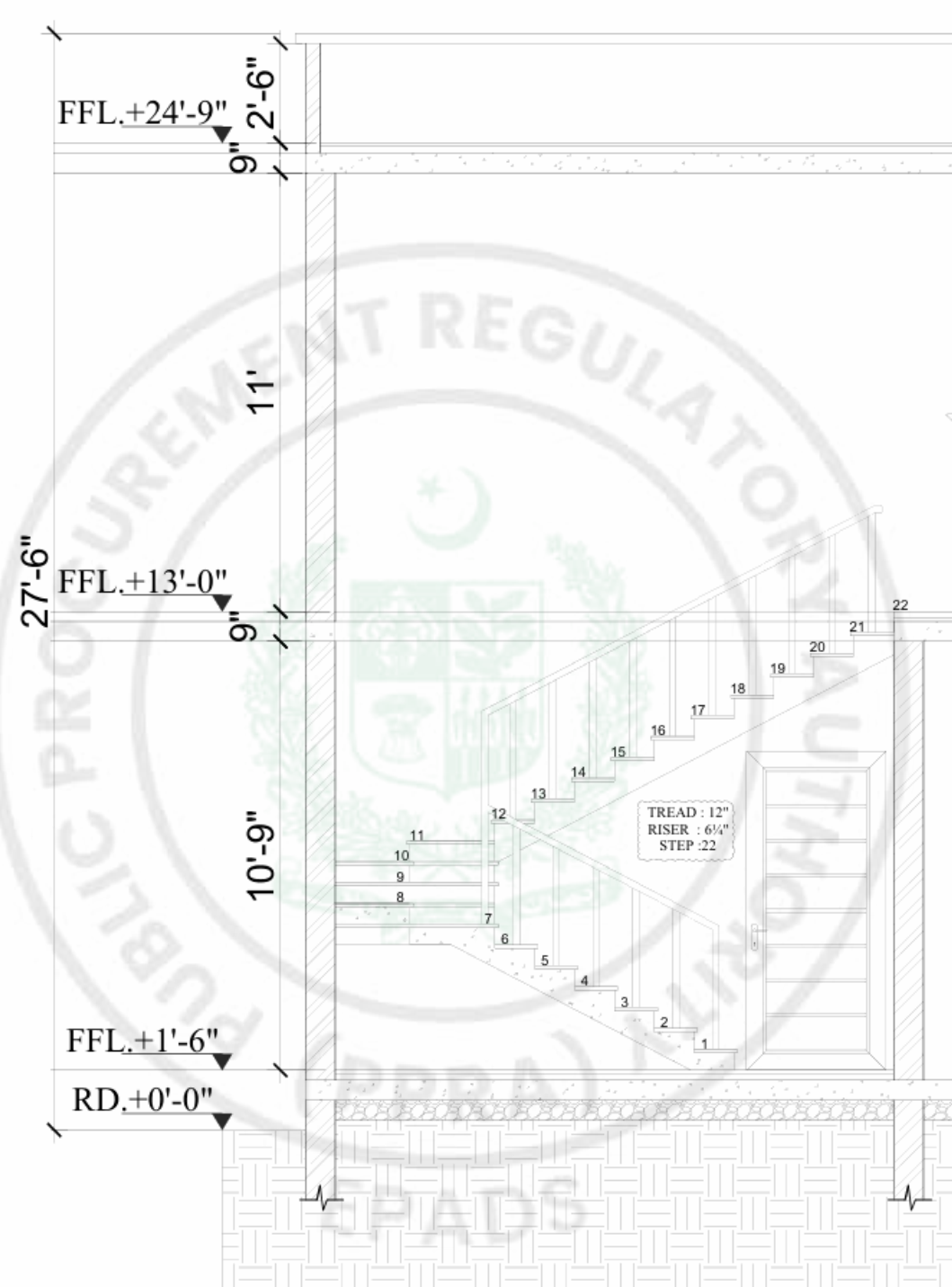
PROJECT:
PEL EXAMINATION CENTER KARACHI

Checked By	M. Hasnat Yaqoob	
Drawing By	Habib ur Rehman	
	Kamran Kalam	
Design By	Farooq Azam Fareed	
	M. Sadeeq	

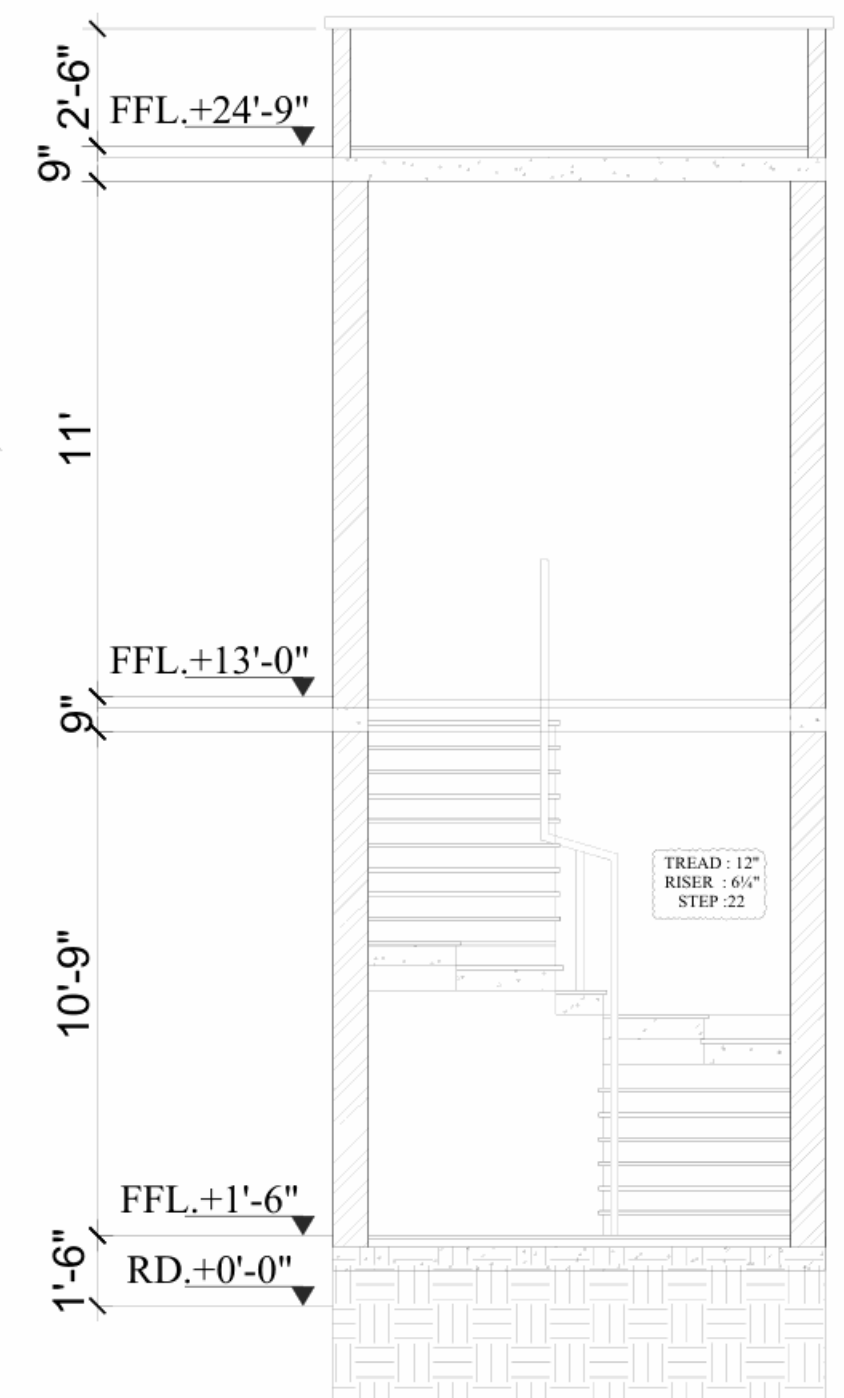
Tender Drawings				TITLE	Job No.
				DETAIL 1 AND 2	Dwg. No.
					AR-30
REV.	DATE	DESCRIPTION	SCALE	AS SHOWN	Date
ORIGINAL SIZE A3					APRIL- 2026



STAIR PLAN



STAIR DETAIL AT A-A



STAIR DETAIL AT B-B



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PROJECT:

PEL EXAMINATION CENTER KARACHI

Checked By	M. Hasnat Yaqoob	
Drawing By	Habib ur Rehman Kamran Kalam	
Design By	Farooq Azam Fareed M. Sadeeq	

Tender Drawings				TITLE	Job No.
				STAIR DETAIL	
					Dwg. No. AR-31
REV.	DATE	DESCRIPTION	SCALE	AS SHOWN	Date
ORIGINAL SIZE A3					APRIL- 2026



PAKISTAN CIVIL AVIATION AUTHORITY

B-6, KDA Scheme-1, Karsaz Karachi, Pakistan.



STRUCTURAL DRAWINGS

(KARACHI PEL EXAMINATION CENTRE)

Consultancy Services for Design and Supervision of Construction of
PEL Examination Centres at Karachi & Lahore

PEL EXAMINATION CENTER

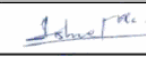
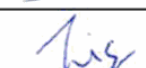
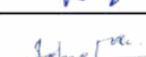
STRUCTURAL DRAWINGS



PEL EXAMINATION CENTER

SR. NO	DRAWING DISCRIPTION	DWG. NO
	STRUCTURAL DRAWINGS	
1	GENERAL NOTES	GN-01
2	COLUMN LAYOUT PLAN, COLUMN ELEVATION AND SECTION	ST-01
3	FOUNDATION LAYOUT PLAN, FOUNDATION REINFORCEMENT DETAILS	ST-02
4	PLINTH BEAM FRAMING PLAN, PLINTH BEAM ELEVATION AND SECTION	ST-03
5	FIRST FLOOR FRAMING PLAN, FIRST FLOOR BEAM ELEVATION AND SECTION	ST-04
6	ROOF FRAMING PLAN, ROOF BEAM ELEVATION AND SECTION	ST-05
7	FIRST FLOOR SLAB REINFORCEMENT PLAN, ROOF SLAB REINFORCEMENT PLAN	ST-06
8	STAIR CASE PLAN AND REINFORCEMENT DETAILS OF STAIR CASE SECTIONS	ST-07
9	STAIR CASE PLAN AND REINFORCEMENT DETAILS OF STAIR CASE SECTIONS	ST-08
10	TYPICAL SECTION AND DETAILS	ST-09



CONSULTANT  HEAD OFFICE	UMAR MUNSHI ASSOCIATES CONSULTING ENGINEERS, ARCHITECTS & PLANNERS A-102, BLOCK-13-A, RAILWAYS EMPLOYEES COOPERATIVE HOUSING SOCIETY, GULSHAN-E-IQBAL KARACHI-75300 PAKISTAN PHONE: (021) 34983541, 34980304, F-AX: (92-21) 34980305 EMAIL: inf-o@umaconsult.com, URL: www.umaconsult.com	CLIENT:  PAKISTAN CIVIL AVIATION AUTHORITY پاکستان سول ایوی ایشن اتھارٹی	PROJECT: PEL EXAMINATION CENTER KARACHI	Checked By	Engr. Ishrat Alam		Tender Drawings	Scale	AS SHOWN	Job No.	
				Drawing By	Engr. Zia ur Rehman			Cad By	UM	Dwg. No.	LIST-01
				Design By	Engr. Ishrat Alam			Design By	Z.A	Date	APRIL. 2026
								Checked	Z.A		
								REV.	CAD.	DESCRIPTION	ORIGINAL SIZE A3

GENERAL NOTES

- Design is in accordance with ACI-318-19, ASCE 7-16 Code & Pakistan Building Code 2021.
- All work shall be carried out in accordance with the job specifications.
- All concrete excluding R.C.C Column is 3000 psi Cylindrical strength at 28 days. and R.C.C Column is 4000 psi Cylindrical strength at 28 days.
- STEEL G-60' DEFORMED CONFORMING TO ASTM.
- 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 cubes tested as per ASTM C 39. Test specimens shall be made and cured in accordance with ASTM C 31.
- 3/8" ϕ & above steel is 60000 psi min. yield strength and min. ultimate strength of 90000 psi as per ASTM A-615 specifications.
- Ordinary Portland cement, conforming to BS-12 / PS-232 shall be used in all Super Structure work, While sulphate resisting cement should be used in all Sub Structures.
- Cement from different sources shall not be mixed for the structure.
- Coarse sand from approved quarries / sources shall be used.
- Well graded crushed stone from approved quarries / sources shall be used as coarse aggregate. Maximum nominal size of the coarse aggregate shall be 3/4" for all R.C.C. work.
- Potable water shall be used for concrete and shall be free of organic and other impurities. 11. 2 1/2" x 2 1/2" Precast concrete blocks having compressive strength of 6000 psi. and spaced not more than 3 ft c/c shall be used for provision of required cover to main reinforcement. Thickness of these blocks shall be equal to the required cover.
- All dimensions are given in feet & inches. Written dimensions are to be followed.
- Unless otherwise shown on the plans, Concrete cover provided for reinforcement shall be as follows;

Footings	= 2 1/2"
Slabs	= 3/4"
Beams	= 2 1/2"
Columns	= 1 1/2"
- Construction drawings along with bar bending schedule shall be submitted by the contractor for Engineer's approval well before proceeding any work.
- All layout, configuration, dimensions and levels shall be verified before proceeding with the work.
- 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.
- Tender price to be quoted with respect to specifications, drawings and B.O.Q.
- Contractor has to acquaint himself of site condition.
- 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.
- During construction, safety and stability of the structure and all temporary work shall be given prime importance. Utmost care and precaution shall be exercised by the contractor during the work against any mishap or accident.
- Bars in beams shall be joggled in vertical plane for laps and shall be staggered.
- All Column Laps are 60 times bar diameter, and Beam Laps are 48 times bar diameter, Otherwise shown in drawings.
- Bars in column shall be joggled for laps with starter bars.
- Position of bars in beams shall be adjusted keeping in view the position of vertical bars of the columns.
- Stirrups shall be placed in such a way that their hooks shall be staggered and located in compression face.
- Concrete test cube shall be cured with the same method and under same conditions as those for the concrete work they represent.
- No concrete shall be poured until its form work and reinforcement has been inspected and approved by the Engineer.
- Sequence of removal of form work shall be as approved by the Engineer.
- All structural Drawings shall be read & checked in conjunction with the Architectural Drawings for layout and levels of different members.
- Existing underground services if any, required to be left in position, shall be carefully protected during excavation.
- Excavation adjacent to existing structures and/or under-ground services shall be made by hand.
- 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.
- While back filling of excavation for footings, compaction shall be done in 8" layers. Each.
- 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.
- 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.
- Following Gravity loads have used for design
 - Dead Load = As Per Structure
 - Roof Live load = 20 psf
- Before casting of foundation geotechnical expert recommendation should be followed. Minimum soil bearing capacity at 5'-0" below existing road level should be 1.0TSF.



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FAX: (92-21) 34980305

CLIENT:



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AUTHORITY**

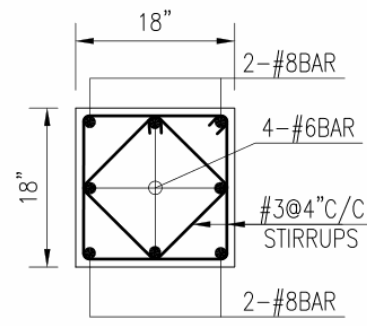
PROJECT:

PEL EXAMINATION CENTER KARACHI

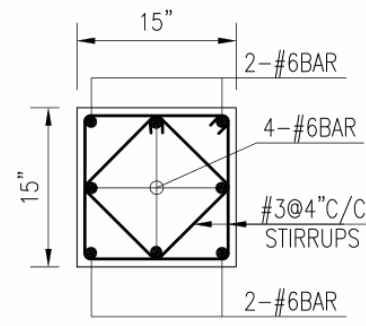
Checked By	Engr. Ishrat Alam	
Drawing By	Engr. Zia ur Rehman	
Design By	Engr. Ishrat Alam	

Tender Drawings

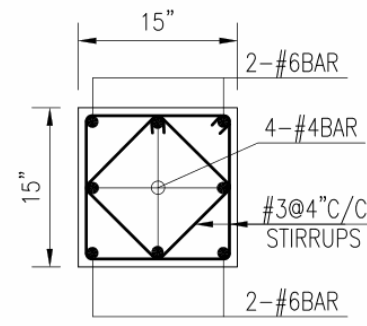
Scale	AS SHOWN	Job No.	
Cad By	UM	Dwg. No.	GN-01
Design By	Z.A	Date	APRIL, 2026
Checked	Z.A		
REV.	CAD.	DESCRIPTION	ORIGINAL SIZE A3



SEC. 1-1

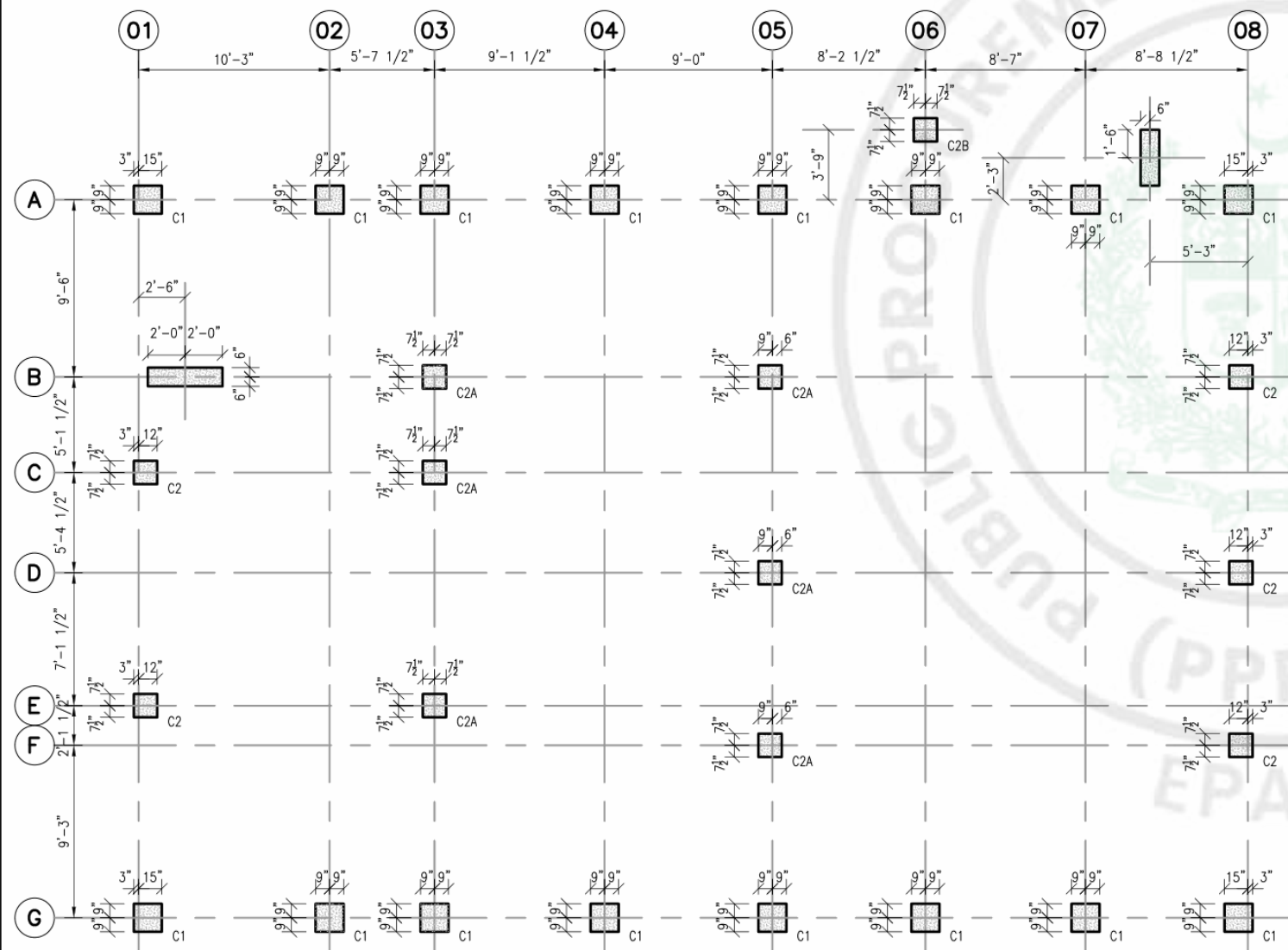


SEC. 2-2

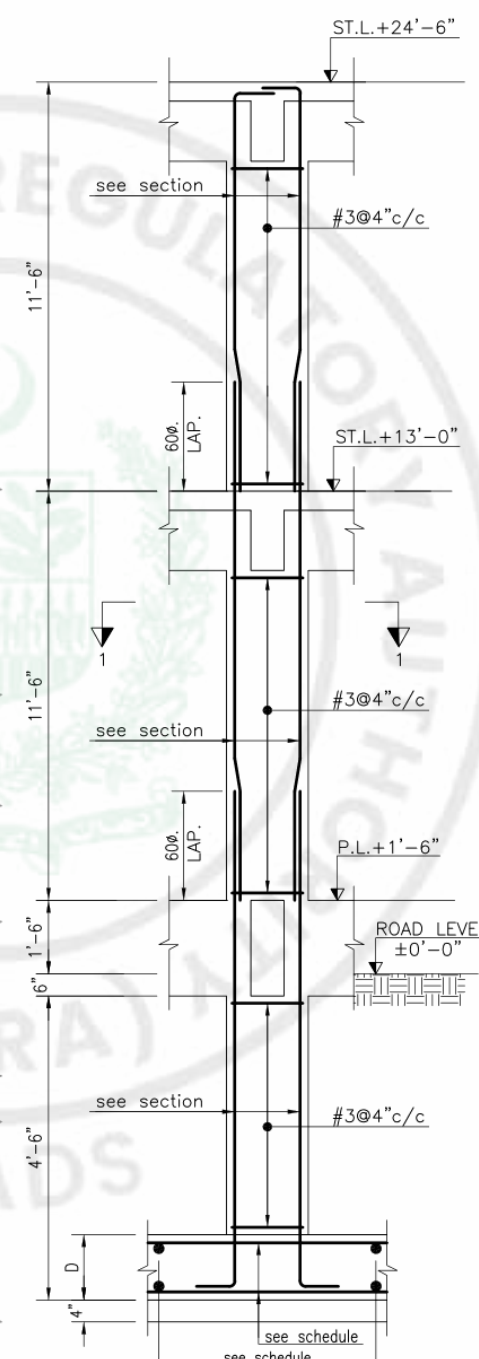


SEC. 2A-2A
SEC. 2B-2B

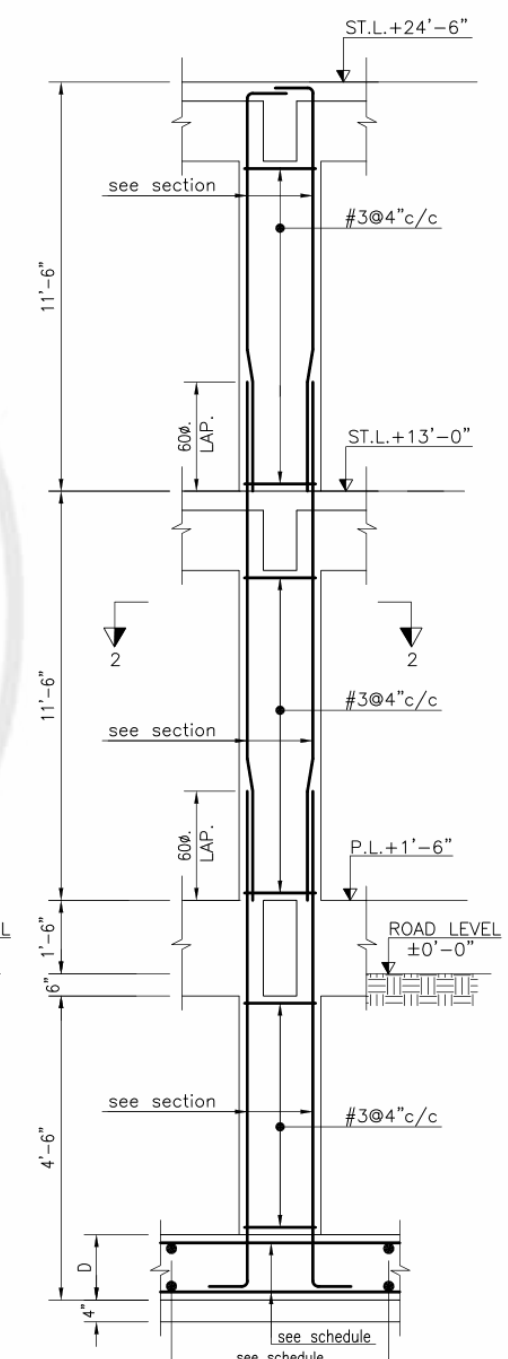
NOTE:
1-All Structural Drawings Shall be read and Checked in Conjunction With the Architectural Drawings.
2-All Dimensions are given in feet and inches, Except noted Otherwise.
3-For General Notes See Drawing NO. GN-01.
4-Issued For Tender



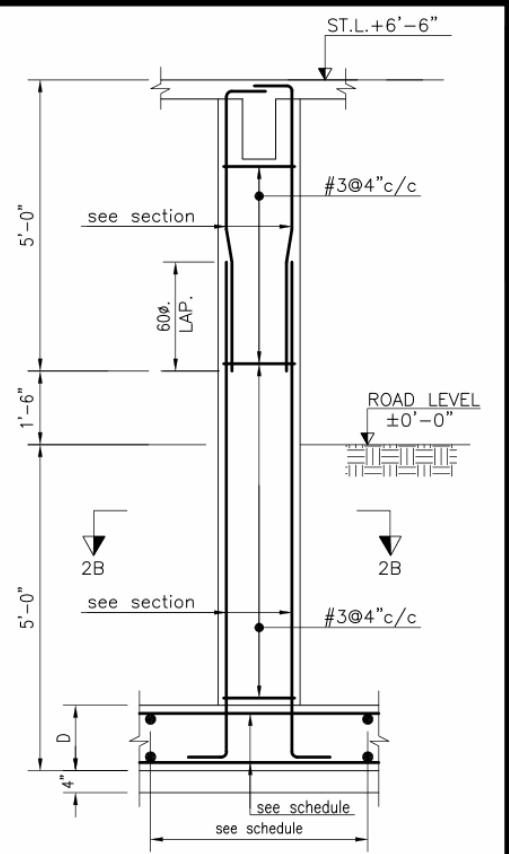
COLUMN LAYOUT PLAN



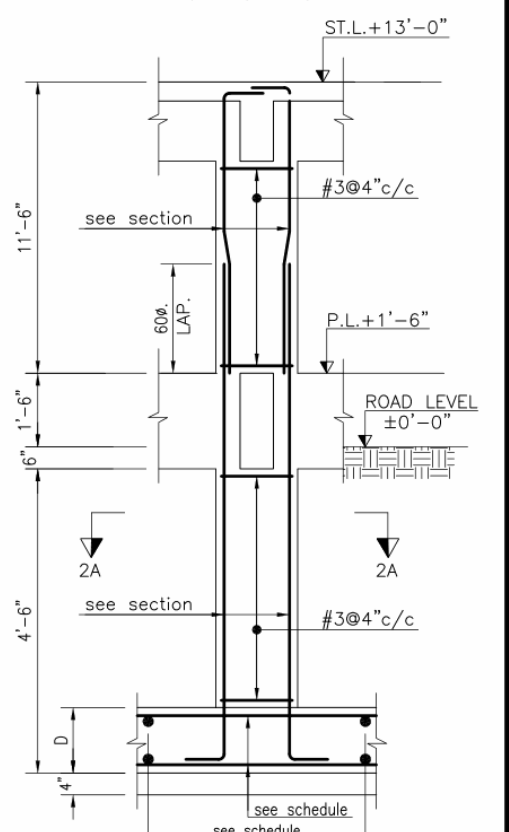
COLUMN ELEVATION C1
(SCALE:-1/4\"/>



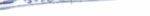
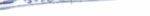
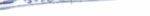
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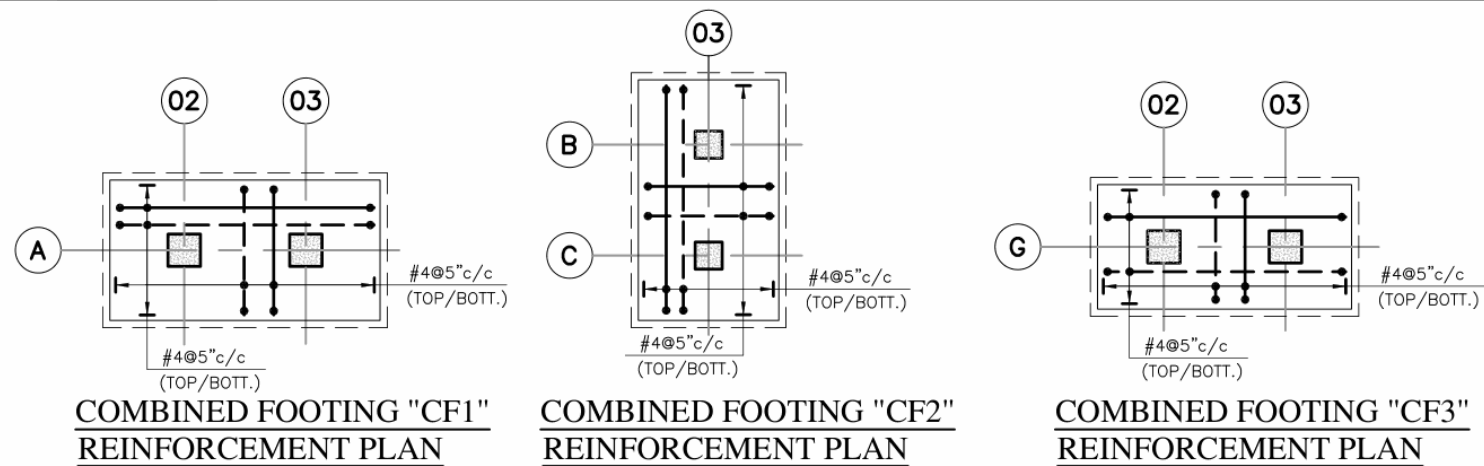


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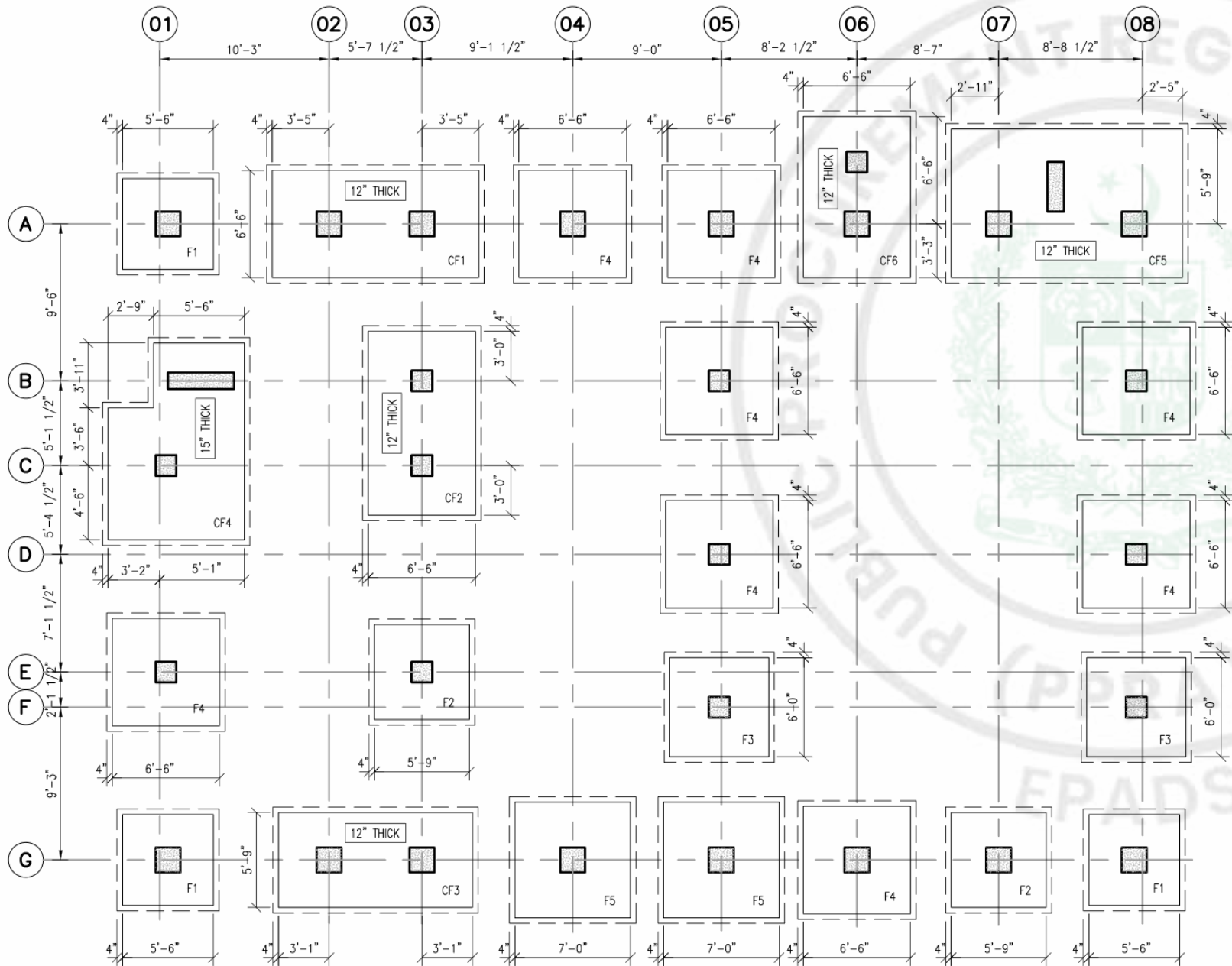
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CONSULTANT  HEAD OFFICE		UMAR MUNSHI ASSOCIATES CONSULTING ENGINEERS, ARCHITECTS & PLANNERS A-102, BLOCK-13-A, RAILWAYS EMPLOYEES COOPERATIVE HOUSING SOCIETY, GULSHAN-E-IQBAL KARACHI-75300 PAKISTAN PHONE: (021) 34983541, 34980304, F-AX: (92-21) 34980305 EMAIL: inf-o@umaconsult.com, URL: www.umaconsult.com	CLIENT:  PAKISTAN CIVIL AVIATION AUTHORITY پاکستان کیلویں ایوی ایشن اتھارٹی	PROJECT: PEL EXAMINATION CENTER KARACHI	<table><tr><td>Checked By</td><td>Engr. Ishrat Alam</td><td></td></tr><tr><td>Drawing By</td><td>Engr. Zia ur Rehman</td><td></td></tr><tr><td>Design By</td><td>Engr. Ishrat Alam</td><td></td></tr></table>	Checked By	Engr. Ishrat Alam		Drawing By	Engr. Zia ur Rehman		Design By	Engr. Ishrat Alam		<table><tr><td rowspan="4">Tender Drawings</td><td>Scale</td><td>AS SHOWN</td><td>Job No.</td><td></td></tr><tr><td>Cad By</td><td>UM</td><td>Dwg. No.</td><td>ST-01</td></tr><tr><td>Design By</td><td>Z.A</td><td>Date</td><td>APRIL, 2026</td></tr><tr><td>Checked</td><td>Z.A</td><td></td><td></td></tr></table>	Tender Drawings	Scale	AS SHOWN	Job No.		Cad By	UM	Dwg. No.	ST-01	Design By	Z.A	Date	APRIL, 2026	Checked	Z.A			<table><tr><td>REV.</td><td>CAD.</td><td>DESCRIPTION</td><td>ORIGINAL SIZE A3</td><td></td></tr></table>	REV.	CAD.	DESCRIPTION	ORIGINAL SIZE A3	
Checked By	Engr. Ishrat Alam																																					
Drawing By	Engr. Zia ur Rehman																																					
Design By	Engr. Ishrat Alam																																					
Tender Drawings	Scale	AS SHOWN	Job No.																																			
	Cad By	UM	Dwg. No.	ST-01																																		
	Design By	Z.A	Date	APRIL, 2026																																		
	Checked	Z.A																																				
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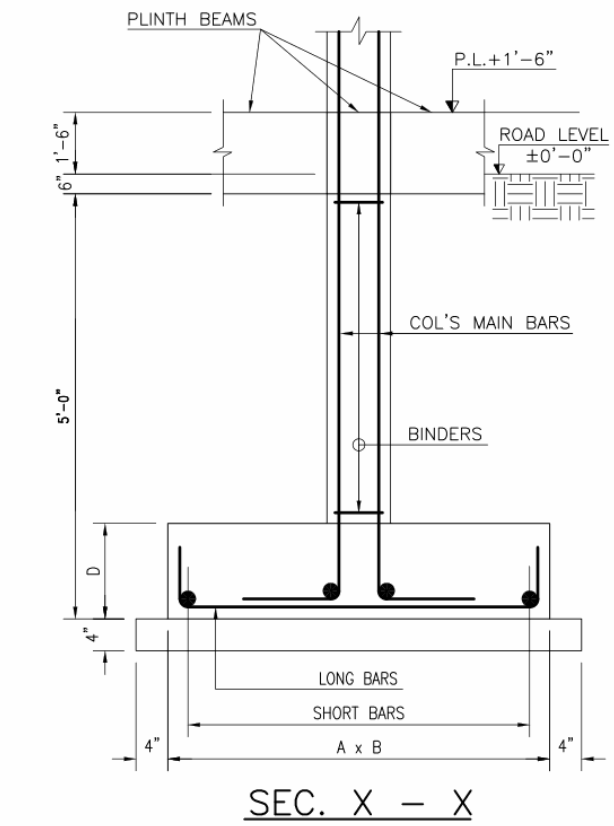
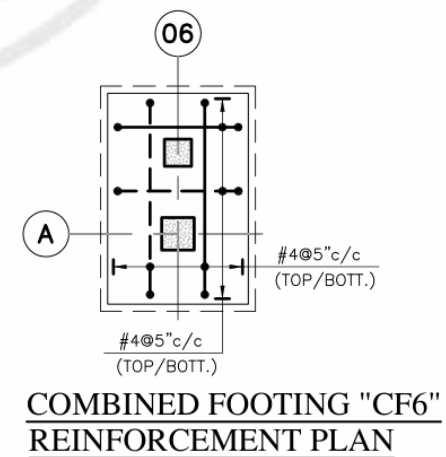
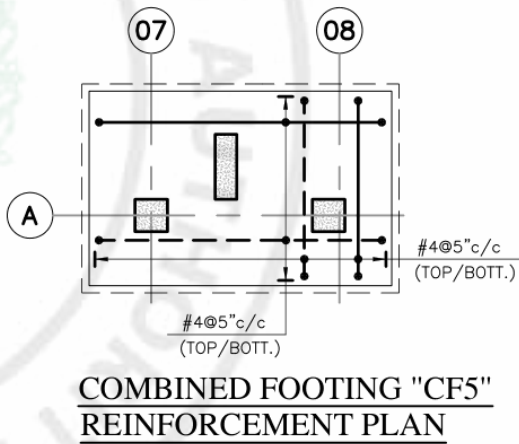
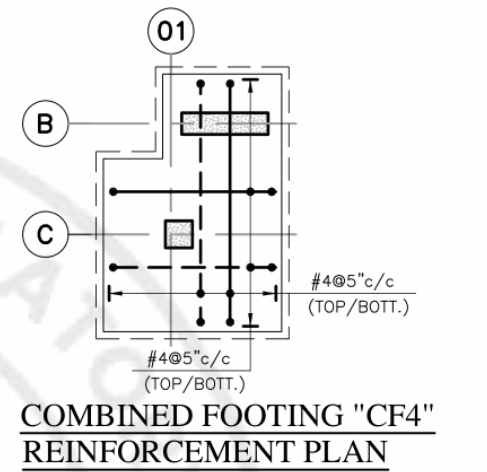


MINIMUM SOIL BEARING CAPACITY 1.0TSF					
SCHEDULE OF FOOTINGS					
FOOTING MARK	SIZE			(BOTTOM) REINFORCEMENT	
	A	B	D	SHORT WAY BARS	LONG WAY BARS
F-1	5'-6"	5'-6"	12"	#4@6"c/c	#4@6"c/c
F-2	5'-9"	5'-9"	12"	#4@6"c/c	#4@6"c/c
F-3	6'-0"	6'-0"	12"	#4@5"c/c	#4@5"c/c
F-4	6'-6"	6'-6"	12"	#4@5"c/c	#4@5"c/c
F-5	7'-0"	7'-0"	12"	#4@4"c/c	#4@4"c/c

NOTE:
 1-All Structural Drawings Shall be read and Checked in Conjunction With the Architectural Drawings.
 2-All Dimensions are given in feet and inches, Except noted Otherwise.
 3-For General Notes See Drawing NO. GN-01.
 4-Issued For Tender



FOUNDATION LAYOUT PLAN



CONSULTANT
UMAR MUNSHI ASSOCIATES
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 PAKISTAN PHONE: (021) 34983541, 34980304, F-AX: (92-21) 34980305
 EMAIL: info@umacconsult.com, URL: www.umacconsult.com

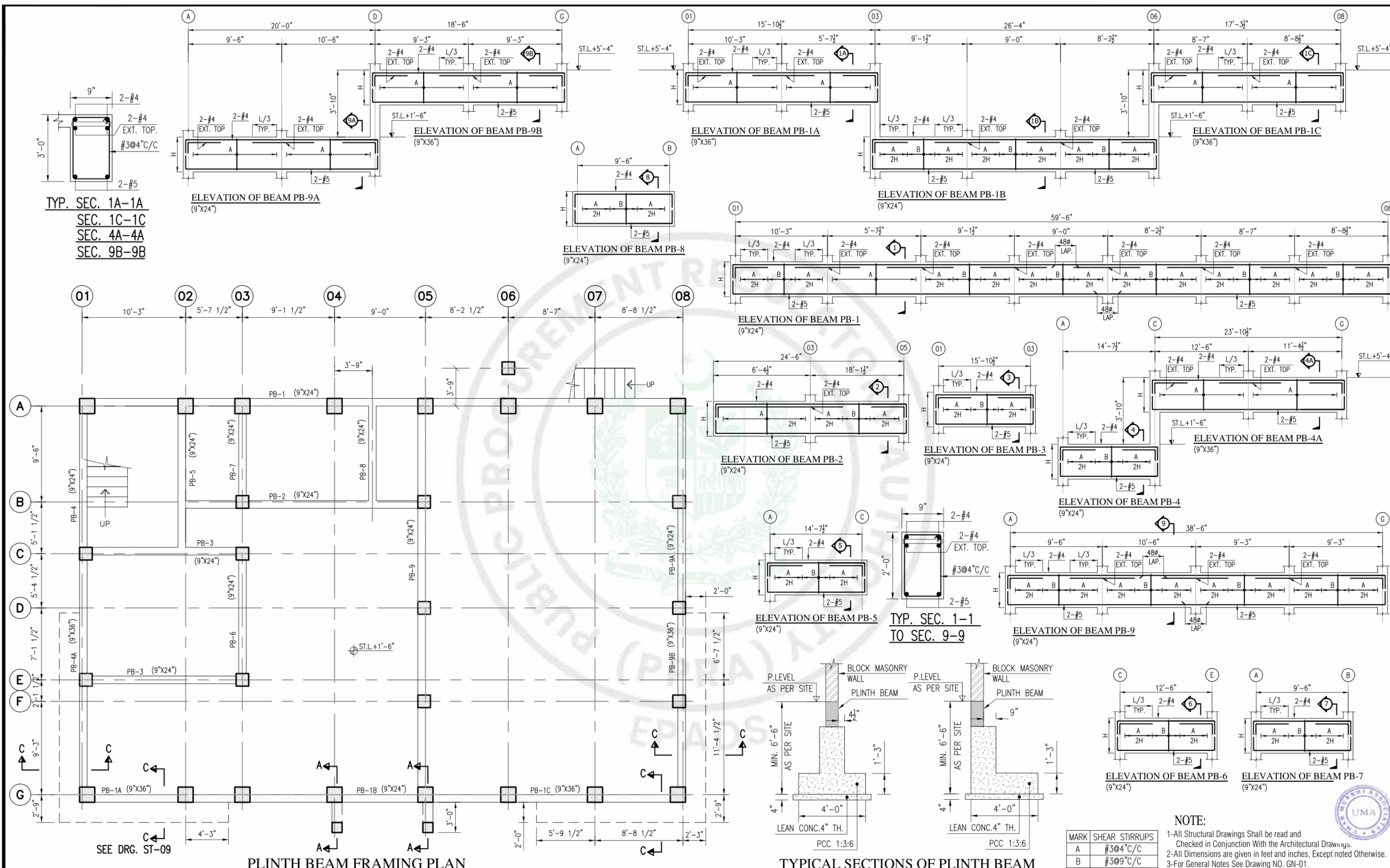
CLIENT:

PAKISTAN CIVIL AVIATION AUTHORITY

PROJECT:
PEL EXAMINATION CENTER KARACHI

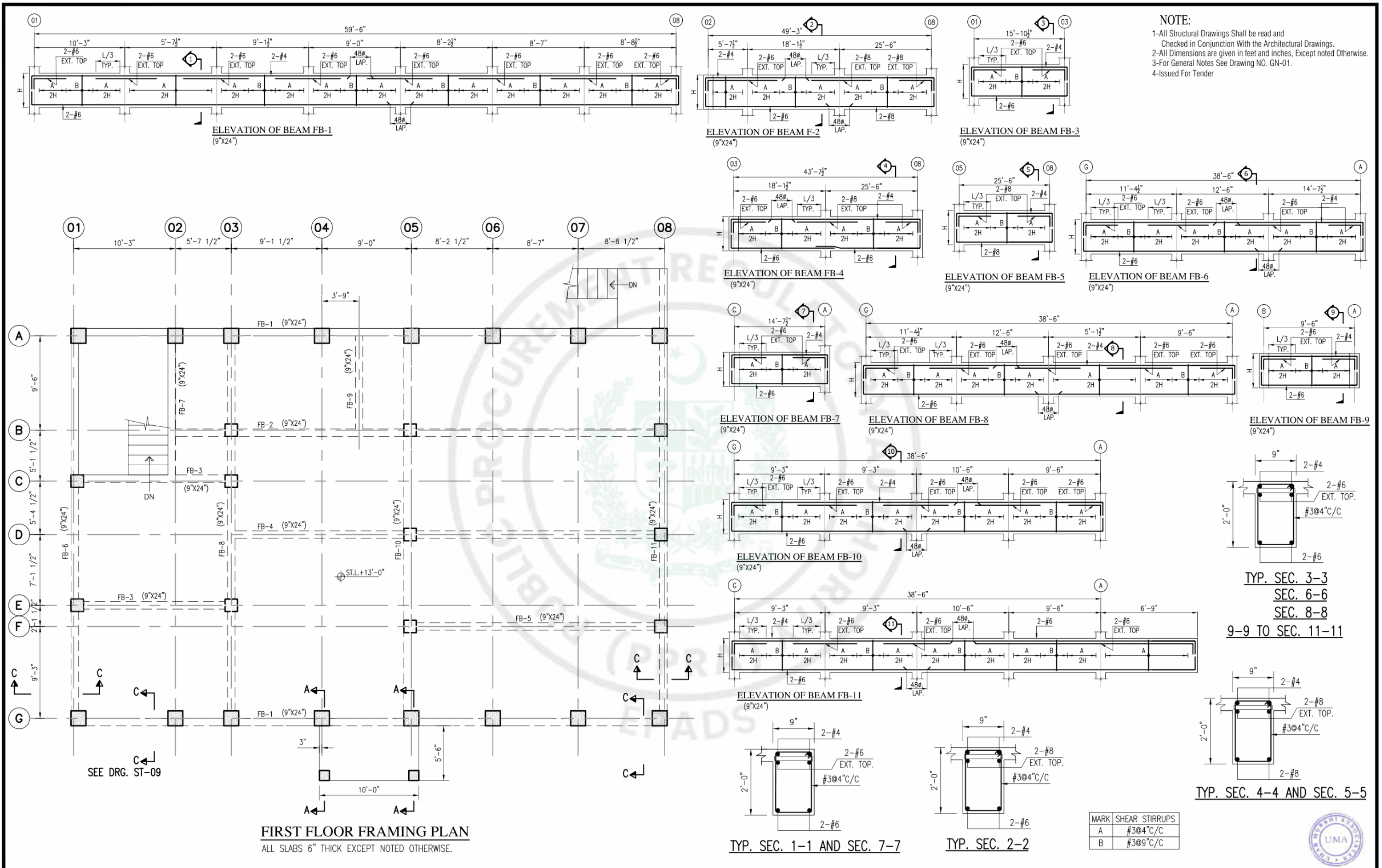
Checked By	Engr. Ishrat Alam	
Drawing By	Engr. Zia ur Rehman	
Design By	Engr. Ishrat Alam	

Tender Drawings		Scale	AS SHOWN	Job No.	
		Cad By	UM	Dwg. No.	ST-02
		Design By	Z.A	Date	APRIL, 2026
		Checked	Z.A		
REV.	CAD.	DESCRIPTION	ORIGINAL SIZE A3		



NOTE:
 1-All Structural Drawings Shall be read and Checked in Conjunction With the Architectural Drawings.
 2-All Dimensions are given in feet and inches. Except noted Otherwise.
 3-For General Notes See Drawing NO. GN-01.
 4-Issued For Tender

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				Drawing By	Engr. Zia ur Rehman			Cad By	UM	Dwg. No.	ST-03
				Design By	Engr. Ishrat Alam			Design By	Z.A	Date	APRIL, 2026
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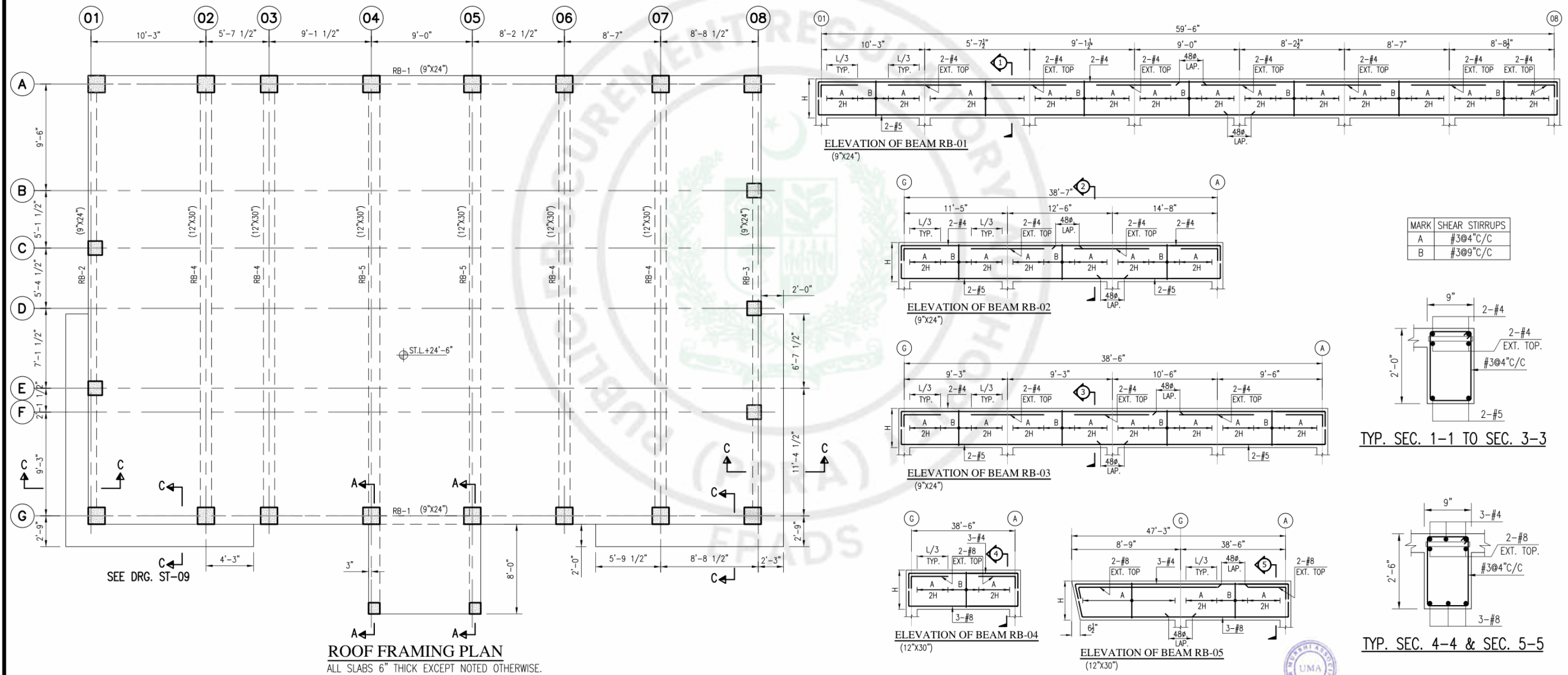


NOTE:
 1-All Structural Drawings Shall be read and Checked in Conjunction With the Architectural Drawings.
 2-All Dimensions are given in feet and inches, Except noted Otherwise.
 3-For General Notes See Drawing NO. GN-01.
 4-Issued For Tender

CONSULTANT UMAR MUNSHI ASSOCIATES CONSULTING ENGINEERS, ARCHITECTS & PLANNERS A-102, BLOCK-13-A, RAILWAYS EMPLOYEES CO-OPERATIVE HOUSING SOCIETY, GULSHAN-E-IOBAL KARACHI-75300 PAKISTAN PHONE: (021) 34983541, 34980304, F-AX: (92-21) 34980305 EMAIL: info@umacconsult.com, URL: www.umacconsult.com	CLIENT: PAKISTAN CIVIL AVIATION AUTHORITY	PROJECT: PEL EXAMINATION CENTER KARACHI	Checked By Engr. Ishrat Alam	Drawing By Engr. Zia ur Rehman	Design By Engr. Ishrat Alam	Tender Drawings REV. CAD. DESCRIPTION	Scale AS SHOWN Job No. ST-04 Dwg. No. APRIL, 2026 Date
	MARK SHEAR STIRRUPS A #3@4"C/C B #3@9"C/C			ORIGINAL SIZE A3			

NOTE:

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- 2-All Dimensions are given in feet and inches, Except noted Otherwise.
- 3-For General Notes See Drawing NO. GN-01.
- 4-Issued For Tender

**UMAR MUNSHI ASSOCIATES**

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PAKISTAN CIVIL AVIATION
AUTHORITY

PROJECT:

PEL EXAMINATION CENTER KARACHI

Checked By

Engr. Ishrat Alam

Drawing By

Engr. Zia ur Rehman

Design By

Engr. Ishrat Alam

Tender Drawings

Scale

AS SHOWN

Cad By

UM

Design By

Z.A

Checked

Z.A

ORIGINAL SIZE A3

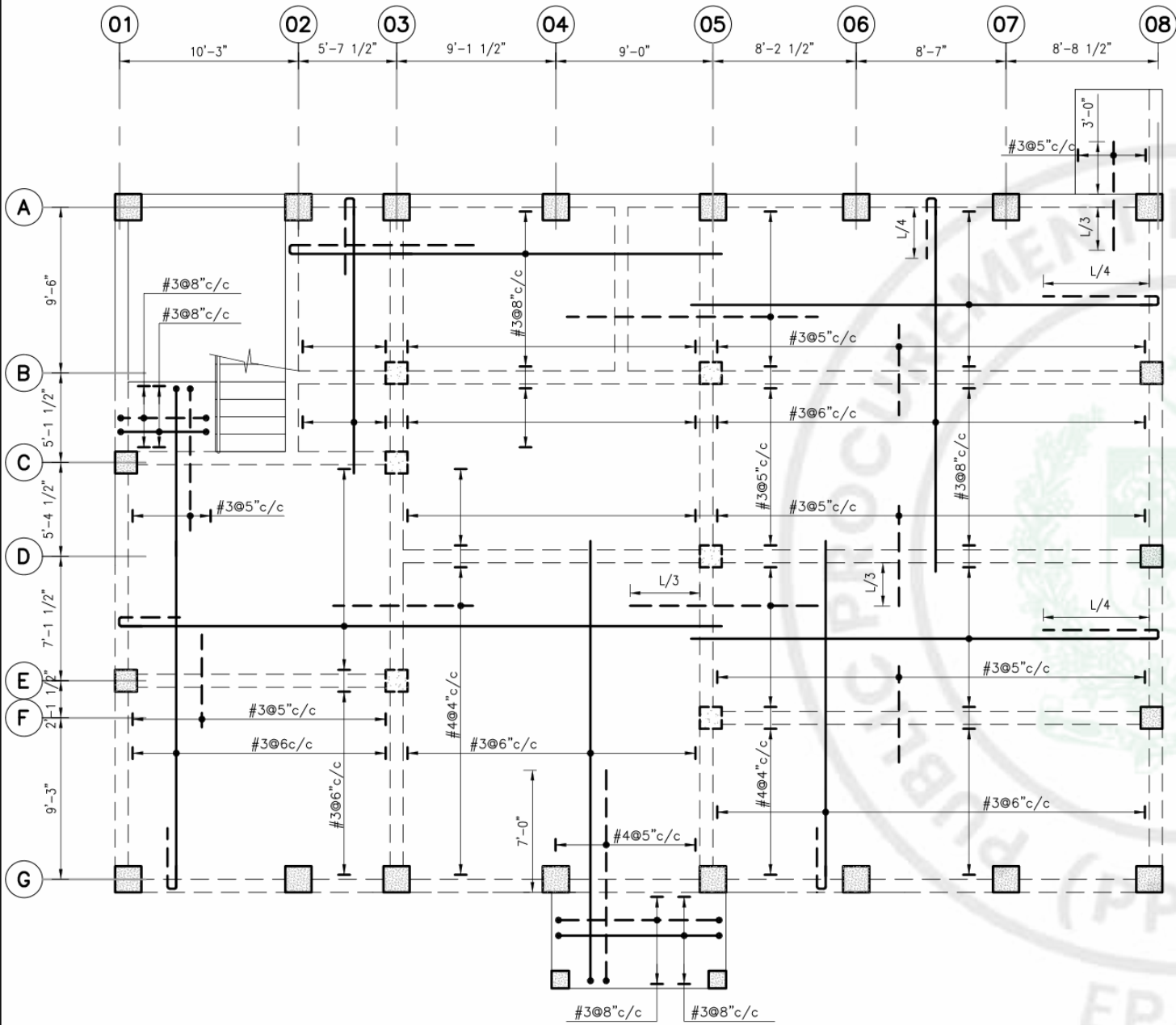
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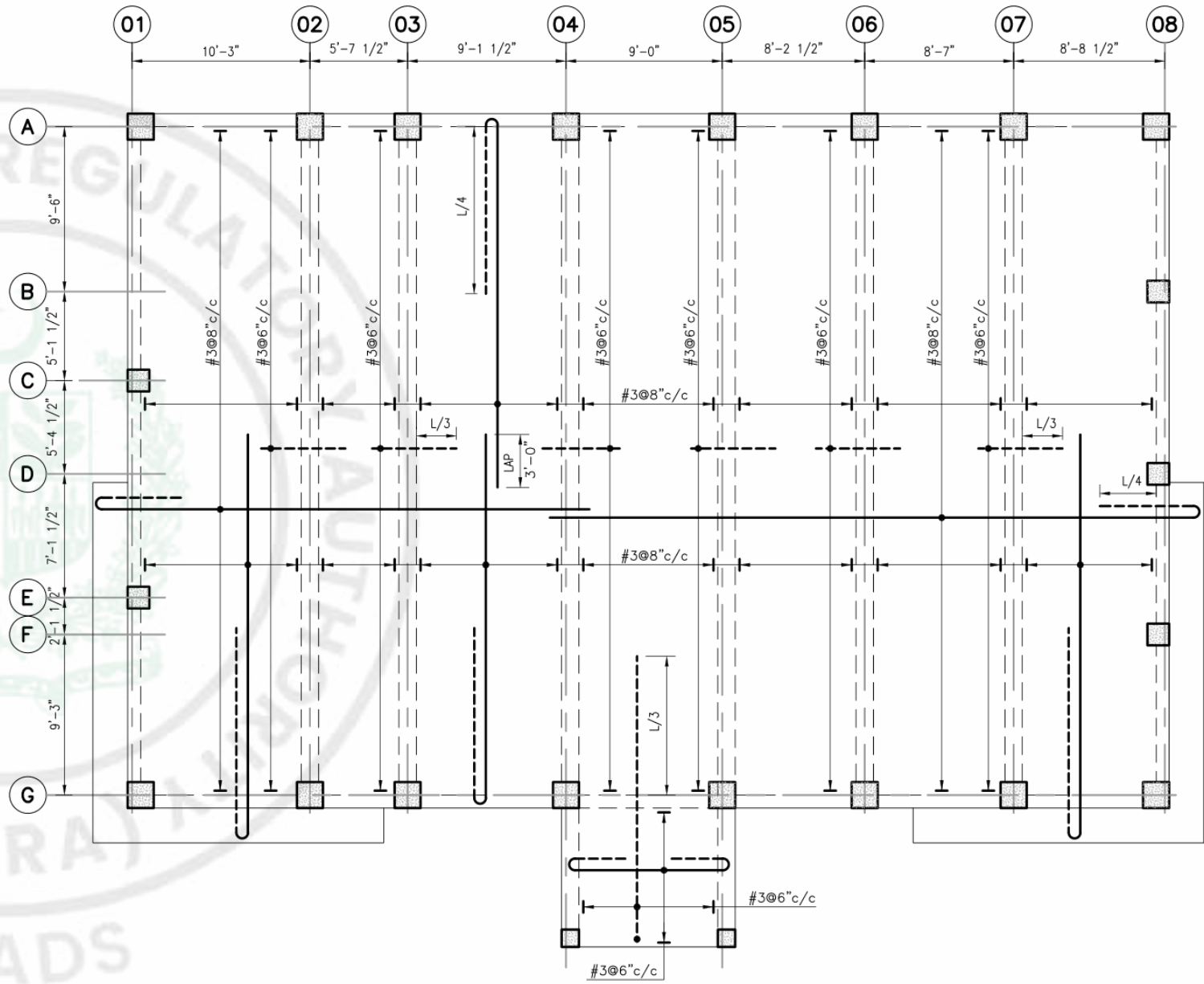
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APRIL, 2026

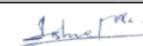
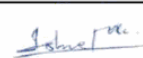
NOTE:
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Checked in Conjunction With the Architectural Drawings.
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3-For General Notes See Drawing NO. GN-01.
4-Issued For Tender

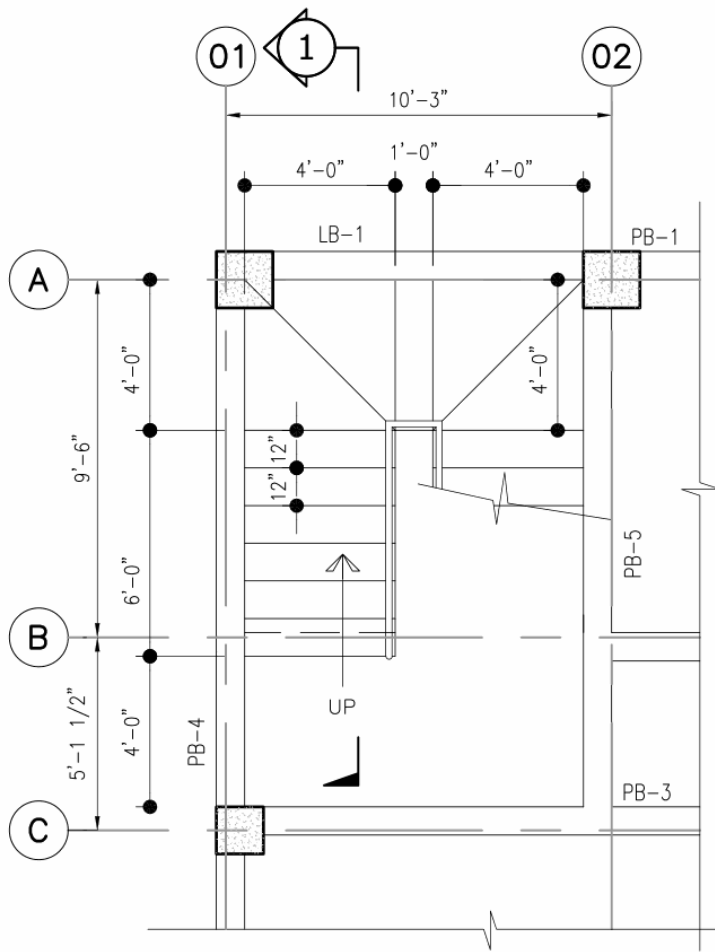


FIRST FLOOR SLAB REINFORCEMENT PLAN

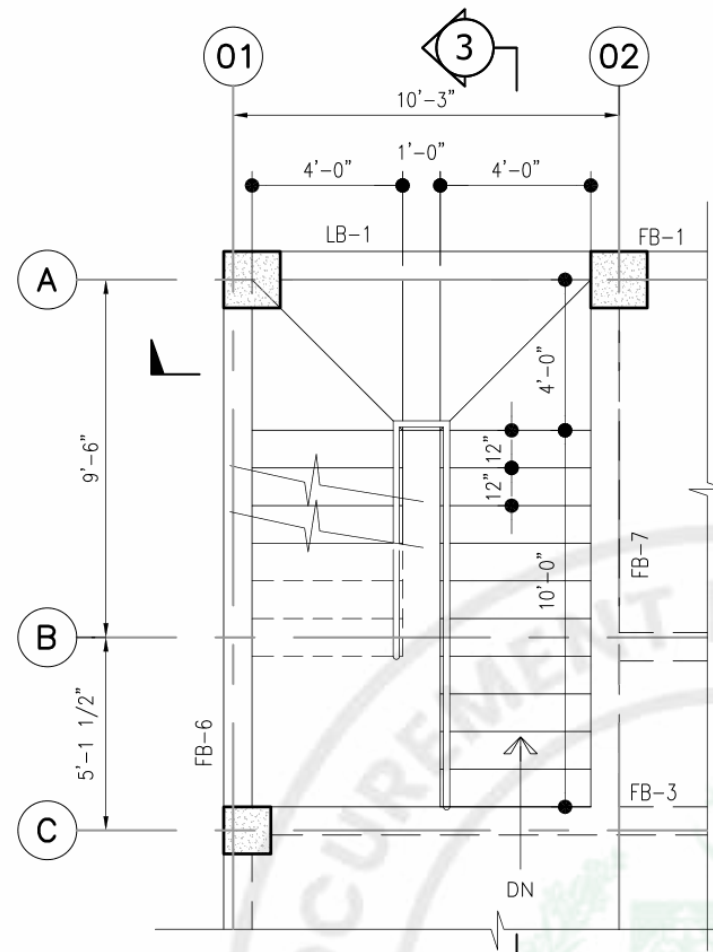


ROOF SLAB REINFORCEMENT PLAN

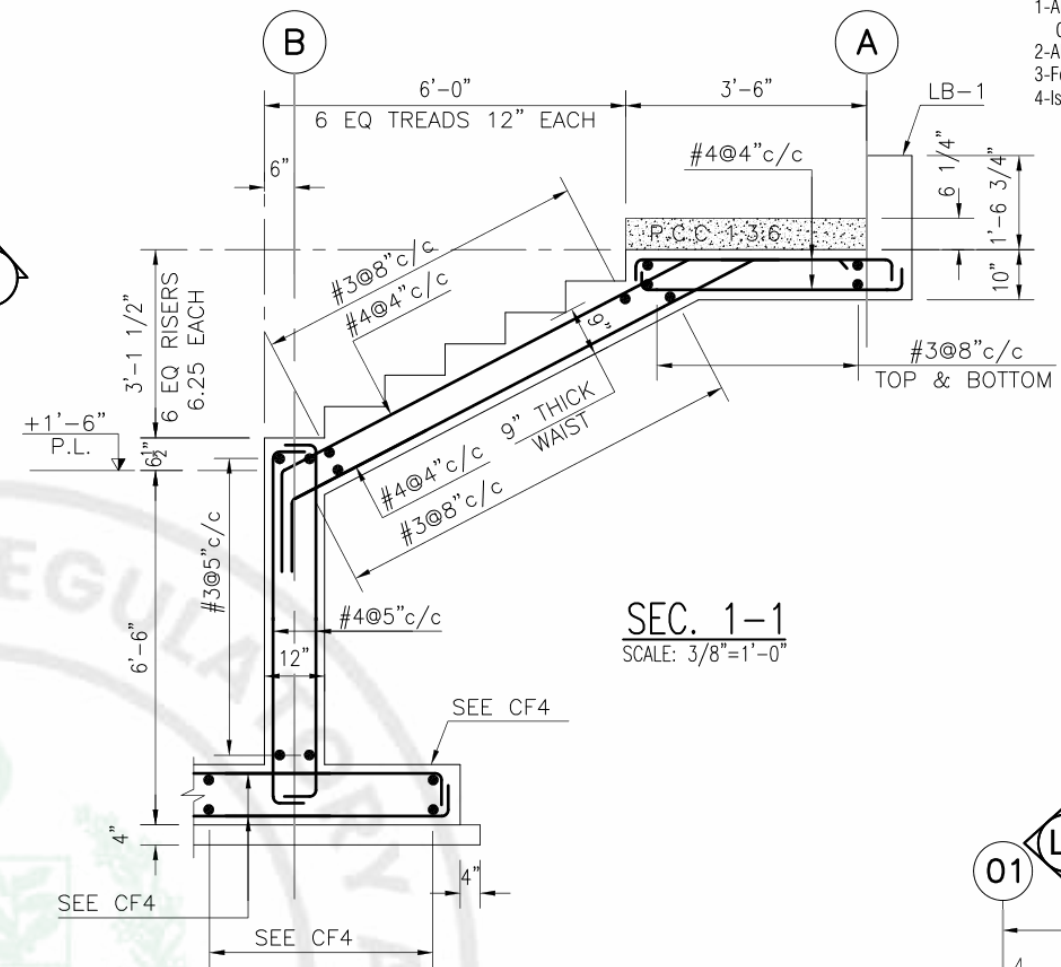
CONSULTANT  HEAD OFFICE	UMAR MUNSHI ASSOCIATES CONSULTING ENGINEERS, ARCHITECTS & PLANNERS A-102, BLOCK-13-A, RAILWAYS EMPLOYEES CO-OPERATIVE HOUSING SOCIETY, GULSHAN-E-IOBAL, KARACHI-75300 PAKISTAN PHONE: (021) 34983541, 34980304, F-AX: (92-21) 34980305 EMAIL: info@umacconsult.com, URL: www.umacconsult.com	CLIENT:  PAKISTAN CIVIL AVIATION AUTHORITY پاکستان سول ایوی ایشن اتھارٹی	PROJECT: PEL EXAMINATION CENTER KARACHI	Checked By	Engr. Ishrat Alam		Tender Drawings	Scale	AS SHOWN	Job No.	
				Drawing By	Engr. Zia ur Rehman			Cad By	UM	Dwg. No.	ST-06
				Design By	Engr. Ishrat Alam			Design By	Z.A	Date	APRIL, 2026
								Checked	Z.A		
								REV.	CAD.	DESCRIPTION	ORIGINAL SIZE A3



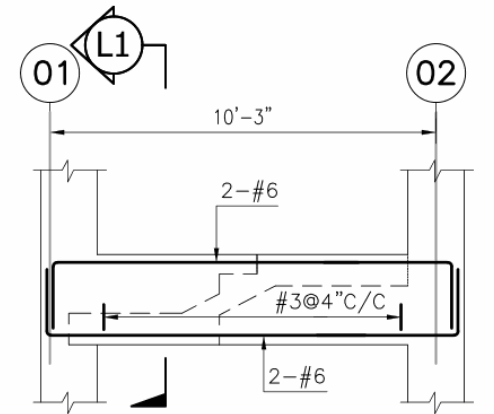
PLINTH BEAM PLAN



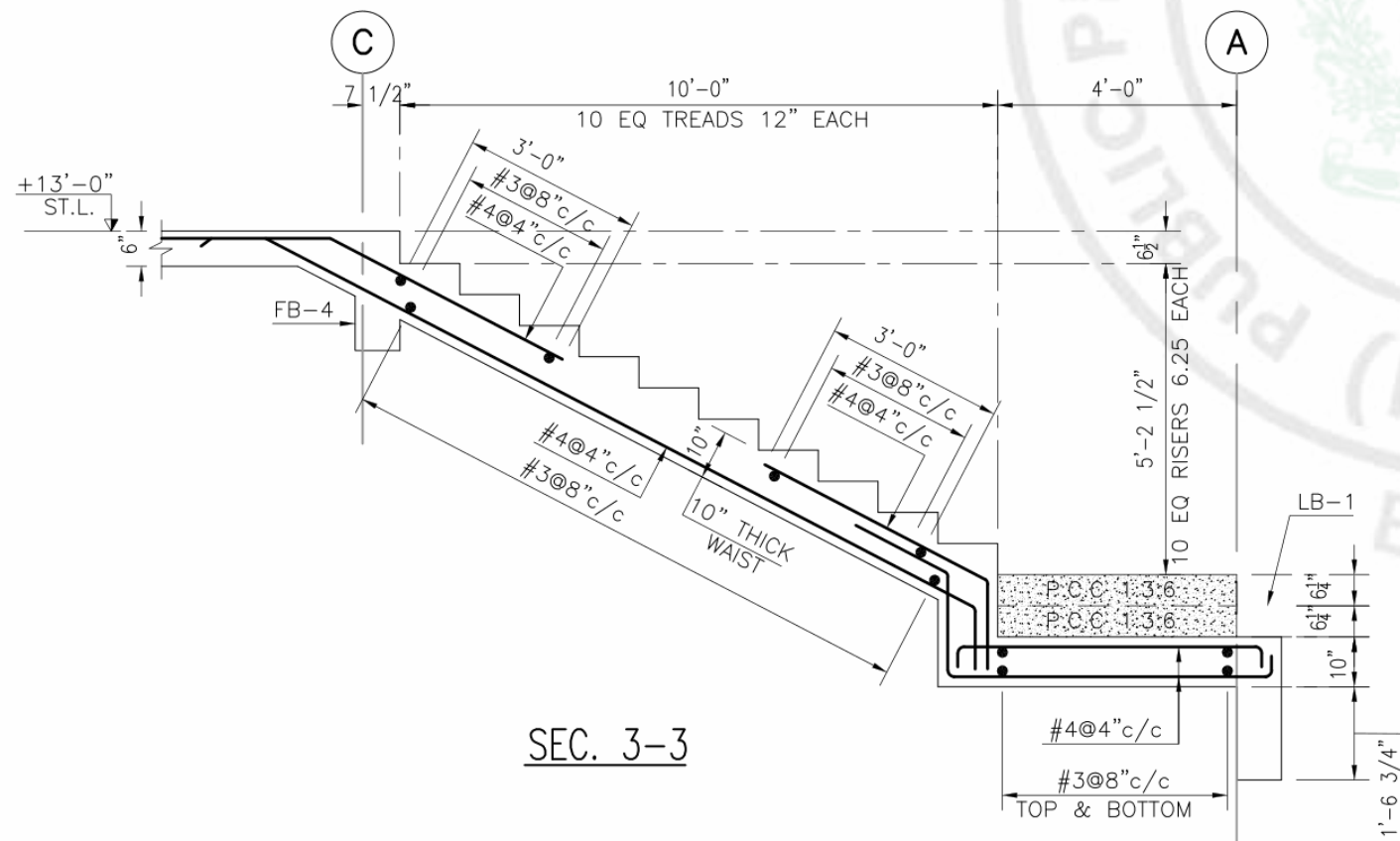
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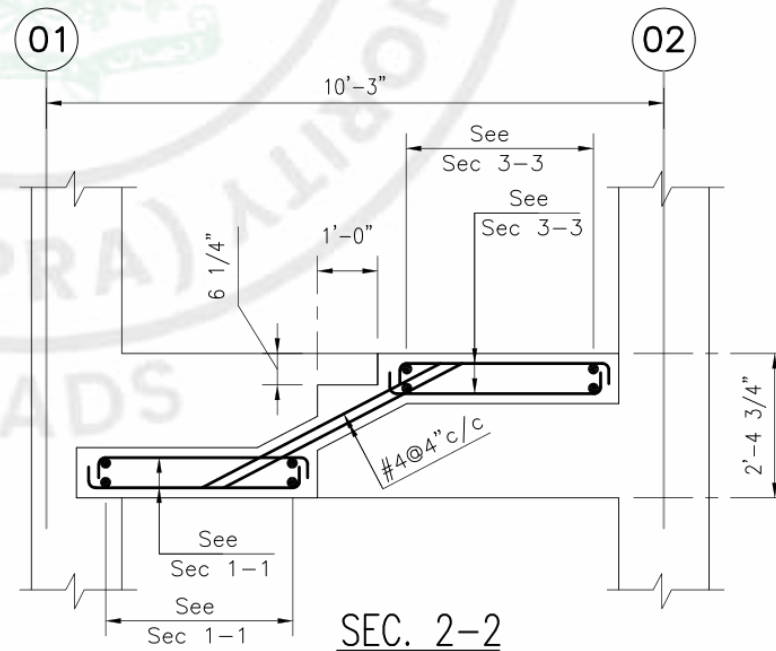
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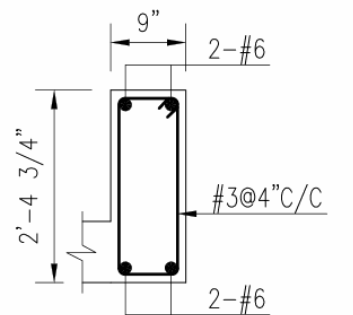
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(9"X28 3/4")



SEC. 3-3

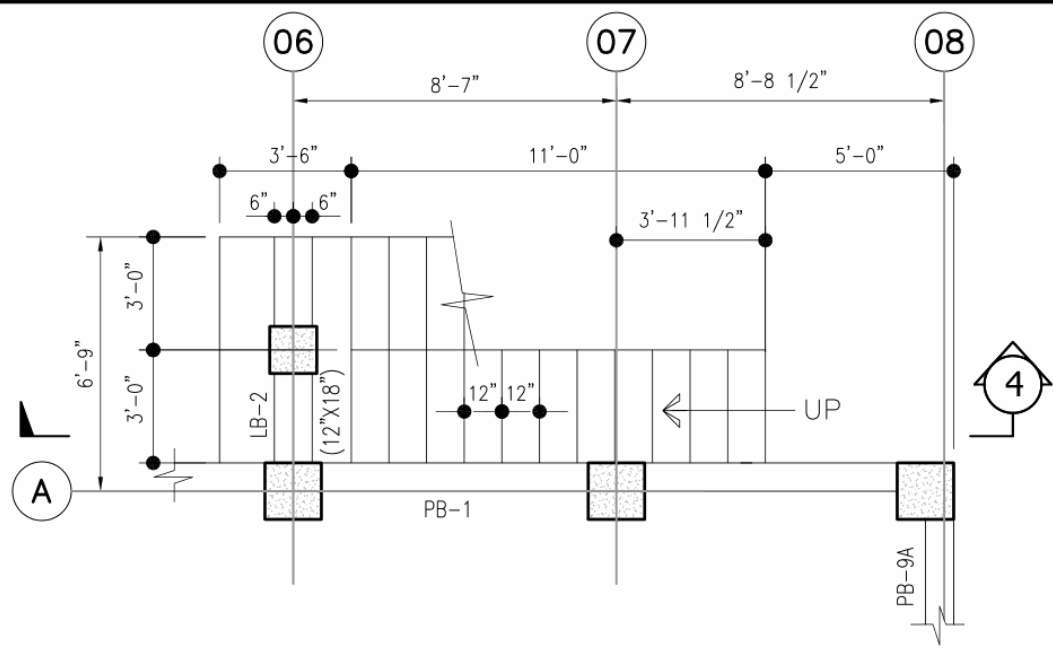


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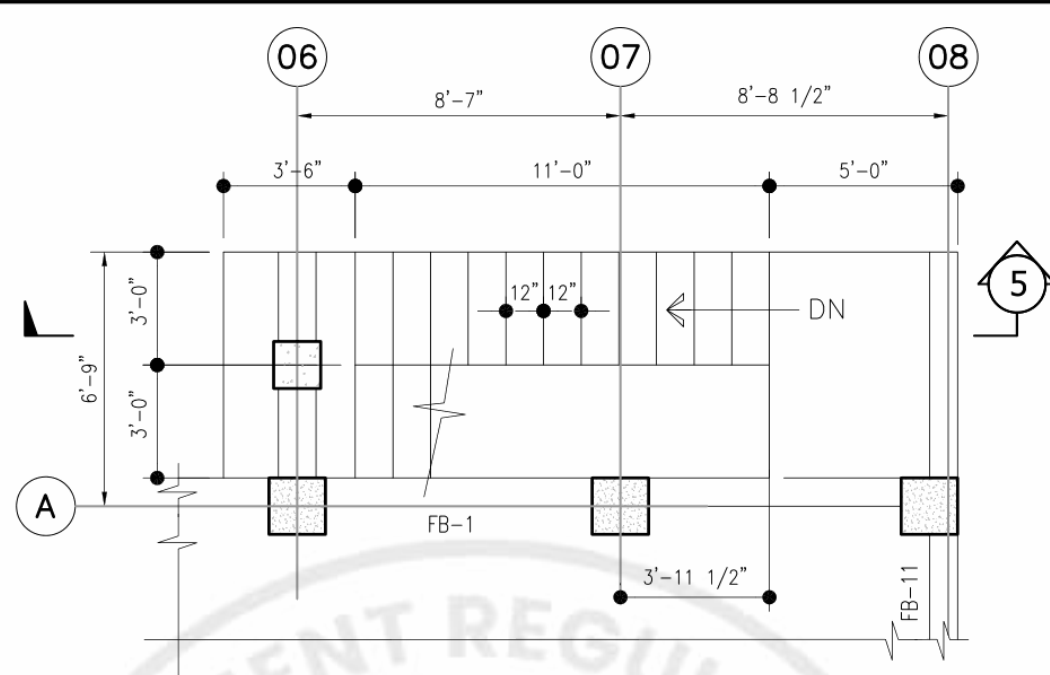


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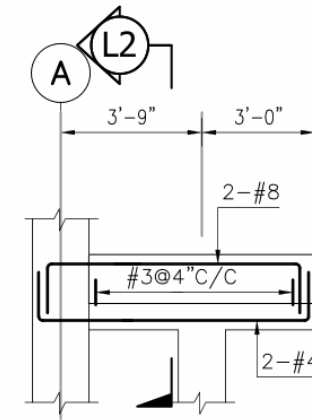
NOTE:
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2-All Dimensions are given in feet and inches, Except noted Otherwise.
3-For General Notes See Drawing NO. GN-01.
4-Issued For Tender



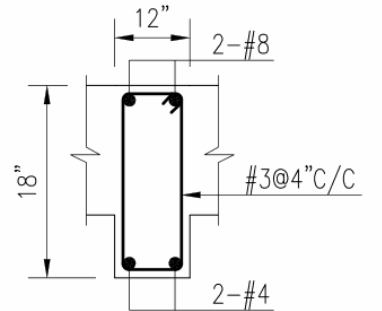
PLINTH BEAM PLAN



FIRST FLOOR PLAN

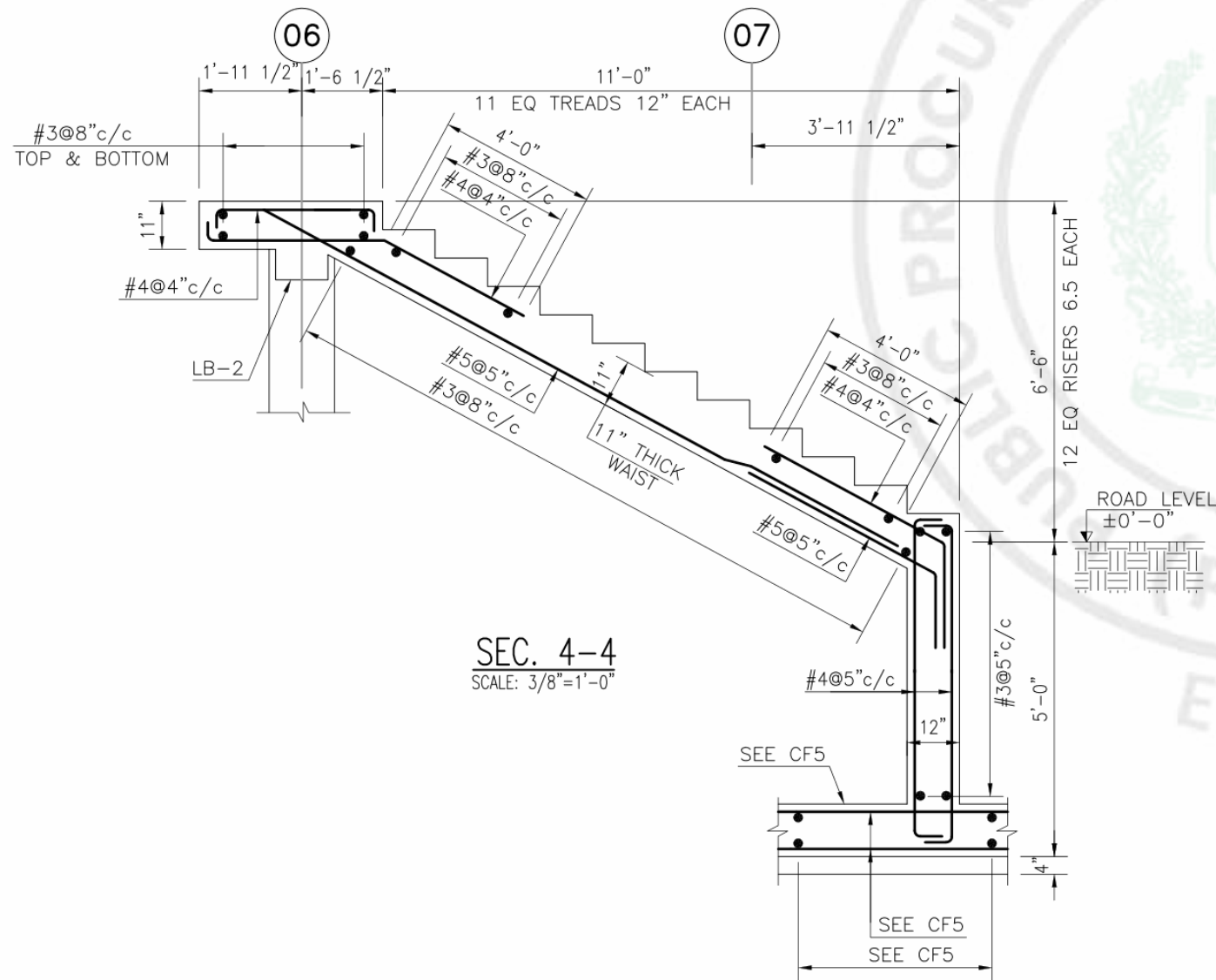


ELEV. OF LB-2
(12'X18')

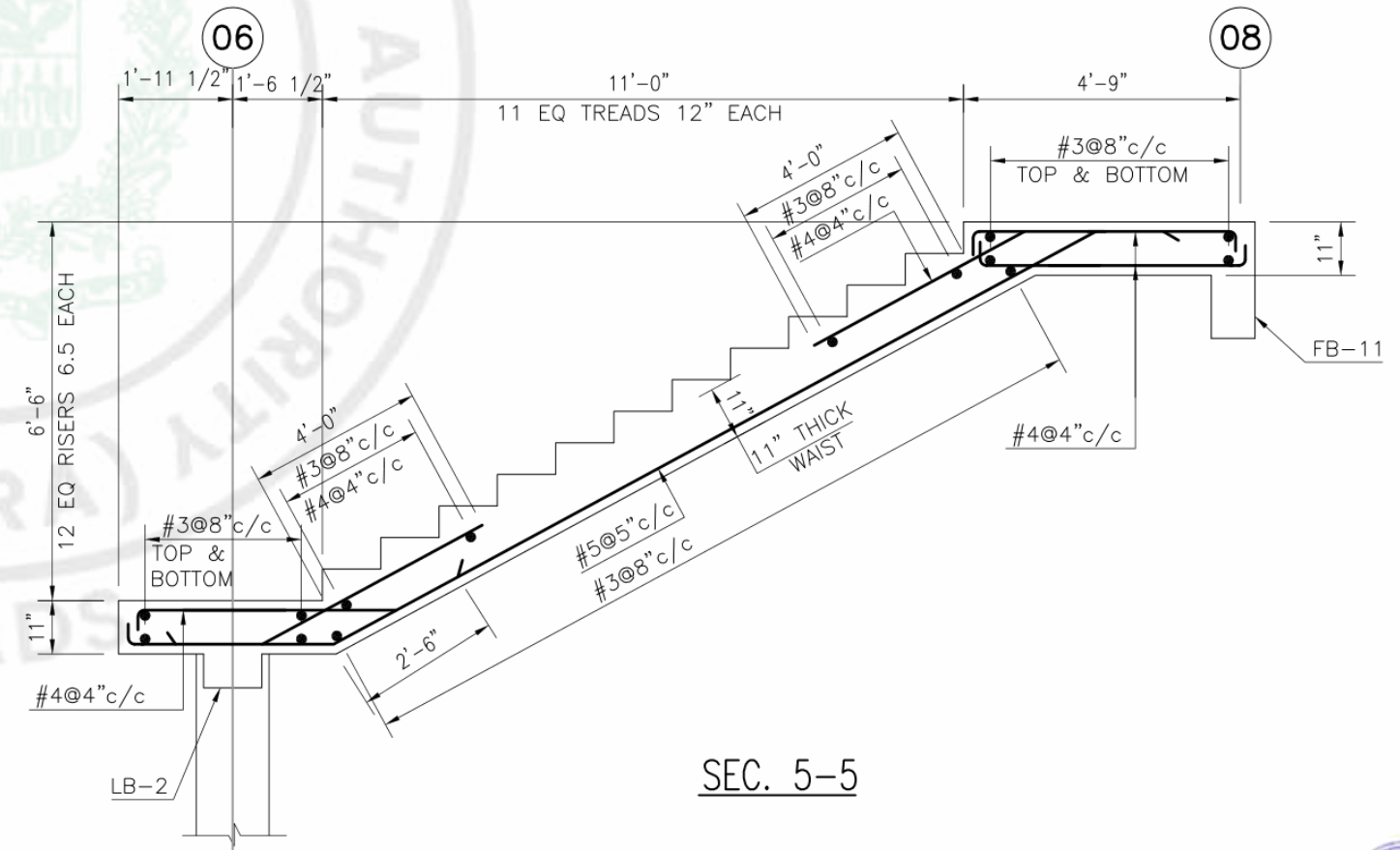


SEC. L2-L2

NOTE:
1-All Structural Drawings Shall be read and Checked in Conjunction With the Architectural Drawings.
2-All Dimensions are given in feet and inches, Except noted Otherwise.
3-For General Notes See Drawing NO. GN-01.
4-Issued For Tender



SEC. 4-4
SCALE: 3/8"=1'-0"



SEC. 5-5



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A-102, BLOCK-13-A, RAILWAYS EMPLOYEES COOPERATIVE
HOUSING SOCIETY, GULSHAN-E-IQBAL KARACHI-75300
PAKISTAN PHONE: (021) 34983541, 34980304,
F-AX: (92-21) 34980305

CLIENT:



**PAKISTAN CIVIL AVIATION
AUTHORITY**

PROJECT:

PEL EXAMINATION CENTER KARACHI

Checked By	Engr. Ishrat Alam	<i>Ishrat</i>
Drawing By	Engr. Zia ur Rehman	<i>Zia</i>
Design By	Engr. Ishrat Alam	<i>Ishrat</i>

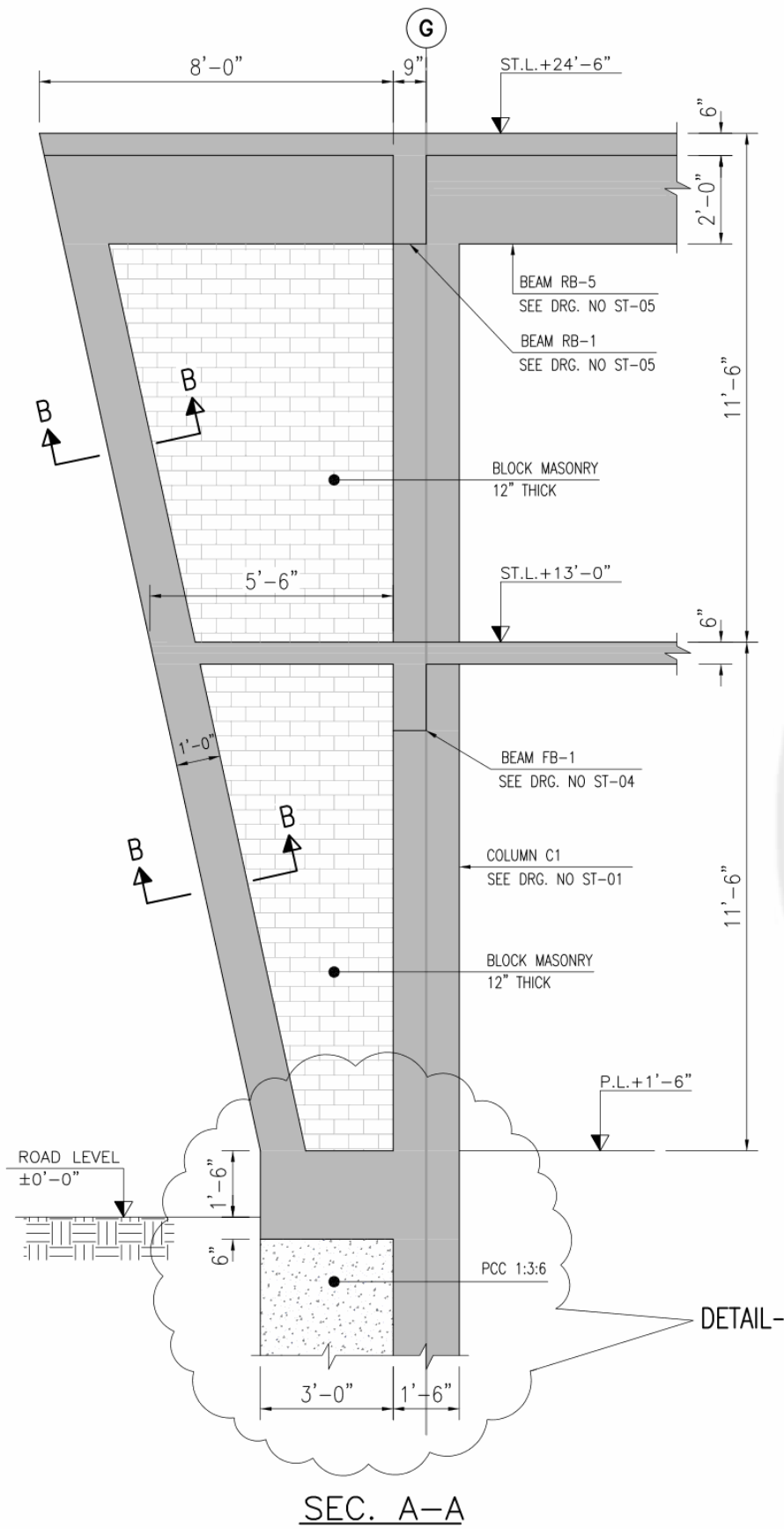
Tender Drawings

REV.	CAD.	DESCRIPTION	ORIGINAL SIZE A3	Page 460 of 495
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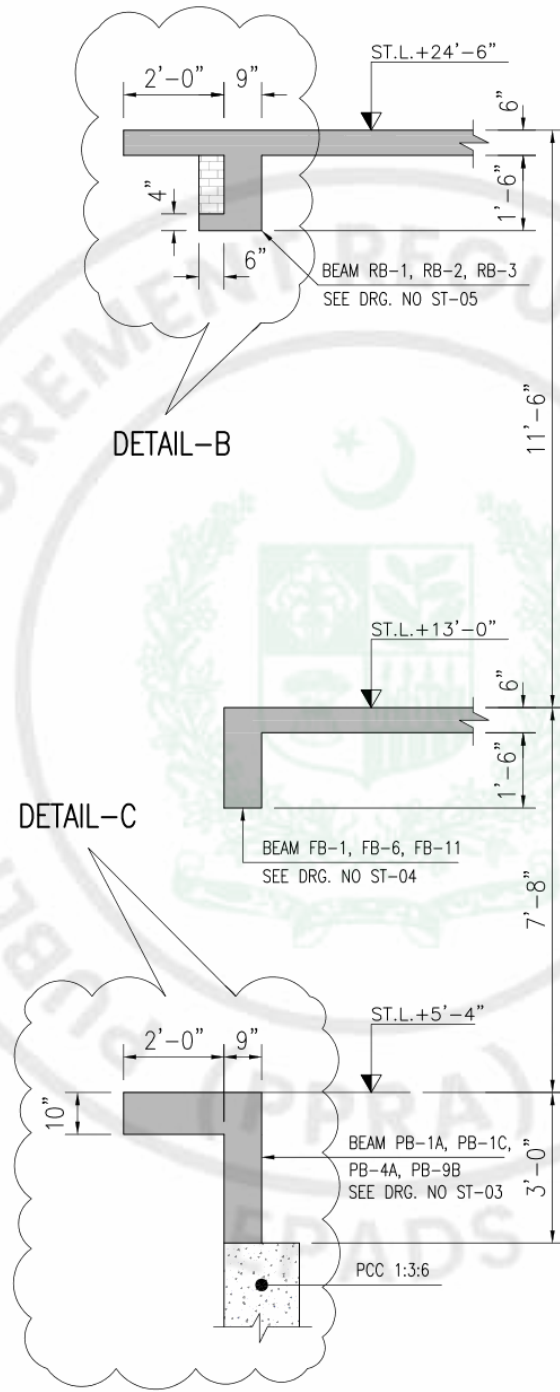
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Cad By	UM	Dwg. No.	ST-08
Design By	Z.A	Date	APRIL, 2026
Checked	Z.A		



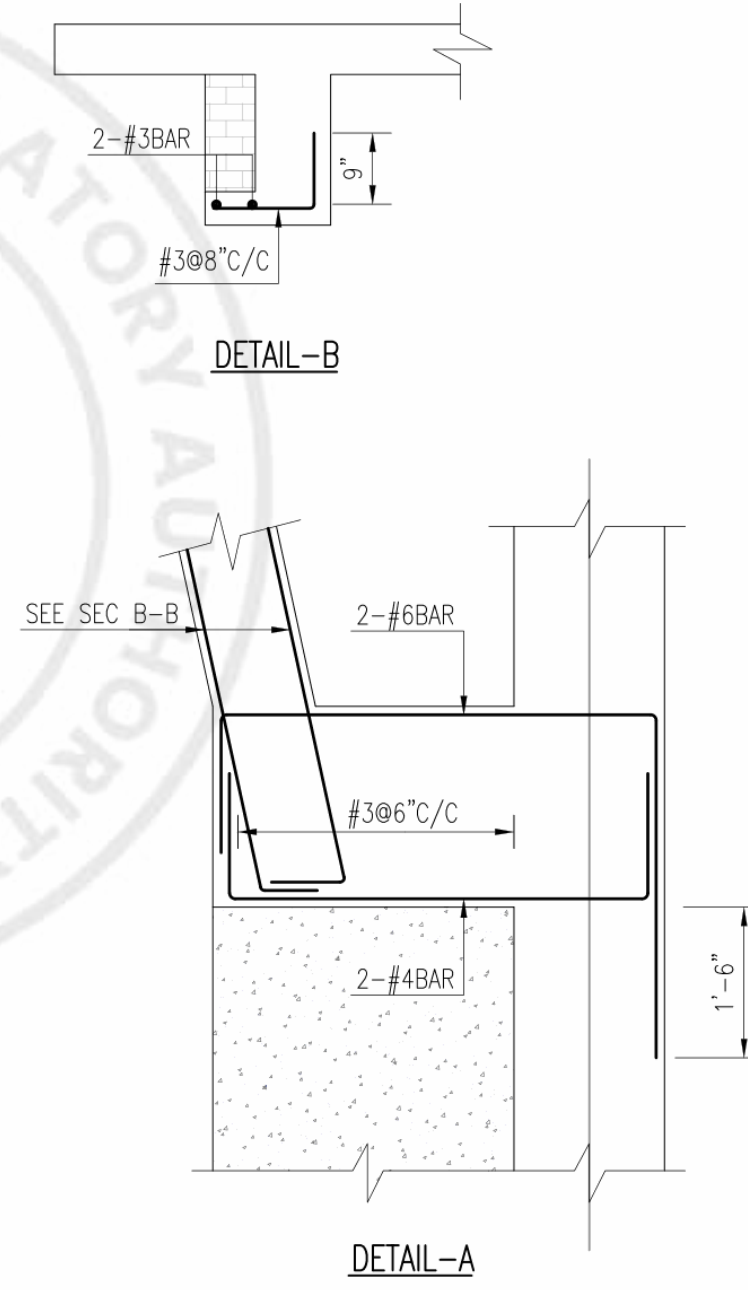
NOTE:
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4-Issued For Tender



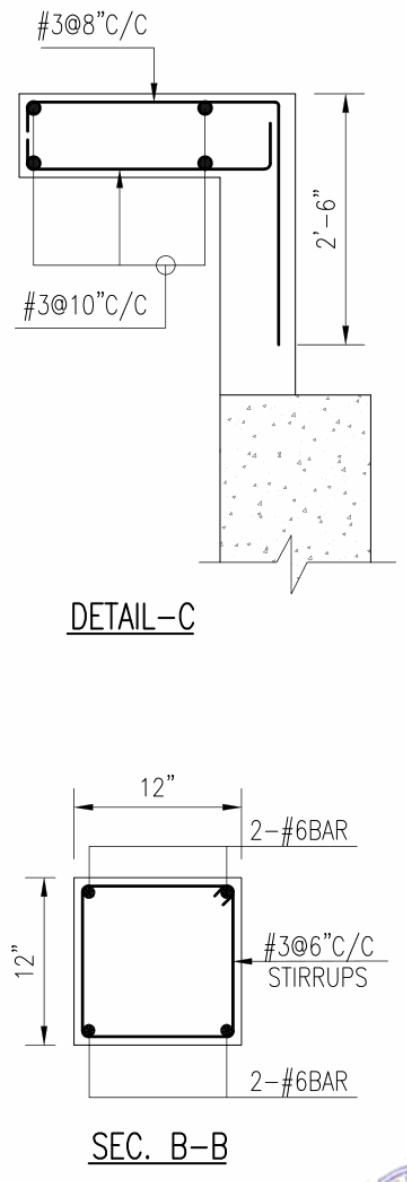
SEC. A-A



SEC. C-C



DETAIL-A

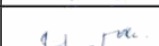


SEC. B-B

CONSULTANT
UMAR MUNSHI ASSOCIATES
CONSULTING ENGINEERS, ARCHITECTS & PLANNERS
A-102, BLOCK-13-A, RAILWAYS EMPLOYEES COOPERATIVE
HOUSING SOCIETY, GULSHAN-E-1QBAL KARACHI-75300
PAKISTAN PHONE: (021) 34983541, 34980304,
FAX: (92-21) 34980305
EMAIL: info@umaconsult.com, URL: www.umaconsult.com

CLIENT:
**PAKISTAN CIVIL AVIATION
AUTHORITY**

PROJECT:
PEL EXAMINATION CENTER KARACHI

Checked By	Engr. Ishrat Alam	
Drawing By	Engr. Zia ur Rehman	
Design By	Engr. Ishrat Alam	

Tender Drawings	Scale	AS SHOWN	Job No.	
	Cad By	UM	Dwg. No.	ST-09
	Design By	Z.A	Date	APRIL, 2026
	Checked	Z.A		
REV.	CAD.	DESCRIPTION	ORIGINAL SIZE A3	



PAKISTAN CIVIL AVIATION AUTHORITY

B-6, KDA Scheme-1, Karsaz Karachi, Pakistan.



E&M DRAWINGS

[KARACHI PEL EXAMINATION CENTRE]

Consultancy Services for Design and Supervision of Construction of
PEL Examination Centres at Karachi & Lahore

ELECTRICAL WORKING

PEL EXAMINATION CENTER KARACHI

DESIGN:  HEAD OFFICE A-102, BLOCK-13-A, RAILWAYS EMPLOYEES COOPERATIVE HOUSING SOCIETY, GULSHAN-E-IQBAL KARACHI-75300 PAKISTAN PHONE: (021) 34983541, 34980304, F-AX: (92-21) 34980305 EMAIL: info@umaconsult.com, URL: www.umaconsult.com	CLIENT:  PAKISTAN CIVIL AVIATION AUTHORITY	PROJECT: PEL EXAMINATION CENTER KARACHI	VETTED BY	U.M.A				TITLE	Job No.	
			CHECKED BY	U.M.A					TITLE PAGE	Dwg. No.
			DRAWING BY	U.M.A						EL-01
			DESIGN BY	U.M.A	REV.	DATE	DESCRIPTION	SCALE	AS SHOWN	Date
			ORIGINAL SIZE A3							APRIL- 2026

LIST OF DRAWINGS

SR.NO	DESCRIPTION	DWG. NO.
01	TITLE SHEET	E.L-01
02	LIST OF DRAWINGS	E.L-02
03	LEGENDS	E.L-03
04	GENERAL NOTES & WIRING NOTES	E.L-04
05	TYPICAL INSTALLATION DETAILS	E.L-05
06	TYPICAL EARTHING DETAILS	E.L-06
07	DB DETAIL-GROUND FLOOR PLAN	E.L-07
08	LIGHTING & FAN-GROUND FLOOR PLAN	E.L-08
09	LIGHTING & FAN-FIRST FLOOR PLAN	E.L-09
10	POWER-GROUND FLOOR PLAN	E.L-10
11	POWER-FIRST FLOOR PLAN	E.L-11
12	DATA & VOICE-GROUND FLOOR PLAN	E.L-12
13	DATA & VOICE-FIRST FLOOR PLAN	E.L-13
14	CCTV-GROUND FLOOR PLAN	E.L-14
15	CCTV-FIRST FLOOR PLAN	E.L-15
16	UTILITY POWER-GROUND FLOOR PLAN	E.L-16
17	UTILITY POWER-FIRST FLOOR PLAN	E.L-17
18		E.L-18

DESIGN:



UMAR MUNSHI ASSOCIATES
CONSULTING ENGINEERS, ARCHITECTS
& PLANNERS

HEAD OFFICE
A-102, BLOCK-13-A, RAILWAYS EMPLOYEES CO-OPERATIVE
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PAKISTAN PHONE: (021) 34983541, 34983034,
FAX: (92-21) 34983035
EMAIL: info@umaconsult.com, URL: www.umaconsult.com

CLIENT:



PAKISTAN CIVIL AVIATION
AUTHORITY

PROJECT:

PEL EXAMINATION CENTER
KARACHI

VETTED BY

U.M.A

CHECKED BY

U.M.A

DRAWING BY

U.M.A

DESIGN BY

U.M.A

TITLE

LIST OF DRAWING

Job No.

Dwg. No.

EL-02

Date

APRIL- 2026

REV. DATE. DESCRIPTION SCALE AS SHOWN
ORIGINAL SIZE A3

ELECTRICAL LEGEND:					
DESCRIPTION	HEIGHT & BOTTOM FROM F.F.L	SYMBOL ELECTRICAL	DESCRIPTION	HEIGHT & BOTTOM FROM F.F.L	SYMBOL ELECTRICAL
DECORATIVE CEILING FAN	CEILING		MAIN DISTRIBUTION BOARD	4'-0"	
EXHAUST FAN	8'-0"		DISTRIBUTION BOARD	4'-0"	
CHANDELIER LIGHT	CEILING		LIGHT PLUG 13Amp	1'-0"	
RECESS MOUNTED SLIM CIRCULAR LED PANEL LIGHT	CEILING		15A PLUG FOR POWER & GEYSER	1'-0"-P 6'-0"-G	
SURFACE MOUNTING CIRCULAR LED DOWN LIGHT	BATH CEILING		DUPLEX LIGHT PLUG 13A		
RECESS MOUNTED LED PANEL LIGHT 24"x24" (40W)	CEILING		TV/DATA/TELEPHONE JUNCTION BOX	4'-0"	
RECESS MOUNTED SLIM CIRCULAR LED PANEL LIGHT	----		ELECTRICAL LEGEND:		
WATER PROOF WALL LIGHT	WALL		DESCRIPTION	HEIGHT & BOTTOM FROM F.F.L	SYMBOL ELECTRICAL
MIRROR LIGHT BATH	7'-0"		DATA & TELEPHONE POINT (RJ-11)	1'-0"	
FLEXIBLE LED STRIP LIGHT	CEILING		TELEVISION / LCD	WALL	
WALL BRACKET FAN	WALL		CABLE POINT (TV) (RG-06)	WALL	
SWITCH 10AMPS.	4'-0"		WIRELESS FIDELITY	WALL	
			JUNCTION BOX FOR MAIN CABLE WIRE		
ELECTRICAL LEGEND:					
DESCRIPTION	HEIGHT & BOTTOM FROM F.F.L	SYMBOL ELECTRICAL	DESCRIPTION	HEIGHT & BOTTOM FROM F.F.L	SYMBOL ELECTRICAL
DECORATIVE STEP LIGHT	STAIR		CCTV CAMERA		
FANCY LIGHTS MAIN GATE LIGHT	MAIN GATE COLUMN		CCTV CAMERA MOVEABLE WIFI		
AUTOMATIC TUBE LIGHT	----		JUNCTION BOX FOR CCTV CAMERA		
ENERGY SAVER	----		25mm DIA PVC WITH 3X1.5SQmm FOR SUPPLY CAMERA		
SHOWER CABINET ROOF LIGHT	----		25mm DIA PVC WITH CO-AXIAL CABLE 3m OR APPROVED EQUIVALENT		
WIFI ADAPTOR	----		VIDEO RECORDER/DVR OR APPROVED		
AIR CONDITIONING LEGEND:			20A, ROUND PIN POWER PLUG FOR AC		
WALL MOUNTED			OUTDOOR CONDENSING UNIT		
REFRIGERANT PIPE					
CONDENSATE DRAIN					

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			CHECKED BY	U.M.A						Dwg. No.
			DRAWING BY	U.M.A						EL-03
			DESIGN BY	U.M.A	REV.	DATE	DESCRIPTION	SCALE	AS SHOWN	Date
			ORIGINAL SIZE A3							

ELECTRICAL NOTES:-

- 01-All electrical operated equipment shall have earth connections.
- 02-Contractor shall take approval from consultant for all the material to be installed prior to purchase however, Pakistan cable, New age and Pioneer Cable are approved.
- 03-All distributions board DB, s shall be approved by consultant prior to purchase by Contractor, Contractor provide technical submittal for DB,s.
- 04-Main and sub Telephone/TV/FACP junctions' box shall be provided where required.
- 05-All kinds of wiring shall not be visible inside or outside the Building, contractor shall place sleeve/conduits where required during constructions.
- 06-Color coding for wires shall be done and approved by IEEE regulations.
- 07-The distance for cables supports and saddle for conduit or cable tray shall be according to the latest IEEE regulations.
- 08-Use DECarate conduit for every circuit coming out of DBs and provide Junction box required for easy pulling electrical wire.
- 09-All electrical pumps motor shall be provide with starter relay.

ELECTRICAL WIRE SCHEDULE FOR INTERNAL LIGHTING

- 1- ALL WIRING IS 2X2.5mm²(7/.029") S/C+2X1.5mm²(3/.029") S/C (EARTH+UPS) THAT WILL RUN IN 1" DIA SEPARATE CONDUIT FROM DISTRIBUTION BOARD TO LIGHT POINT, INCLUDING CIRCUIT WIRING BETWEEN SWITCHES ON THE SAME CIRCUIT.
- 2- ALL WIRING FROM SWITCH TO LIGHT POINT IS 2X1.5mm²(3/.029") S/C+1X1.5mm²(3/.029") S/C(EARTH) RUNNING IN 3/4" DIA CONDUIT.
- 3- SWITCH PLATE LOOPING WOULD BE DONE BY USING 2X1.5mm²(3/.029") S/C +1X1.5mm²(3/.029") S/C (EARTH).
- 4-ALL LIGHTING IN BATHROOM OR WET AREAS IS SURFACE MOUNTED SO USE A ROOF JOINT BOX (3/4" X 3" OR 1" X 3") INSTEAD OF LIGHT BOX.
- 5- THE DOOR BELL CAN BE POWERED FROM NEAREST AVAILABLE LIGHTING CIRCUIT.

10 AMP & 5 AMP SWITCHED SOCKETS: (FOR GENERAL APPLIANCES)

- 1- ALL WIRING IS 2X4mm²(7/.036") S/C+1X2.5mm²(7/.029") S/C (EARTH) THAT WILL RUN IN 1" OR 3/4" DIA SEPARATE CONDUIT FROM D.B TO SWITCHED SOCKET.
- 2-5 AMP LOOPING WILL BE DONE BY USING 2X2.5mm²(7/.029") S/C +1X1.5mm²(3/.029") S/C (EARTH).
- 3.ALL OUTDOOR SOCKETS SHOULD BE WATER PROOF.

20 AMP DOUBLE POLE/FLEX SOCKETS: (FOR S.P AIR-CONDITIONERS)

- 1- ALL WIRING IS 2X4mm²(7/.036") S/C+1X2.5mm²(7/.029") S/C (EARTH) THAT WILL RUN IN 1" OR 3/4" DIA SEPARATE CONDUIT FROM D.B TO SWITCHED/FLEX SOCKET/DOUBLE POLE SWITCH.

CABLE ,TV,INTERCOMM AND CCTV SYSTEM :

- 1-FOR DATA SYSTEM USE CAT-6A FTP CABLE IN 3/4" OR 1" DIA CONDUIT DEPENDING ON CIRCUIT RUN AND NO. OF CABLES.
- 2-FOR TELEPHONE SYSTEM USE CAT-6 UTP CABLE OR MIN 2 PAIR TELEPHONE CABLE IN 3/4" OR 1" DIA CONDUIT DEPENDING ON CIRCUIT RUN AND NO. OF CABLES.
- 3-FOR CABLE T.V SYSTEM WIRING USE RG-06U CABLE FOR INDOOR & RG-11 CABLE FOR OUTDOOR AND LONG CIRCUITS IN 3/4" DIA CONDUIT OR 1" DIA CONDUIT DEPENDING ON CIRCUIT RUN AND NO. OF CABLES.
- 4-FOR CONVENTIONAL CCTV SYSTEM USE RG-06U CABLE ALONG WITH SEPARATE PIPING AND CABLE FOR ELECTRICAL POWER.
- 5-FOR IP BASED CCTV SYSTEM USE CAT-6 UTP CABLE TO WIRE INDOOR CAMERAS AND CAT-6 SSTP/SFTP TO WIRE OUTDOOR CAMERAS, THE POWER SHALL RUN USING SAME CAT CABLE IN POE SYSTEM WHILE THE CABLE FOR ELECTRICAL POWER SHOULD BE SEPARATE IN NON POE SYSTEM.
- 6-3/4" DIA CONDUIT OR 1" DIA CONDUIT SHALL BE USED DEPENDING ON CIRCUIT RUN AND NO. OF CABLES.

DESIGN:



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PAKISTAN CIVIL AVIATION
AUTHORITY

PROJECT:

PEL EXAMINATION CENTER
KARACHI

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U.M.A

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TITLE

GENERAL NOTES

Job No.

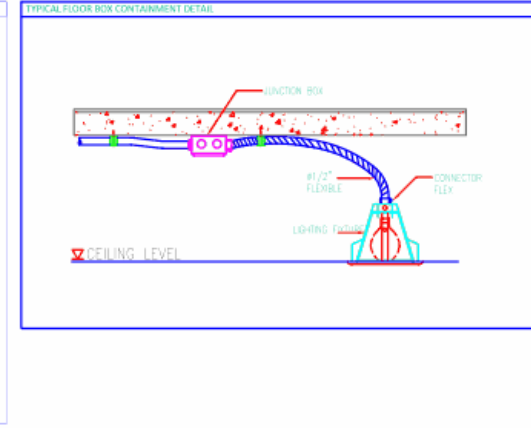
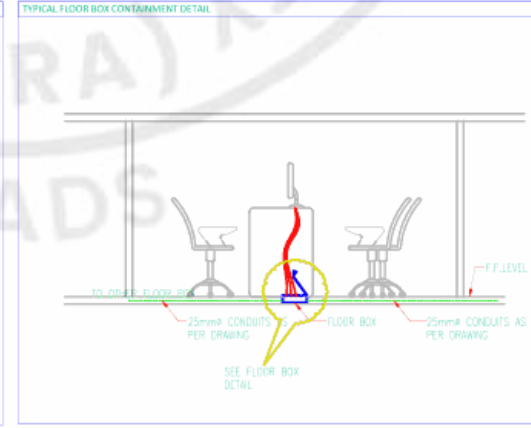
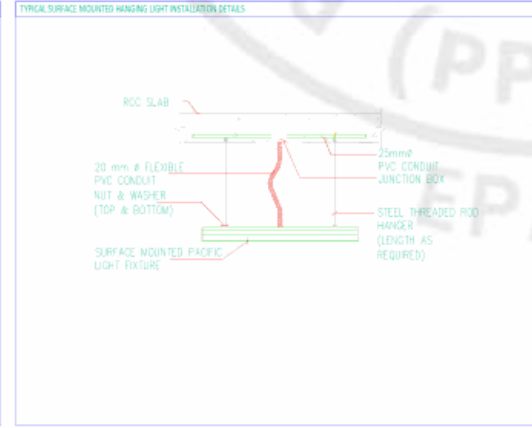
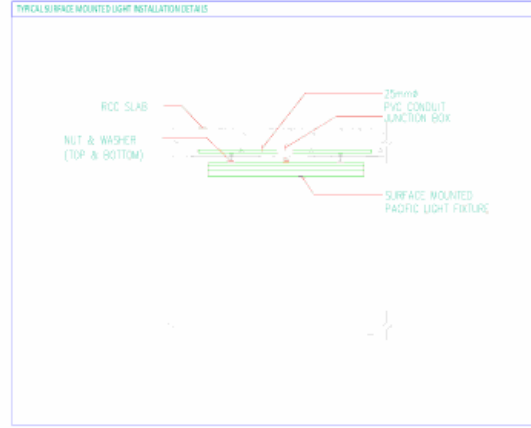
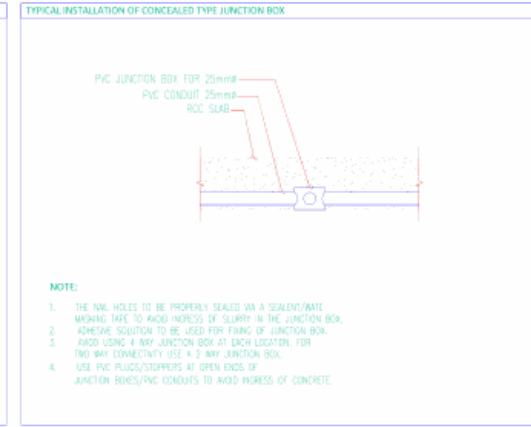
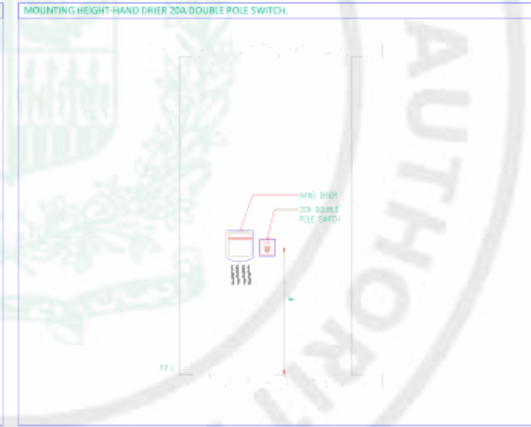
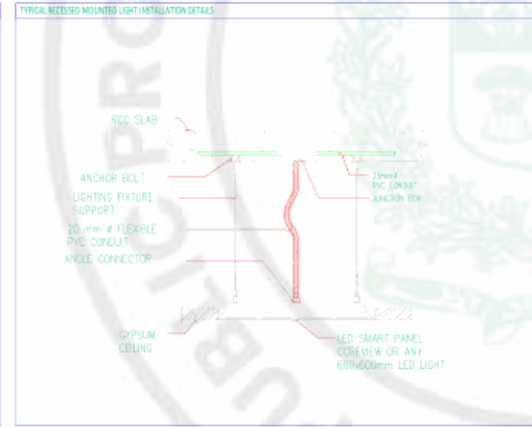
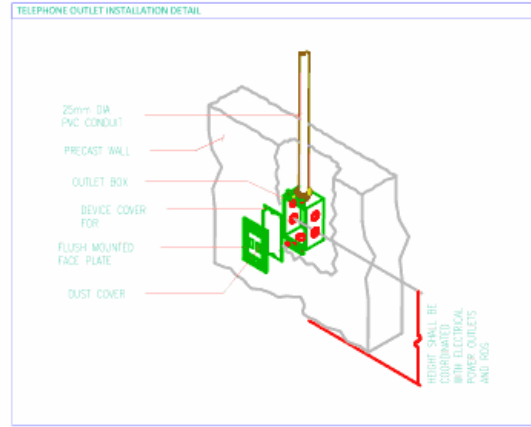
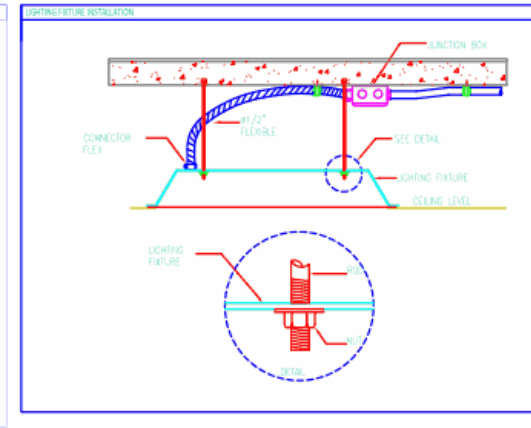
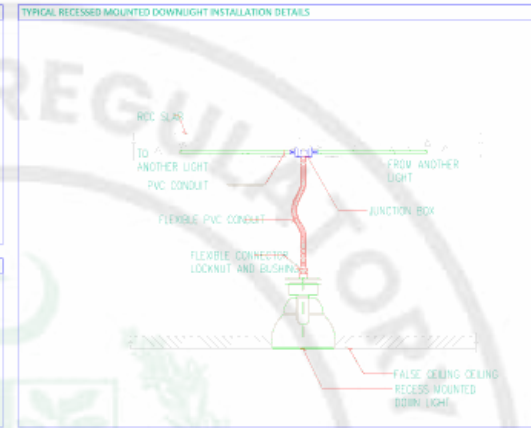
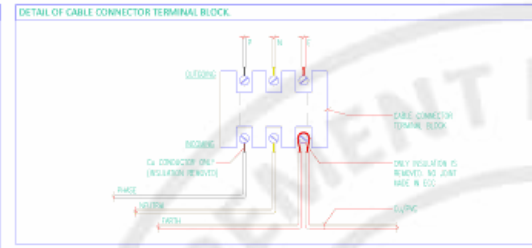
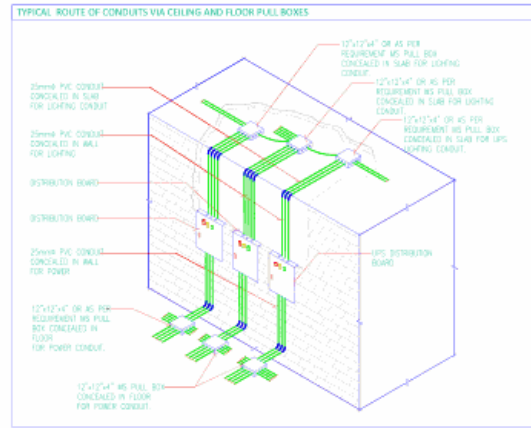
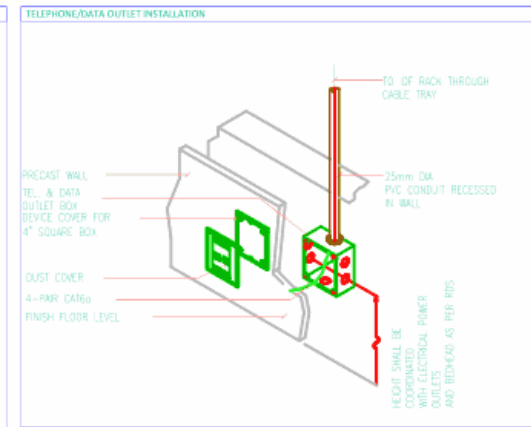
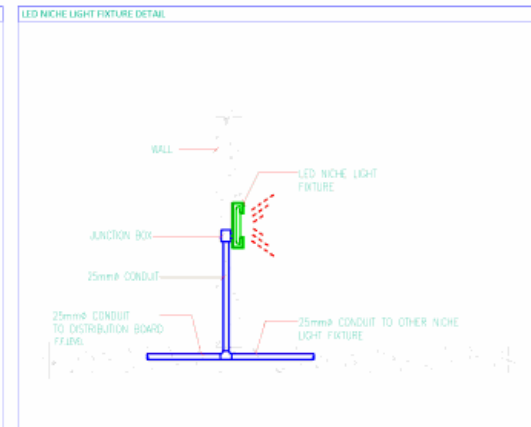
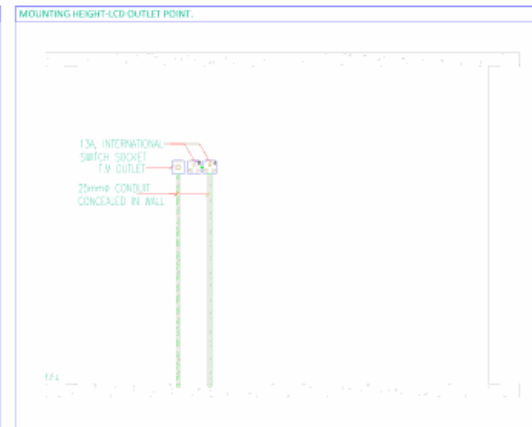
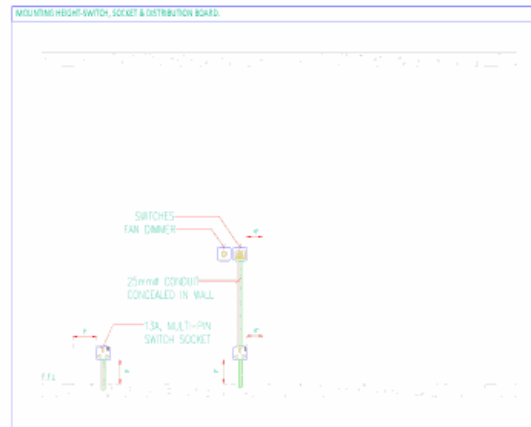
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EL-04

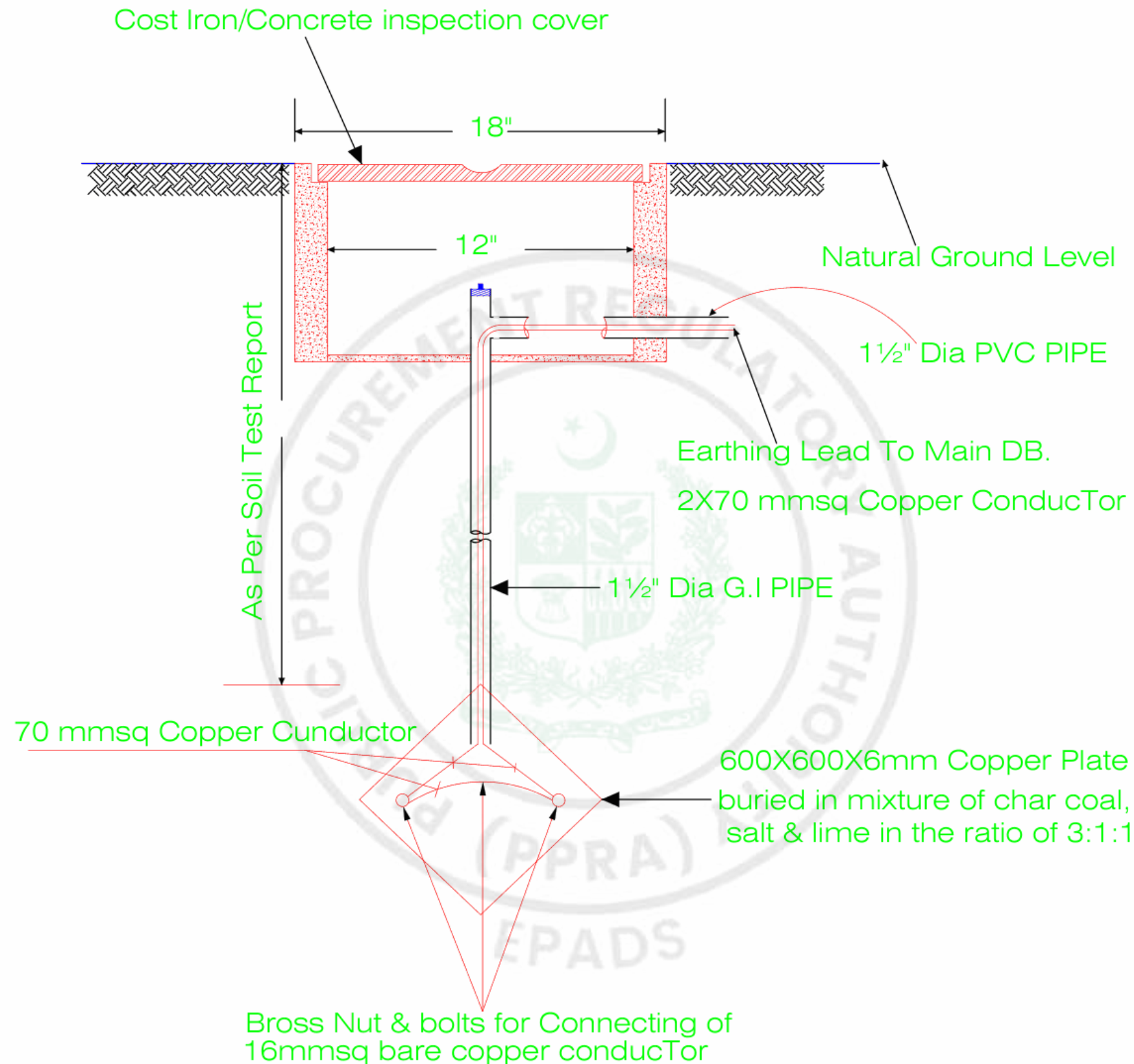
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			CHECKED BY	U.M.A				TYPICAL INSTALLATION DETAILS		Dwg. No.
			DRAWING BY	U.M.A						EL-05
			DESIGN BY	U.M.A	REV.	DATE	DESCRIPTION	SCALE	AS SHOWN	Date
			ORIGINAL SIZE A3							APRIL- 2026



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TYPICAL EARTHING
DETAILS

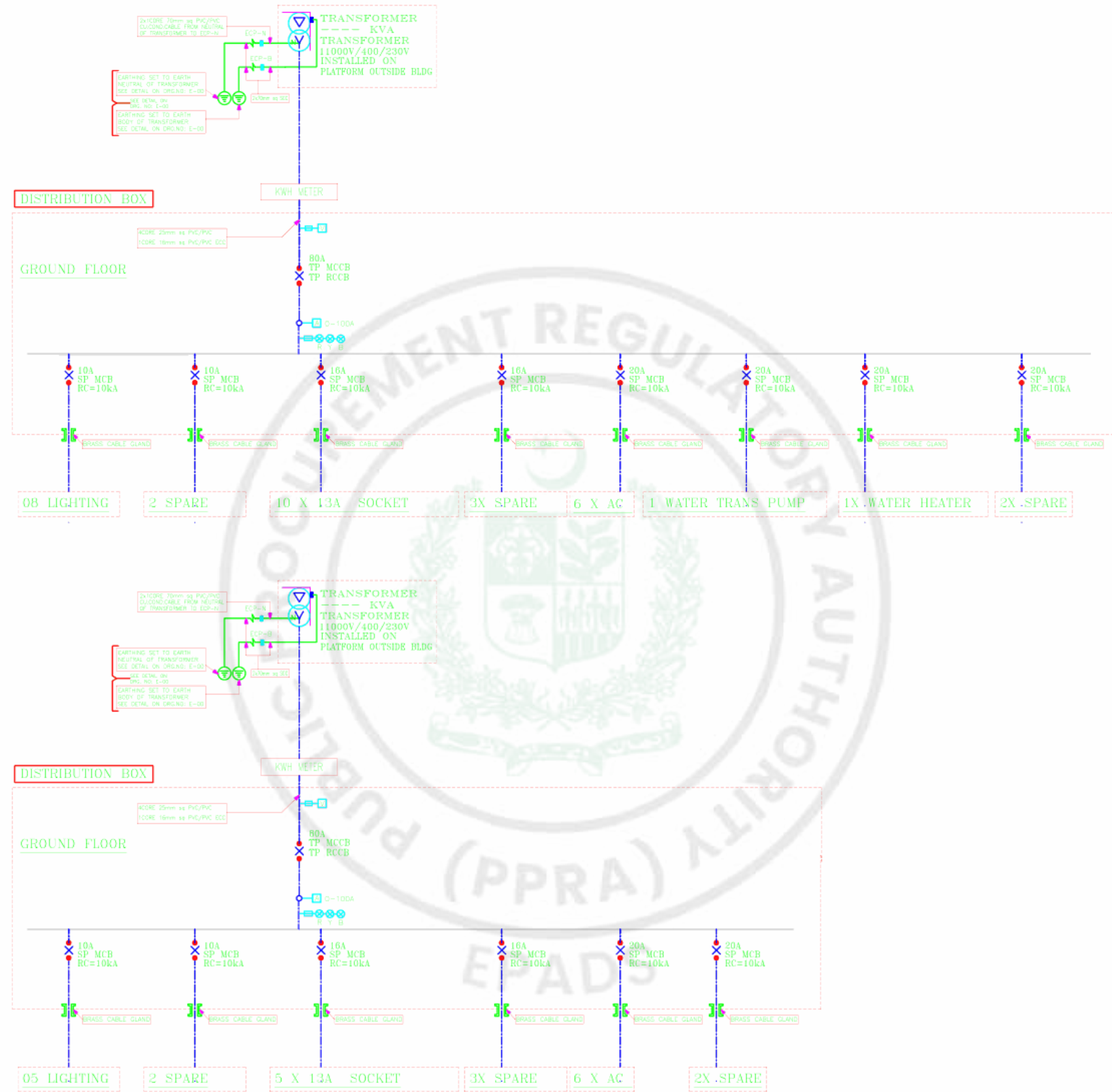
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APRIL- 2026

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DB DETAILS

Job No.

Dwg. No.

EL-07

Date

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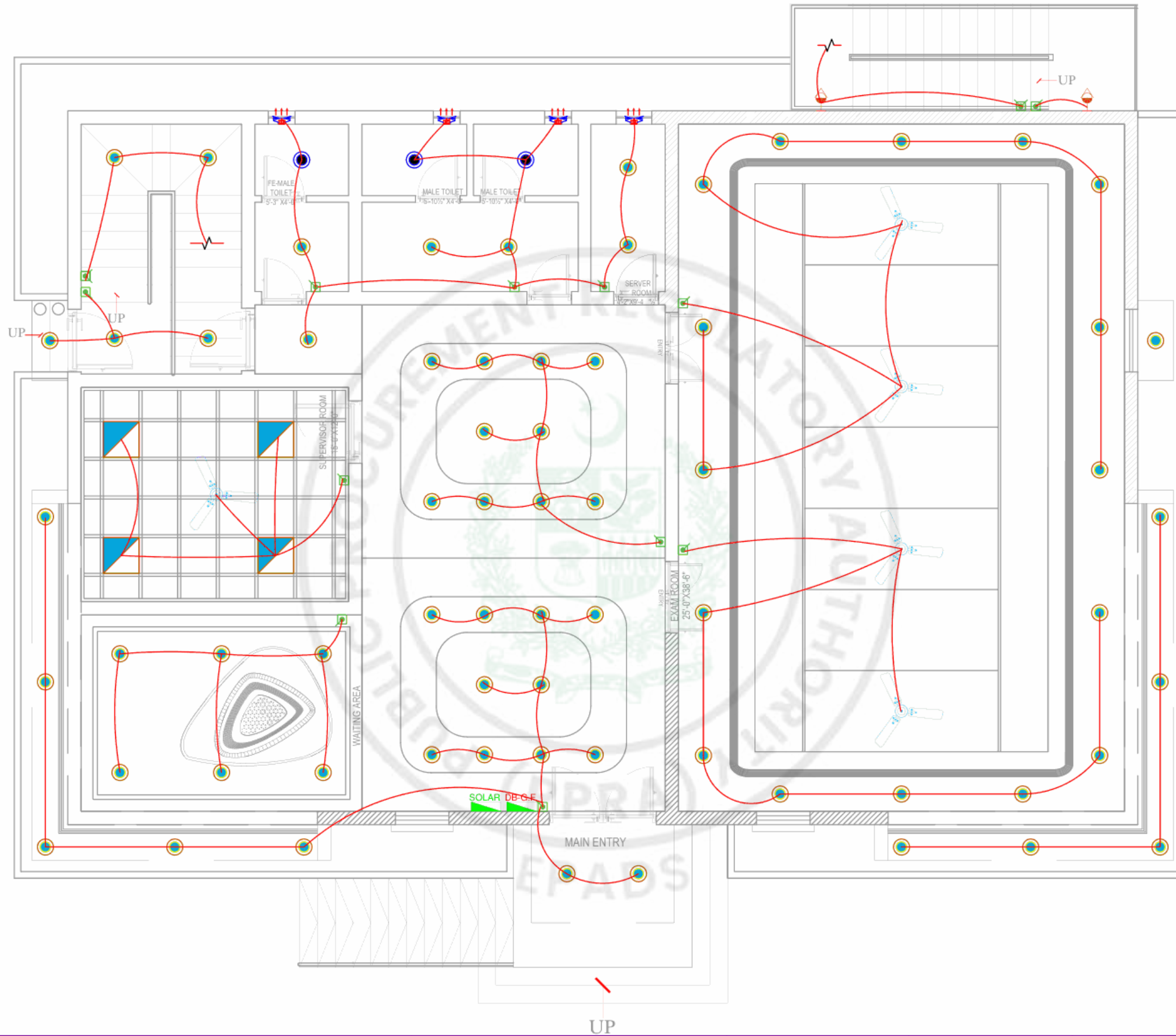
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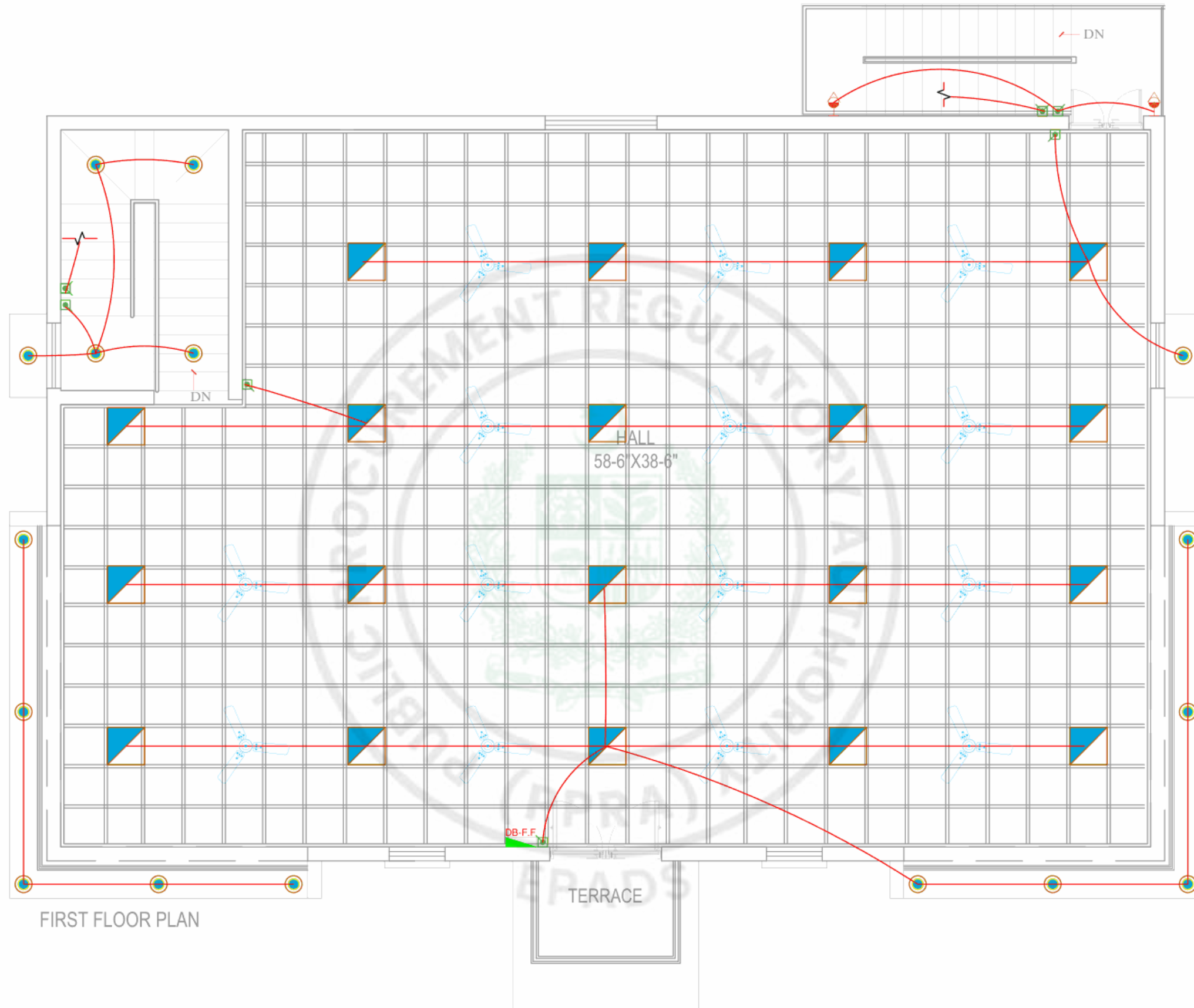


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PROJECT:
 PEL EXAMINATION CENTER
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VETTED BY	U.M.A					TITLE GROUND FLOOR LIGHTING PLAN	Job No.
CHECKED BY	U.M.A						Dwg. No. EL-08
DRAWING BY	U.M.A						Date
DESIGN BY	U.M.A						APRIL- 2026
REV. DATE. DESCRIPTION SCALE AS SHOWN						ORIGINAL SIZE A3	



FIRST FLOOR PLAN

TERRACE

DESIGN:



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TITLE

FIRST FLOOR LIGHTING
PLAN

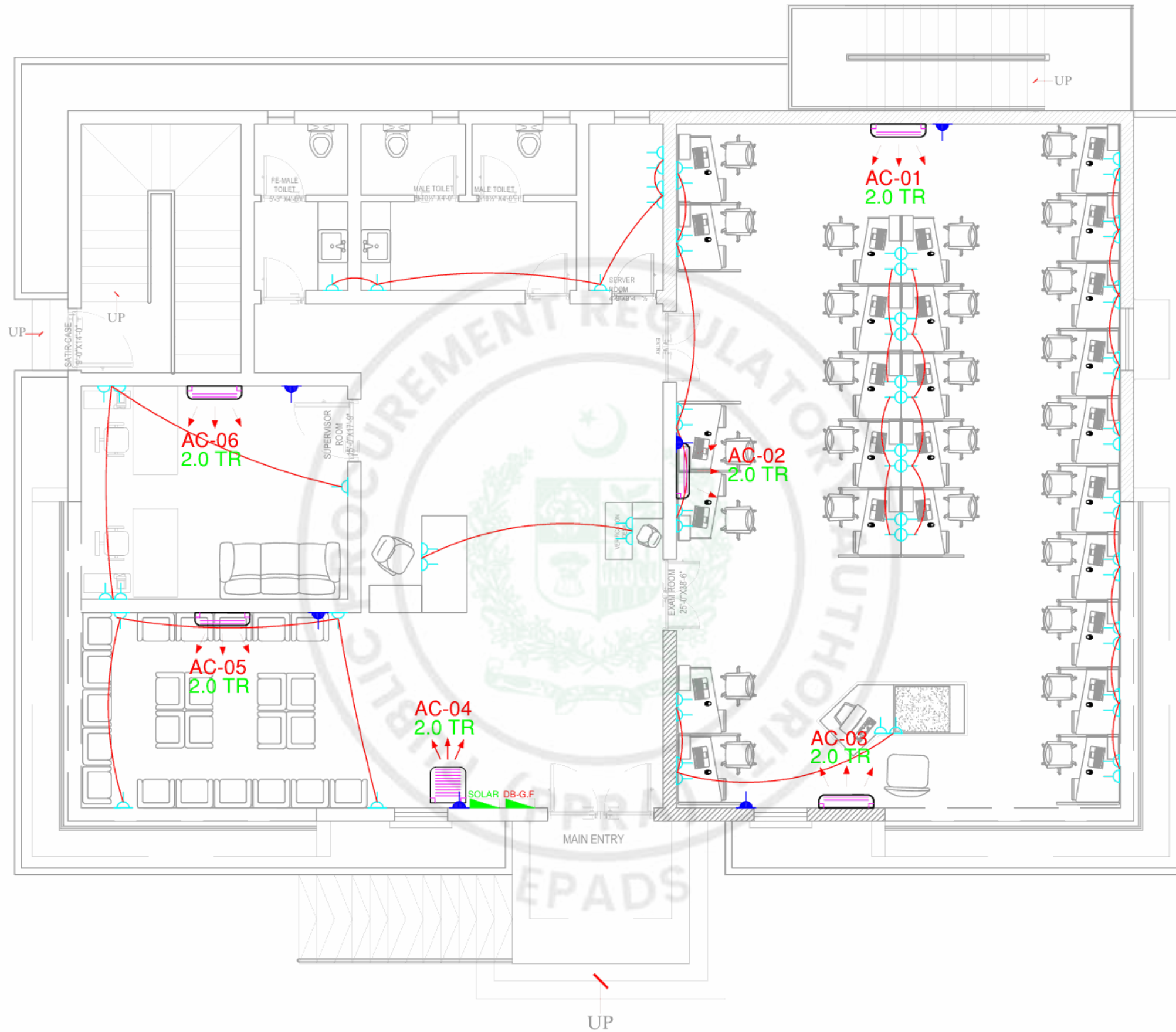
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EL-09

Date

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GROUND FLOOR POWER
PLAN

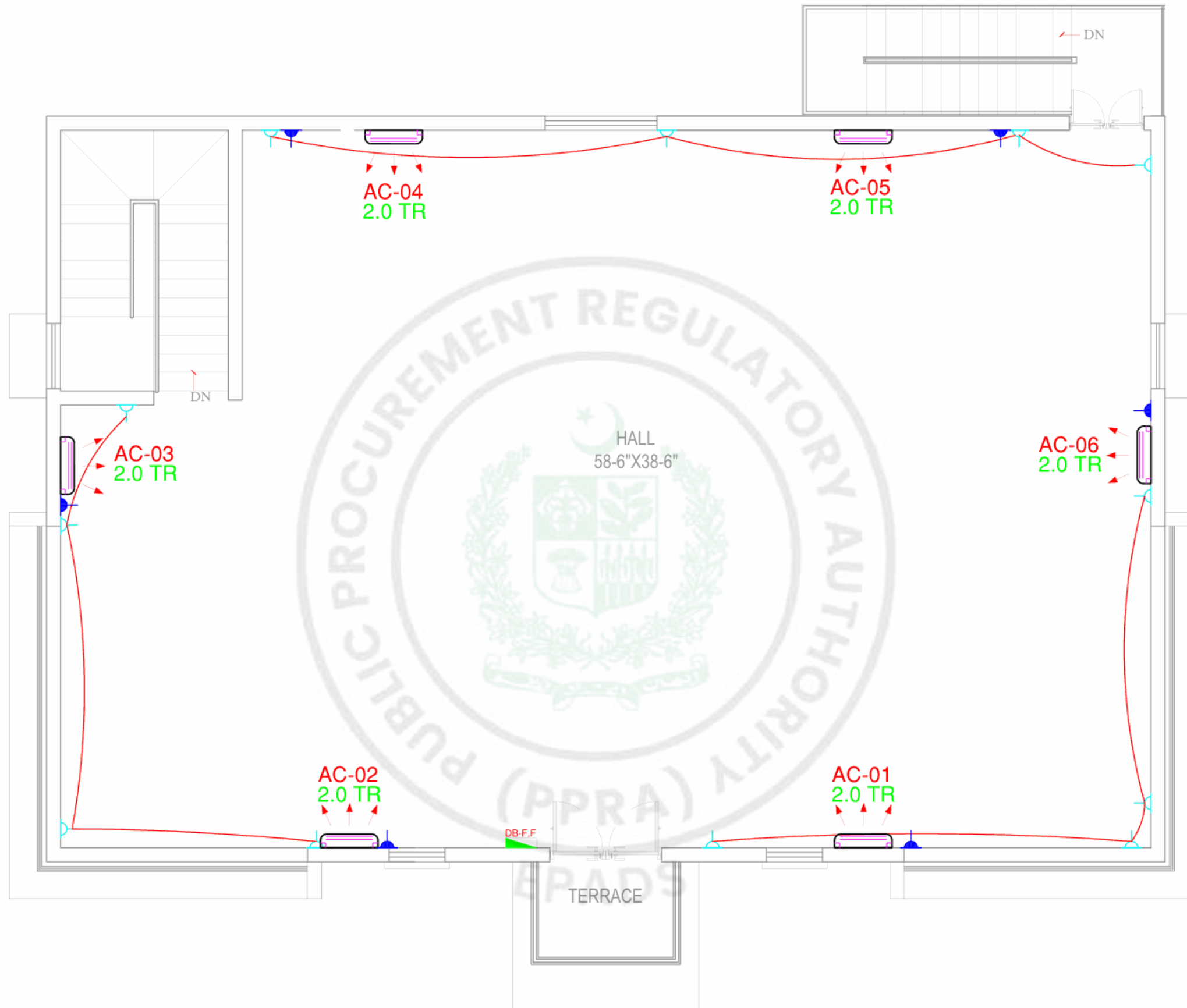
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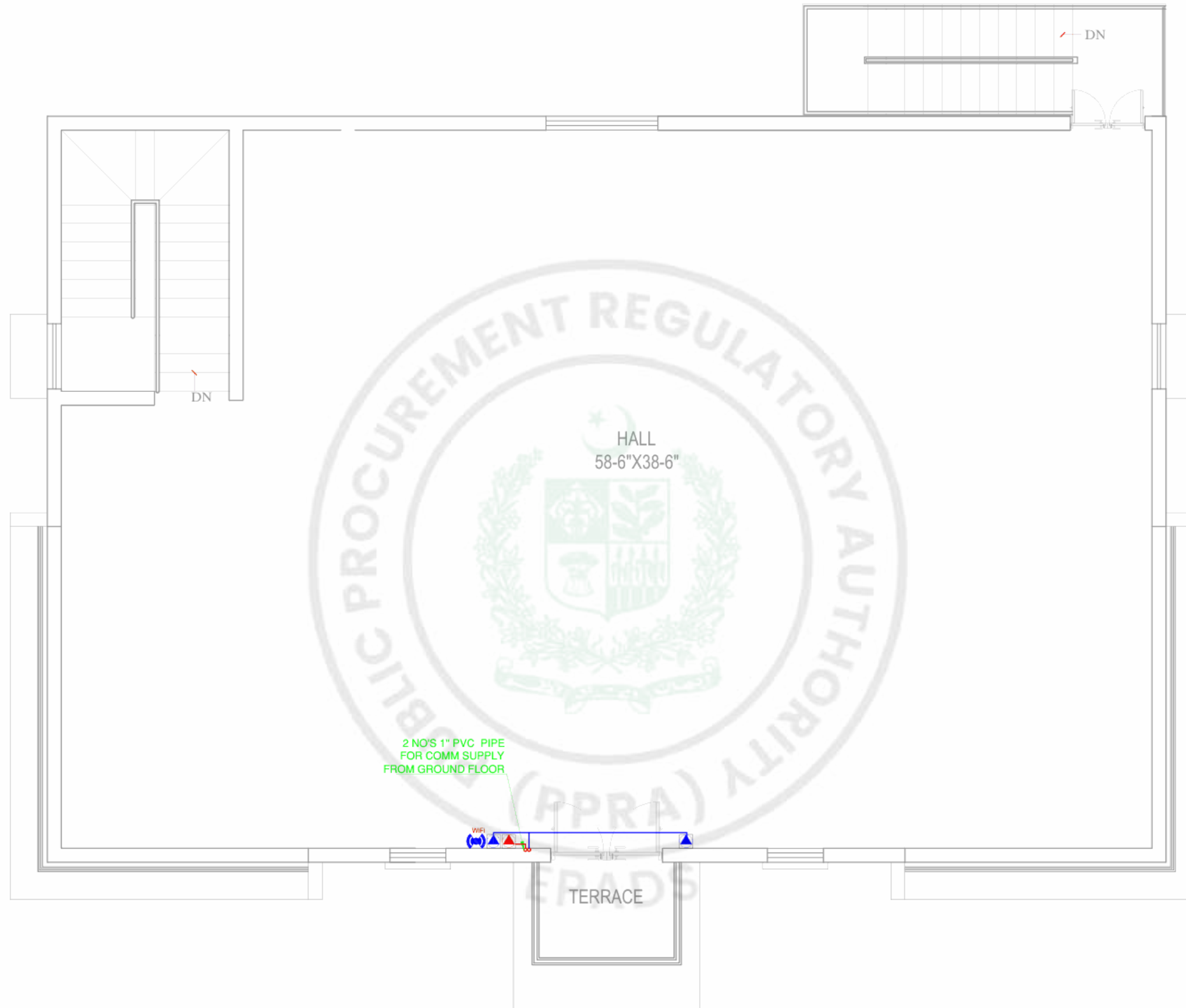
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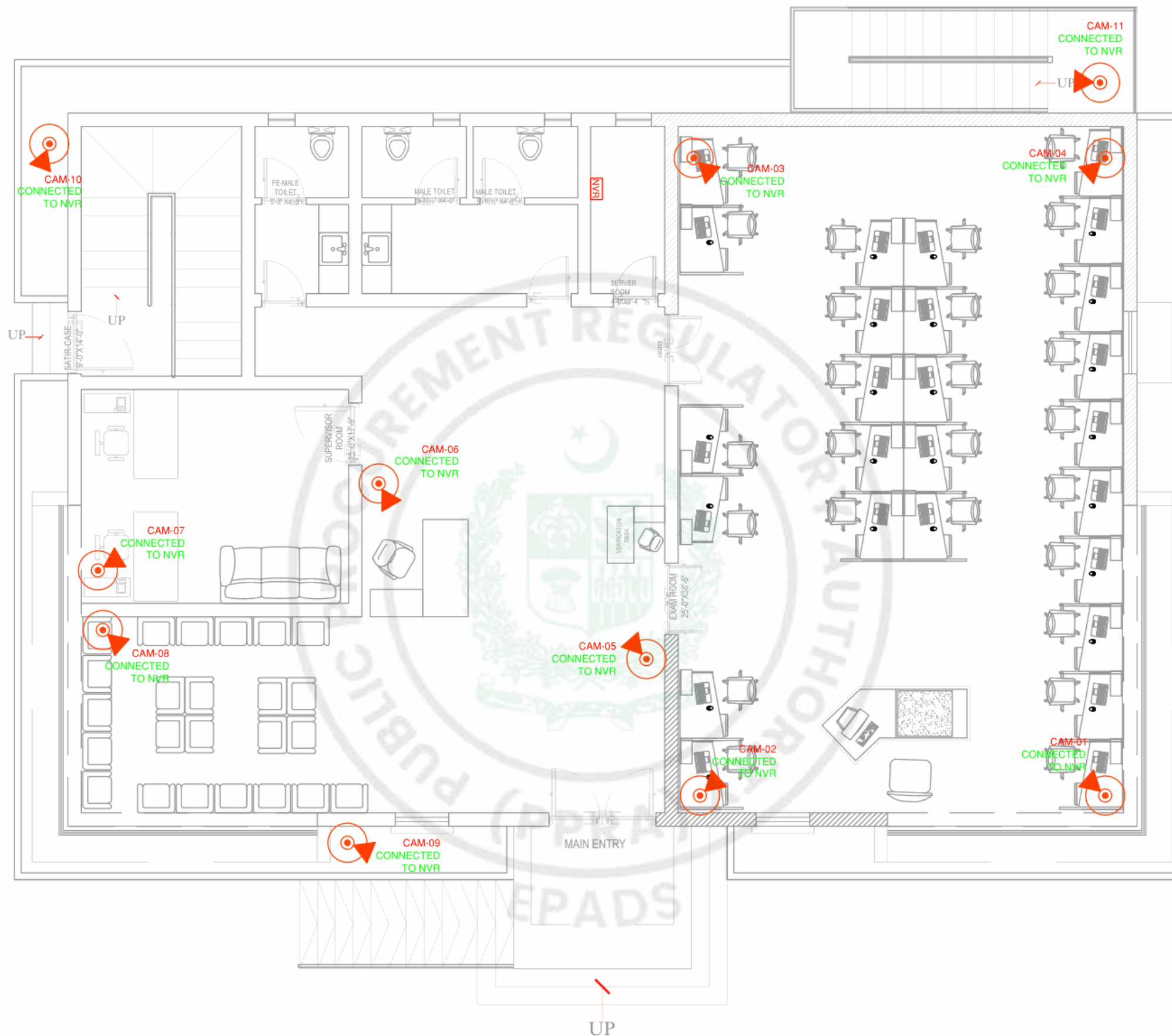
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			CHECKED BY	U.M.A				FIRST FLOOR POWER PLAN		Dwg. No.
			DRAWING BY	U.M.A						EL-11
			DESIGN BY	U.M.A	REV.	DATE.	DESCRIPTION	SCALE	AS SHOWN	Date
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			DESIGN BY	U.M.A	REV.	DATE.	DESCRIPTION	SCALE	AS SHOWN	Date
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PROJECT:

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TITLE

GROUND FLOOR CCTV
PLAN

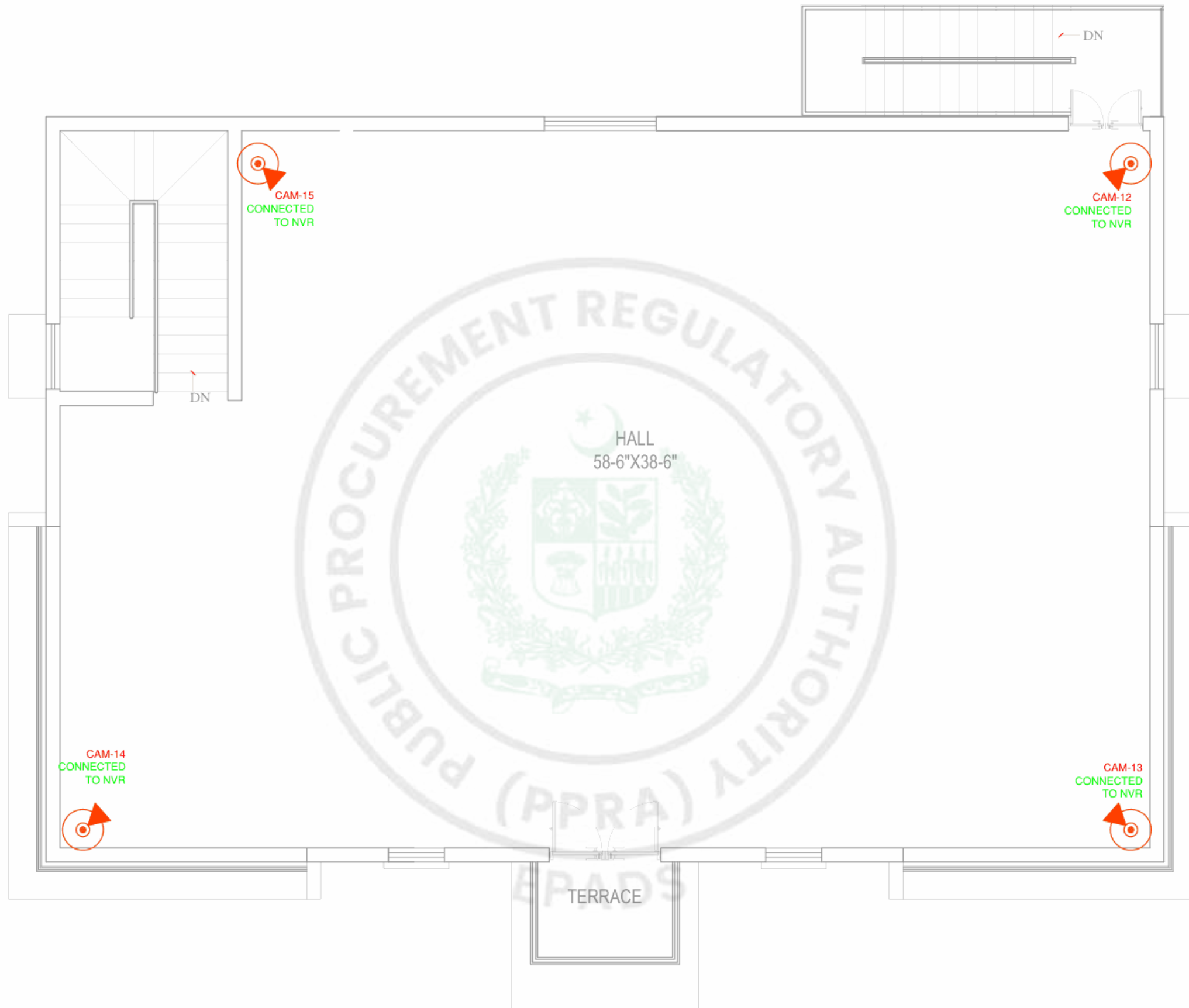
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EL-14

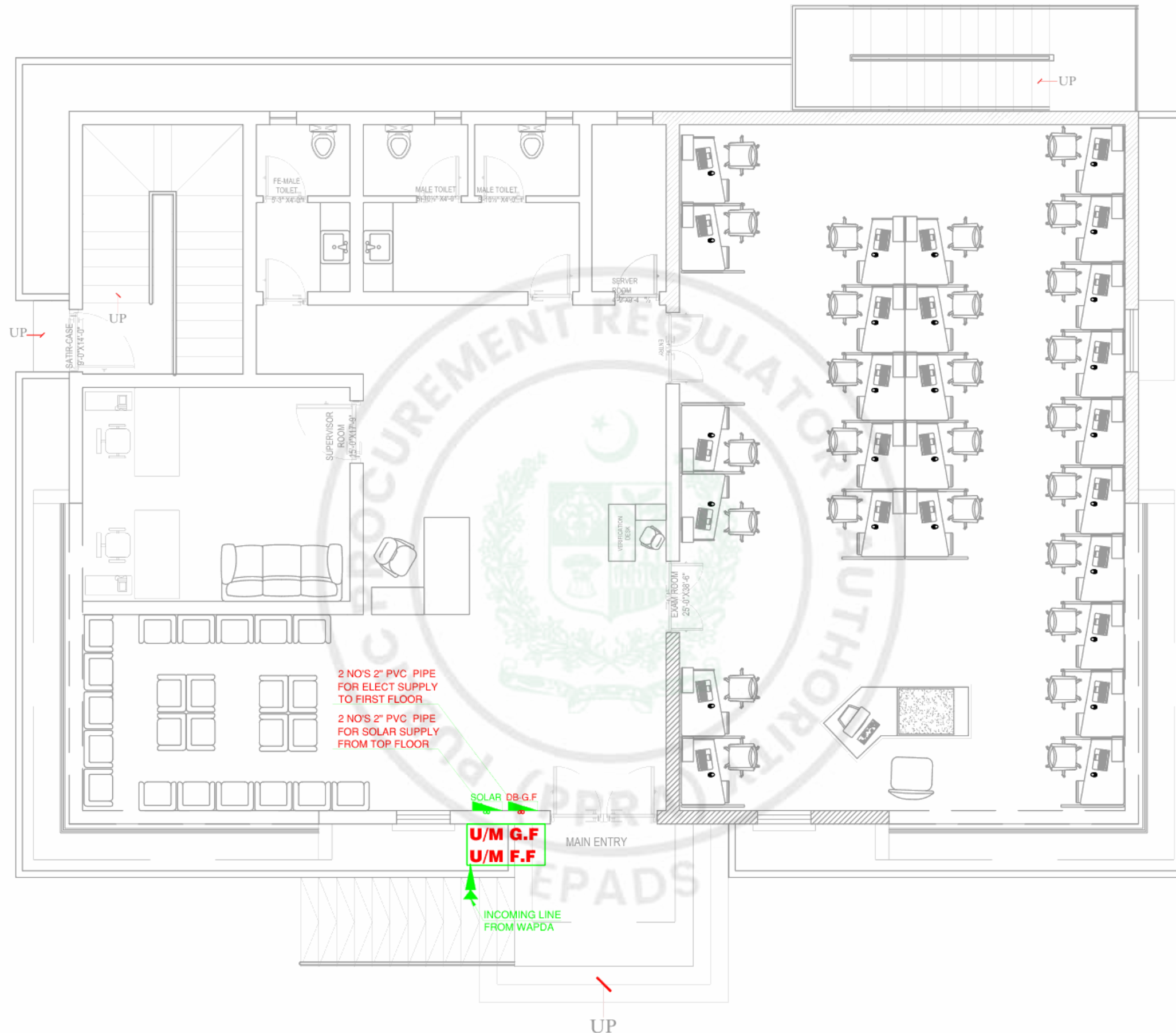
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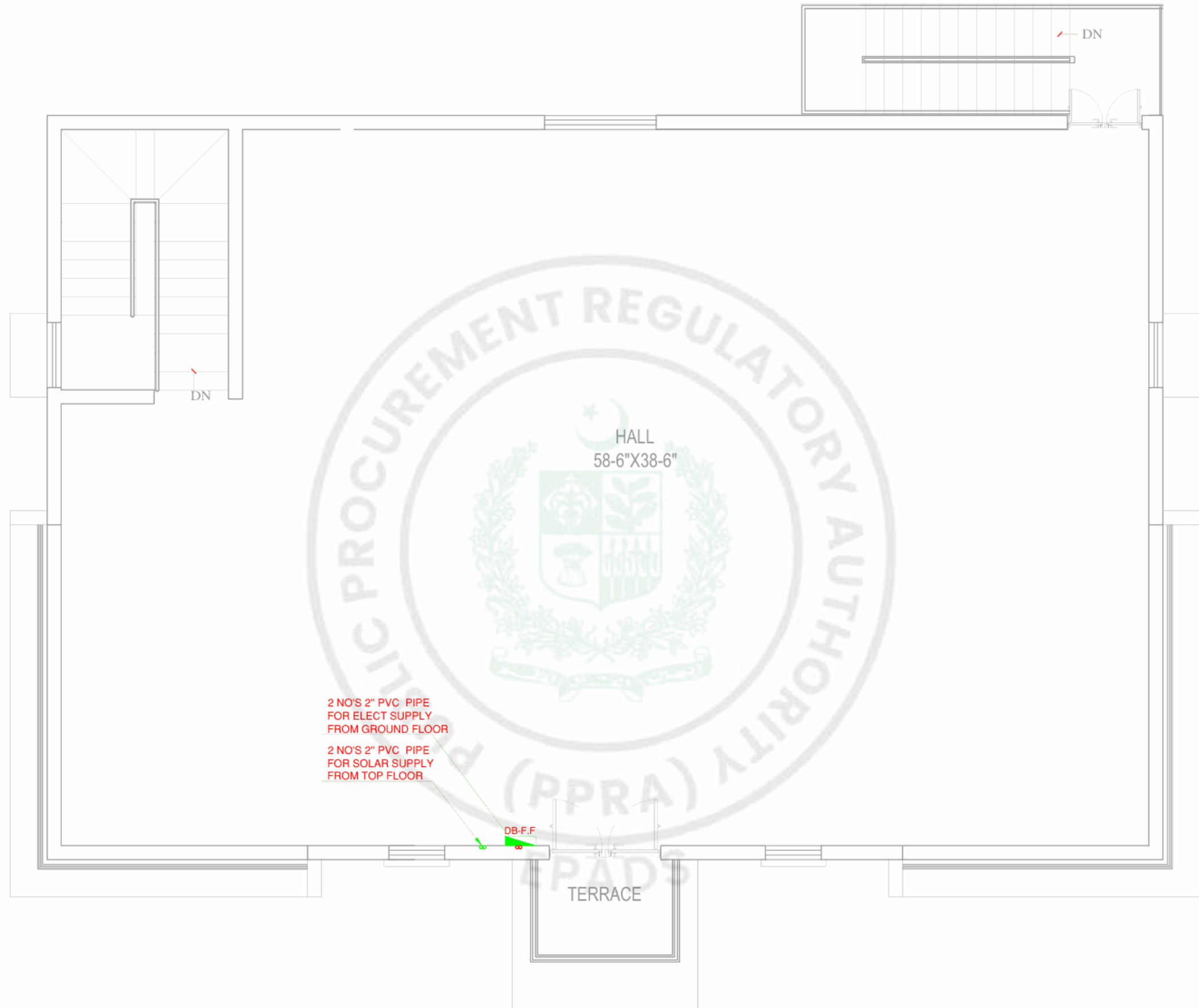
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			CHECKED BY	U.M.A						Dwg. No.
			DRAWING BY	U.M.A						EL-15
			DESIGN BY	U.M.A	REV.	DATE.	DESCRIPTION	SCALE	AS SHOWN	Date
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			CHECKED BY	U.M.A				GROUND FLOOR UTILITY POWER PLAN		Dwg. No.
			DRAWING BY	U.M.A						EL-16
			DESIGN BY	U.M.A	REV.	DATE.	DESCRIPTION	SCALE	AS SHOWN	Date
			ORIGINAL SIZE A3							



DESIGN:



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FAX: (92-21) 34980305
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CLIENT:



PAKISTAN CIVIL AVIATION
AUTHORITY

PROJECT:

PEL EXAMINATION CENTER
KARACHI

VETTED BY

U.M.A

CHECKED BY

U.M.A

DRAWING BY

U.M.A

DESIGN BY

U.M.A

TITLE

**FIRST FLOOR UTILITY
POWER PLAN**

Job No.

Dwg. No.
EL-17

Date

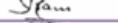
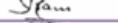
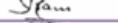
APRIL- 2026

REV.	DATE.	DESCRIPTION	SCALE	AS SHOWN
ORIGINAL SIZE A3				

PLUMBING WORKING

PEL EXAMINATION CENTER KARACHI



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Checked By	Syed Jawed Shah																																																										
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ORIGINAL SIZE A3						APRIL- 2026																																																					

LIST OF DRAWINGS

SR.NO	DESCRIPTION	DWG. NO.
01	TITLE SHEET	PLUMB-01
02	LIST OF DRAWING	PLUMB-02
03	LEGENDS	PLUMB-03
04	GENERAL NOTES	PLUMB-04
05	APPROVED MANUFACTURERS/SUPPLIERS	PLUMB-05
06	PIPING MATERIAL LIST	PLUMB-06
07	TYPICAL INSTALLATION DETAILS	PLUMB-07
08	TYPICAL INSTALLATION DETAILS	PLUMB-08
09	TYPICAL INSTALLATION DETAILS	PLUMB-09
10	PLUMBING NOTES	PLUMB-10
11	SEWERAGE-GROUND FLOOR PLAN	PLUMB-11
12	SEWERAGE-FIRST FLOOR PLAN	PLUMB-12
13	WATER SUPPLY-GROUND FLOOR PLAN	PLUMB-13
14	WATER SUPPLY-FIRST FLOOR PLAN	PLUMB-14
15	NATURAL GAS-GROUND FLOOR PLAN	PLUMB-15



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										Dwg. No. PL-02	Date APRIL- 2026
						REV.	DATE.	DESCRIPTION	SCALE	AS SHOWN	
						ORIGINAL SIZE A3					

LEGEND

	SP	SOIL WATER PIPE
	WP	WASTE WATER PIPE
	RP	RAIN WATER PIPE
	HW	HOT WATER SUPPLY
	CW	COLD WATER SUPPLY
	FD	FLOOR DRAIN
	GY	ELECTRIC/GAS GEYSER
	SMH	SOIL WATER MANHOLE
	WMH	WASTE WATER MANHOLE
	CB	CATCH BASIN RAIN WATER



DESIGN:



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PAKISTAN CIVIL AVIATION AUTHORITY

PROJECT:

PEL EXAMINATION CENTER KARACHI

Checked By	Syed Jawed Shah	
Drawing By	M. Noman	
	Mrs. Iram Jahangir	
Design By	Mrs. Iram Jahangir	
	Syed Jawed Shah	

Tender Drawings			TITLE LEGENDS		Job No. -
					Dwg. No. PL-03
REV.	DATE.	DESCRIPTION	SCALE	AS SHOWN	Date
ORIGINAL SIZE A3					APRIL- 2026

- ALL HORIZONTALLY DRAINAGE PIPES SHALL BE PROVIDED MINIMUM 1% SLOPE IN FLOW DIRECTION.
- ALL SOIL & WASTE PIPE SHALL HAVE AIR VENT AT THE TOP OF THE BUILDING.
- ALL FLOOR DRAIN SHALL HAVE MINIMUM 2 INCH WATER SEAL.
- ALL SEWERAGE AND STORM WATER PIPES SHALL BE CONCEALED IN WALLS OR COVERED WITH SOME CLADDING.
- FOR COLD WATER SUPPLY PPR PN-20 PIPES SHALL BE USED.
- ALL EXPOSED COLD & HOT WATER PIPING SHALL BE GI (IIL) MEDIUM CLASS OR PPRC.
- ALL HOT WATER PIPES SHALL BE PPR PN-20.
- ALL HOT WATER PIPES SHALL BE INSULATED.
- ALL NATURAL GAS PIPES SHALL BE GALVANIZED (GI) MEDIUM QUALITY.
- ALL NATURAL GAS PIPES SHALL BE EXPOSED & USE GALVANIZED IRON (MEDIUM QUALITY) PIPES.
- ALL SHAFTS/DUCTS CARRYING NATURAL GAS PIPES SHOULD BE VENTED.



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ORIGINAL SIZE A3																																																							

PIPING MATERIALS LIST OF APPROVED MANUFACTURERS/SUPPLERS

WATER PIPING:

PPR PN-20 COLD/HOT WATER PIPES AS PER
DIN 8078 WITH MOLDED FITTINGS PN-25 AS
PER DIN 16962, GI PIPES BS 1387

DADEX

FIRAT

COSMOPLAST

JAMAL PIPES

MASTER PAKISTAN

ABOVE GROUND DRAINAGE PIPING:

AS PER DIN 8061/8062 OR ISO 3633 TYPE-B
UPVC PIPES AND FITTINGS AS PER BS EN 1329 FOR
ABOVE GROUND PIPING

VESBO, TURKEY

COSMOPLAST

PALING MALAYSIA

TETRAPLAST

MASTER PAKISTAN

BURIED DRAINAGE PIPING:

UPVC PIPE WITH SOLVENT WELD FITTING AS PER BS
4660 (BS EN 1401)
FOR BURIED PIPING

VESBO, TURKEY

COSMOPLAST

PALING MALAYSIA

TETRAPLAST

MASTER PAKISTAN

CONDENSATE DRAINAGE PIPING:

UPVC CLASS 'E' PIPE WITH SOLVENT WELD FITTING AS
PER (BS 3505)

VESBO, TURKEY

COSMOPLAST

PALING MALAYSIA

TETRAPLAST

MASTER PAKISTAN

ALL EQUIPMENTS SHALL BE INSTALLED STRICTLY AS PER
MANUFACTURER'S RECOMMENDATION.

FLOOR TRAPS, ROOF DRAINS GULLY TRAPS, ANGLE DRAIN,
GREASE TRAP, COP-CLEAN OUT PLUG)



DESIGN:



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CONSULTING ENGINEERS, ARCHITECTS
& PLANNERS

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PAKISTAN CIVIL AVIATION AUTHORITY

PROJECT:

PEL EXAMINATION CENTER KARACHI

Checked By

Syed Jawed Shah

[Signature]

Drawing By

M. Noman

[Signature]

Design By

Mrs. Iram Jahangir

[Signature]

Syed Jawed Shah

[Signature]

Tender Drawings

TITLE

APPROVED
MANUFACTURED

Job No.

Dwg. No.
PL-05

Date

APRIL- 2026

REV. DATE. DESCRIPTION SCALE AS SHOWN

ORIGINAL SIZE A3

APPROVED MANUFACTURERS/ SUPPLIERS

GEYSERS (GAS/ELECTRIC)	PUMA	APPROVED BY AN ARCHITECT
	SINGER	
	SUPER ASIA	
	CANON	
	ARISTON, ITALY	
VALVES (GATE VALVES, FLEXIBLE CONNECTORS)	ECONOSTO	APPROVED BY AN ARCHITECT BRASS/BRONZE, PN-16
	KITZ VALVES	
	HATTERSLEY	
	ITAP ITALY	
	COSMOPLAST	
CENTRIFUGAL/ PRESSURIZING/ RECIRCULATING PUMPS)	ALARKO CARRIER	APPROVED BY AN ARCHITECT
	DAB PUMPS	
	GRUNDFOS PUMPS	
	KSB	
	LOCAL	
SUBMERSIBLE PUMPS	WILO GERMANY	APPROVED BY AN ARCHITECT
	DAB PUMPS	
	GRUNDFOS PUMPS	
	KSB	
	LOCAL	

ALL EQUIPMENTS SHALL BE INSTALLED STRICTLY AS PER MANUFACTURER'S RECOMMENDATION.



DESIGN:



UMAR MUNSHI ASSOCIATES
CONSULTING ENGINEERS, ARCHITECTS
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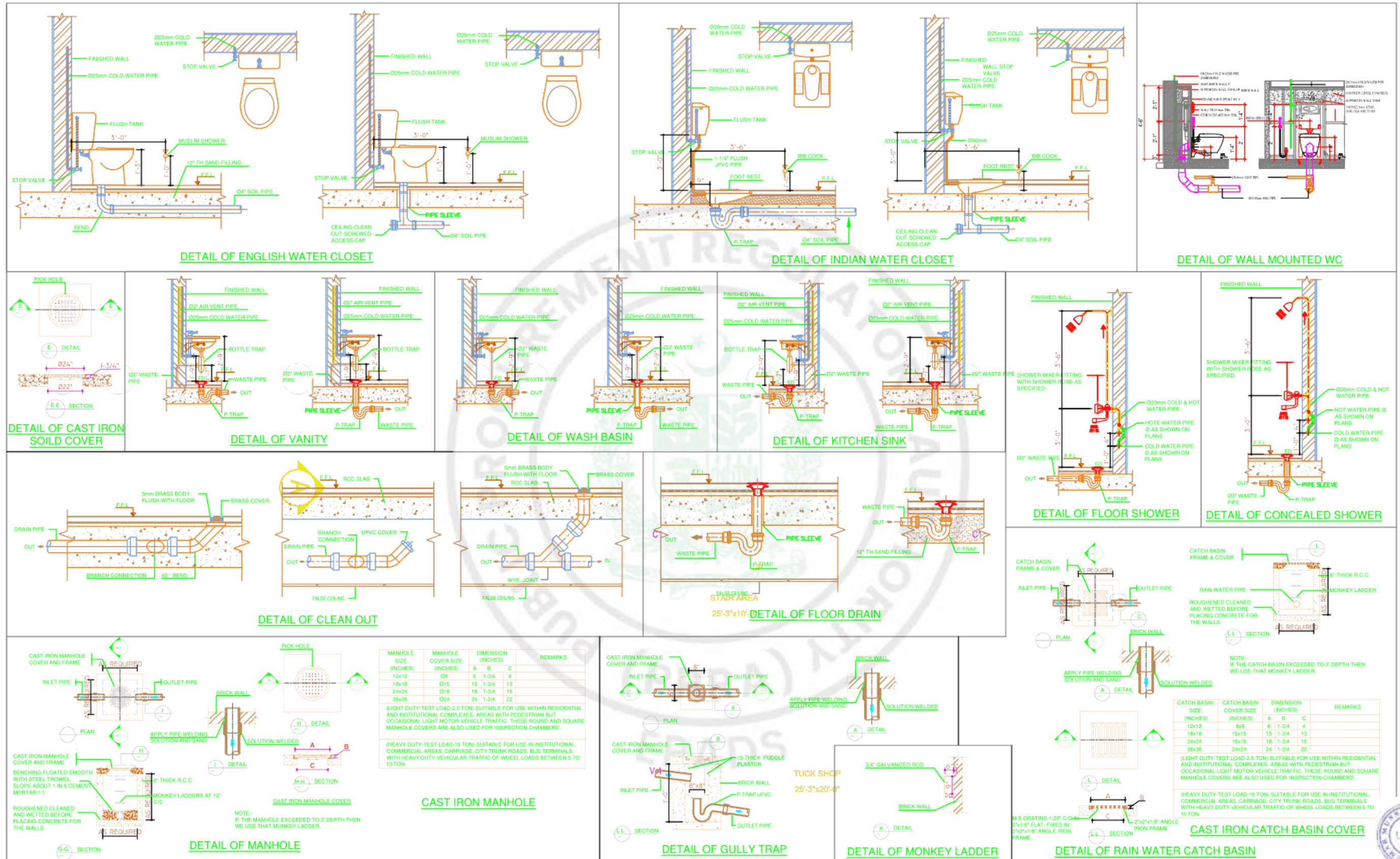
PAKISTAN CIVIL AVIATION AUTHORITY

PROJECT:

PEL EXAMINATION CENTER KARACHI

Checked By	Syed Jawed Shah	
Drawing By	M. Noman	
	Mrs. Iram Jahangir	
Design By	Mrs. Iram Jahangir	
	Syed Jawed Shah	

Tender Drawings				TITLE	Job No.
				PIPING MATERIEL LIST	-
					Dwg. No.
					PL-06
REV.	DATE.	DESCRIPTION	SCALE	AS SHOWN	Date
ORIGINAL SIZE A3					APRIL- 2026



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PEL EXAMINATION CENTER KARACHI

Checked By

Syed Jawed Shah

Drawing By

Mrs. Iram Jahangir

Design By

Syed Jawed Shah

Tender Drawings

TITLE

**YPICAL INSTALLATION
DETAILS**

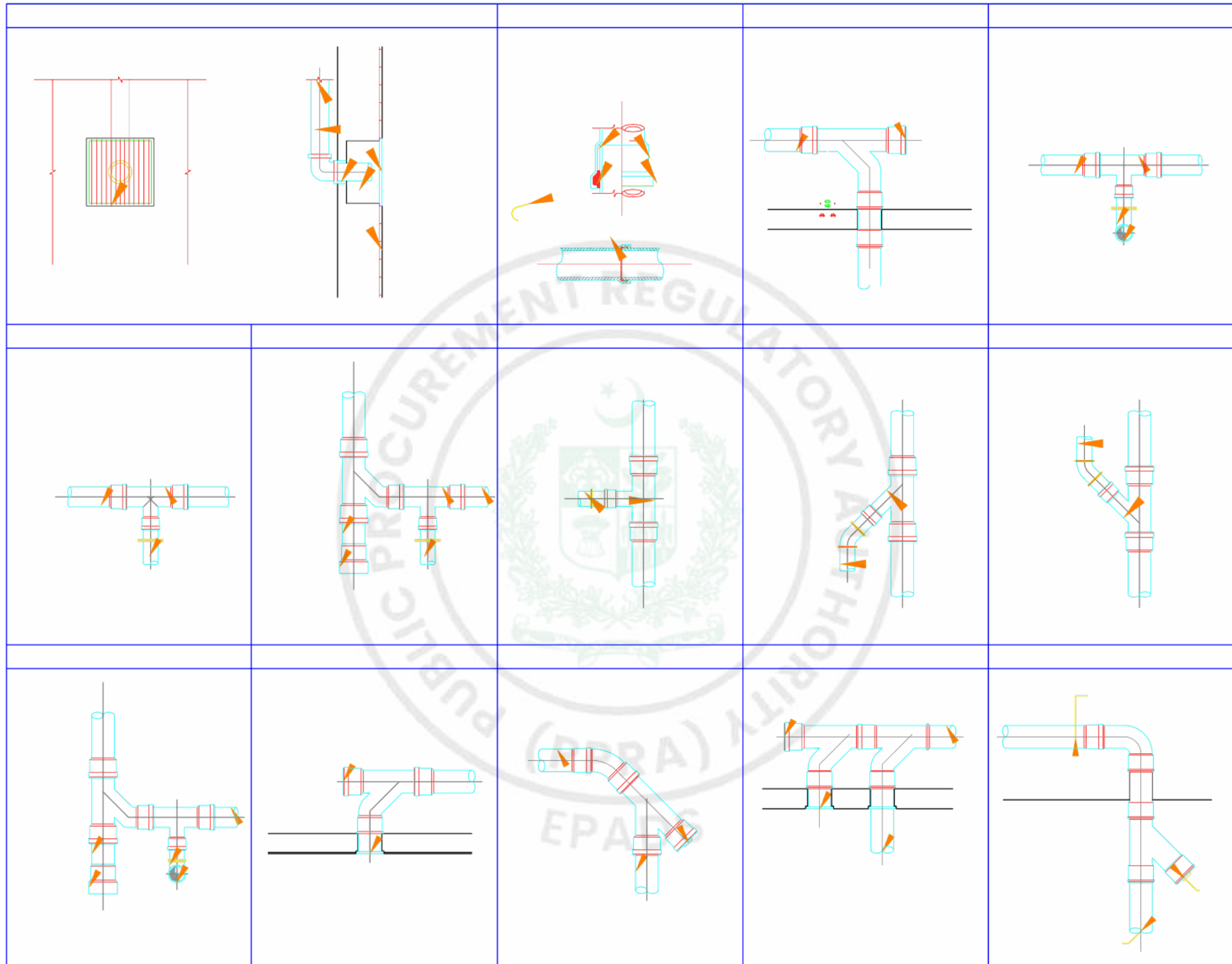
Job No.

Dwg. No.
PL-07

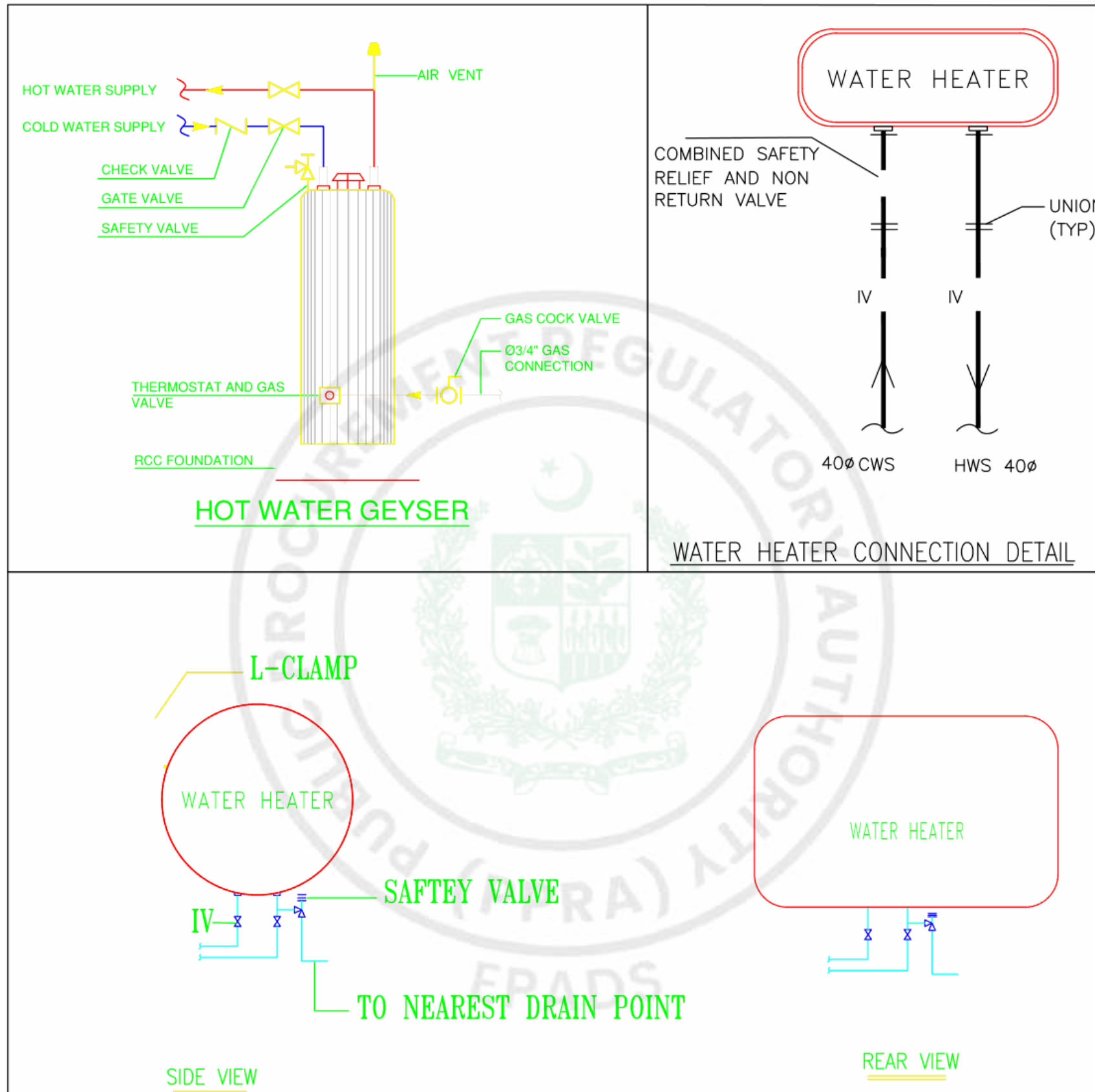
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APRIL- 2026

REV.	DATE	DESCRIPTION	SCALE	AS SHOWN
ORIGINAL SIZE A3				



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INSTALLATION DETAIL OF WATER HEATER

DESIGN:



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& PLANNERS

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PAKISTAN CIVIL AVIATION AUTHORITY

PROJECT:

PEL EXAMINATION CENTER KARACHI

Checked By	Syed Jawed Shah	
Drawing By	M. Noman	
	Mrs. Iram Jahangir	
Design By	Mrs. Iram Jahangir	
	Syed Jawed Shah	

Tender Drawings				TITLE	Job No.
				YPICAL INSTALLATION DETAILS-3	Dwg. No. PL-09
REV.	DATE.	DESCRIPTION	SCALE	AS SHOWN	Date
ORIGINAL SIZE A3					APRIL- 2026

PLUMBING NOTES

1. HOT & COLD WATER CONNECTIONS TO EACH SANITARY APPLIANCE SHALL INCLUDE CHROME PLATED ANGLE VALVE FOR ISOLATION AND THE ISOLATING VALVE FOR BATH TUB & SHOWER SHALL BE LOCATED ABOVE THE FALSE CEILING.
2. FINAL CONNECTION TO ALL APPLIANCE SHALL BE THROUGH PPR PIPE AS INDICATED ON THE DRAWINGS.
3. THE PIPES DIAMETER INDICATED ON THE DRAWING ARE FOR PPR PIPES.
4. EXACT LOCATION OF WATER PIPE WORK SHALL BE DETERMINED ON SITE.
5. MANHOLE COVERS AND FARMS ARE TO BE MEDIUM DUTY IN PEDESTRIAN AREAS.
6. ALL SANITARY APPLIANCES SHALL BE PROVIDED WITH TRAP.
7. CONTRACTOR SHALL COORDINATE ALL WORKS WITH ELECTRICAL, STRUCTURE AND ARCHITECTURAL.
8. MECHANICAL SERVICES SHALL NOT CUT IN ANY STRUCTURE BEAMS, RIBS OR ANY OTHER STRICTURE ELEMENTS UNLESS A PRIOR WRITTEN APPROVAL AS BEEN TAKEN FROM ENGINEER.
9. ALL EQUIPMENT SHALL BE INSTALLED STRICTLY AS PER MANUFACTURER'S RECOMMENDATION.
10. ALL UNDER GROUND SEWAGE PIPES SHALL HAVE A MINIMUM SLOPE OF 1%.



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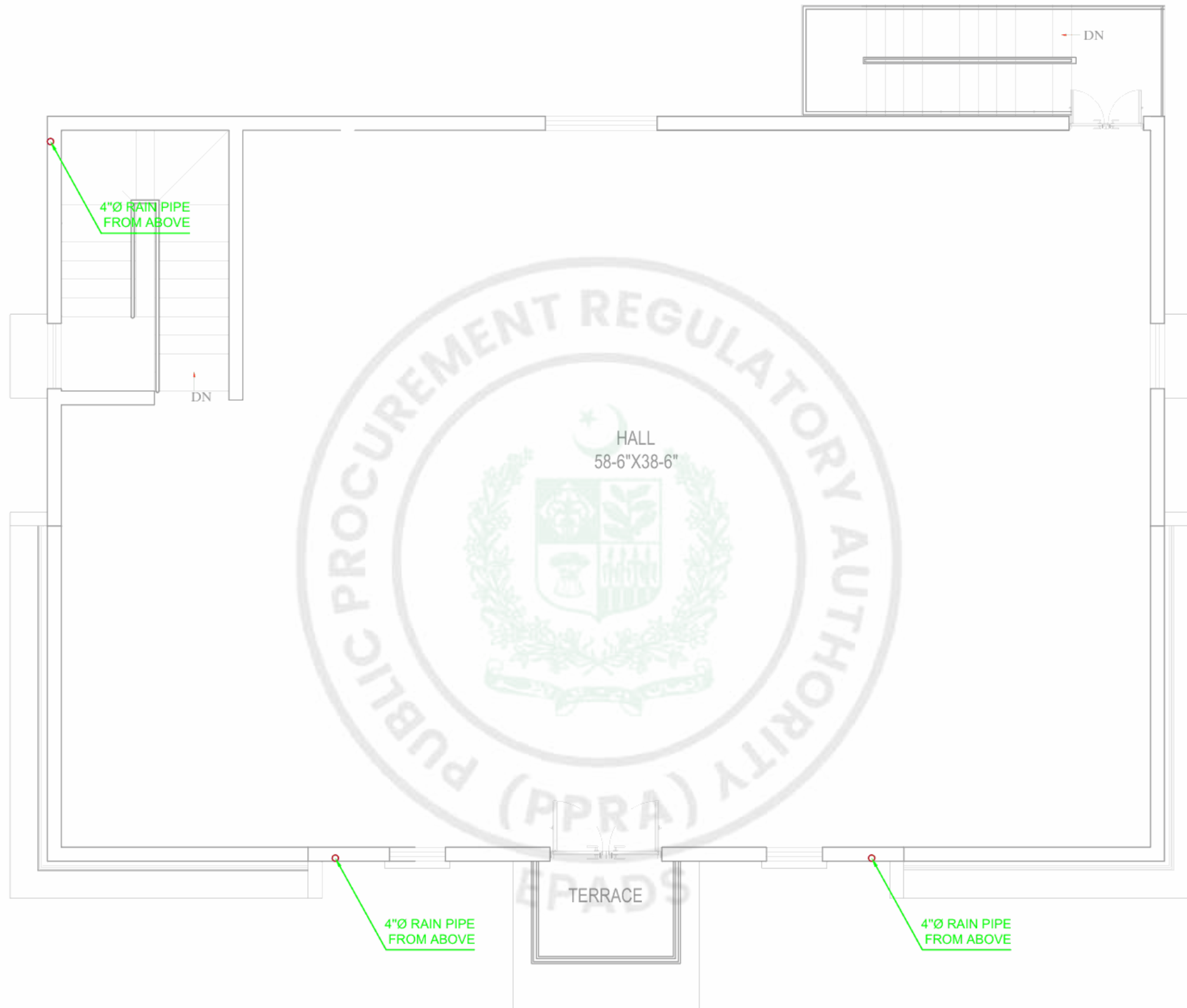


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PROJECT:

PEL EXAMINATION CENTER KARACHI

Checked By	Syed Jawed Shah		Tender Drawings	TITLE PLUMBING NOTES	Job No.
Drawing By	M. Noman				Dwg. No. PL-10
Design By	Mrs. Iram Jahangir				Date APRIL- 2026
	Mrs. Iram Jahangir		REV.	DATE.	DESCRIPTION
	Syed Jawed Shah		SCALE	AS SHOWN	ORIGINAL SIZE A3



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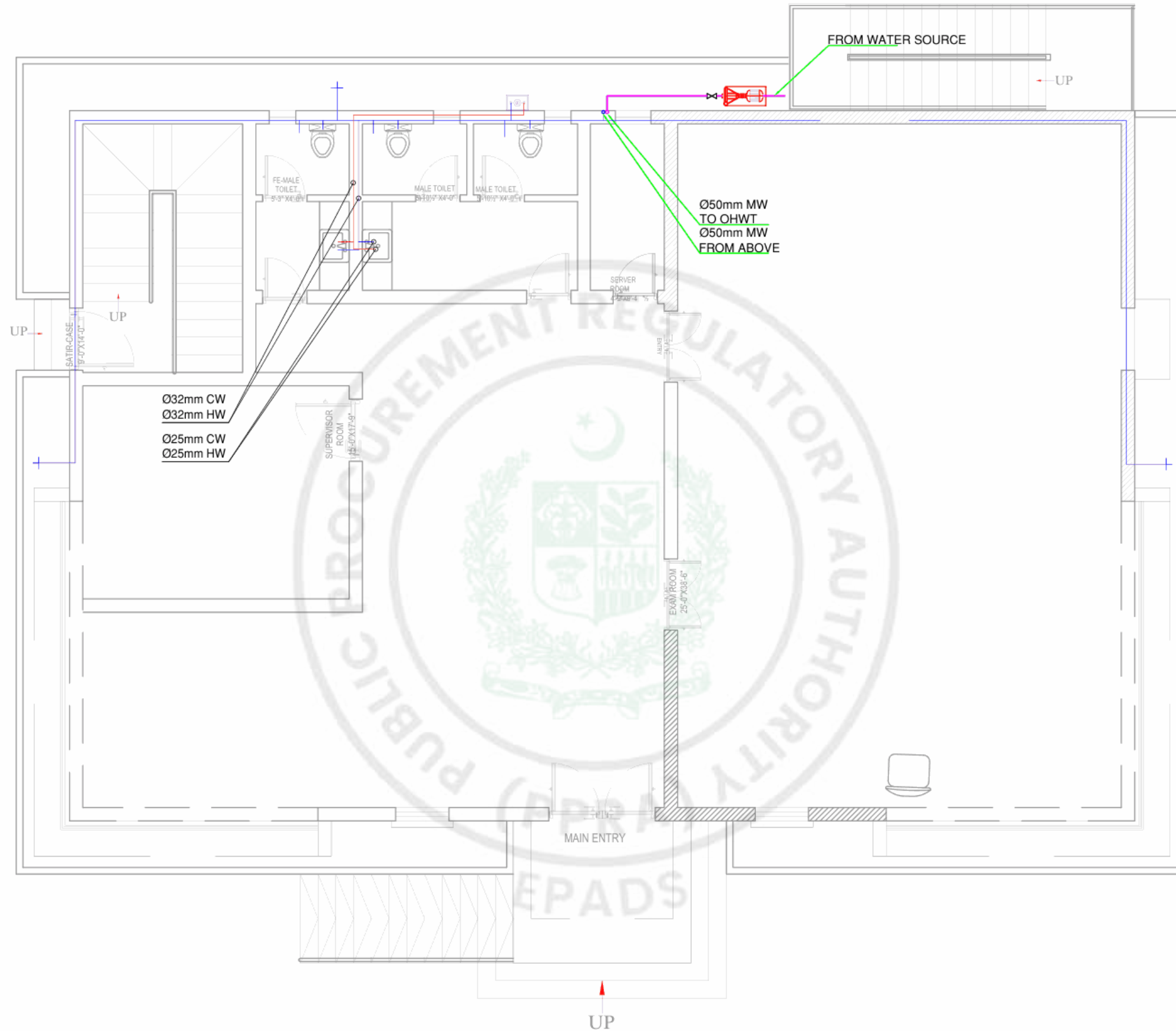
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Drawing By	M. Noman	
	Mrs. Iram Jahangir	
Design By	Mrs. Iram Jahangir	
	Syed Jawed Shah	

Tender Drawings				TITLE	Job No.
				GROUND FLOOR DRAINAGE PLAN	Dwg. No. PL-12
REV.	DATE.	DESCRIPTION	SCALE	AS SHOWN	Date
ORIGINAL SIZE A3					APRIL- 2026



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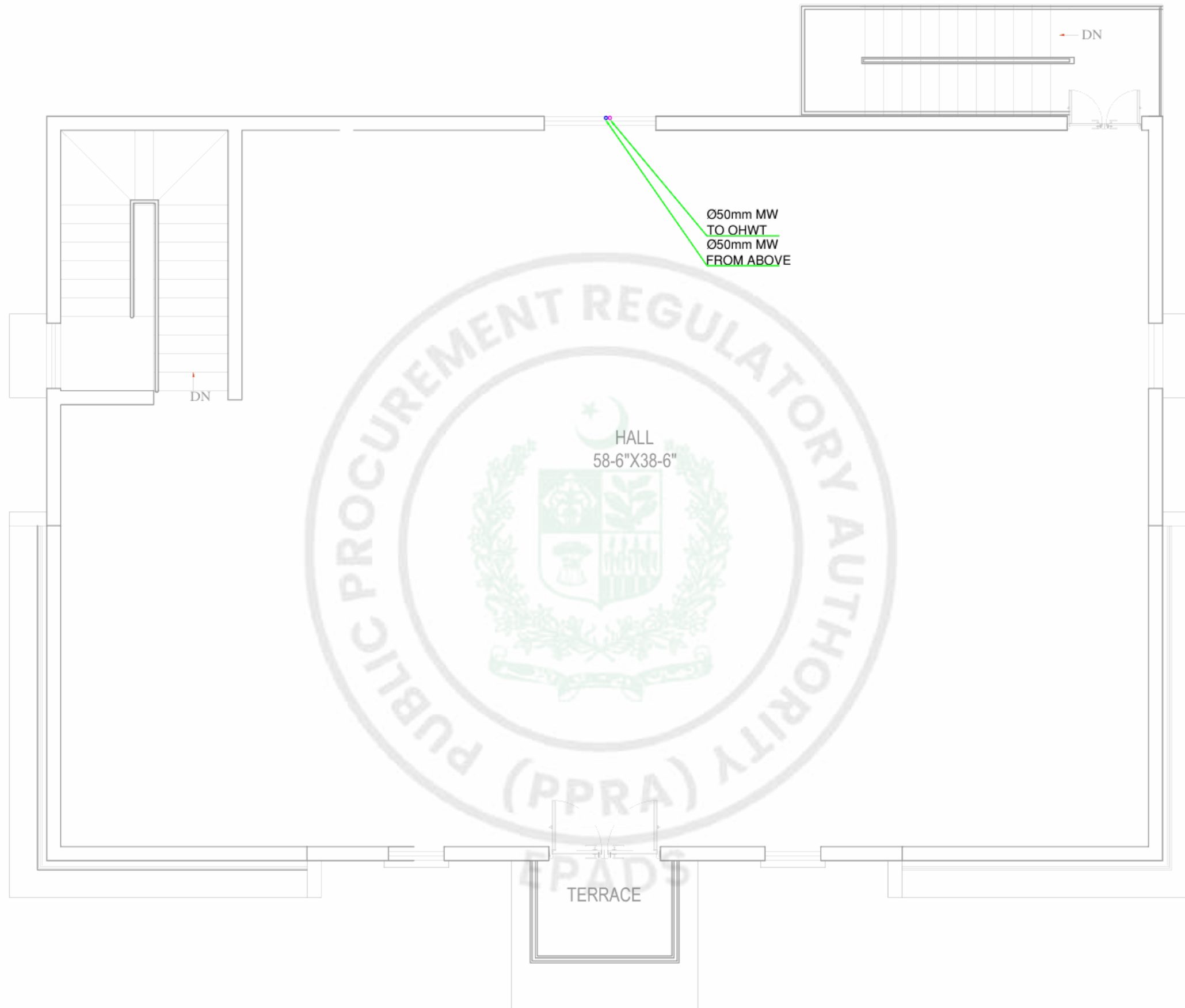
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	Mrs. Iram Jahangir	
Design By	Mrs. Iram Jahangir	
	Syed Jawed Shah	

Tender Drawings				TITLE	Job No.
				GROUND FLOOR WATER SUPPLY PLAN	Dwg. No. PL-13
REV.	DATE	DESCRIPTION	SCALE	AS SHOWN	Date
ORIGINAL SIZE A3					APRIL- 2026



DESIGN:

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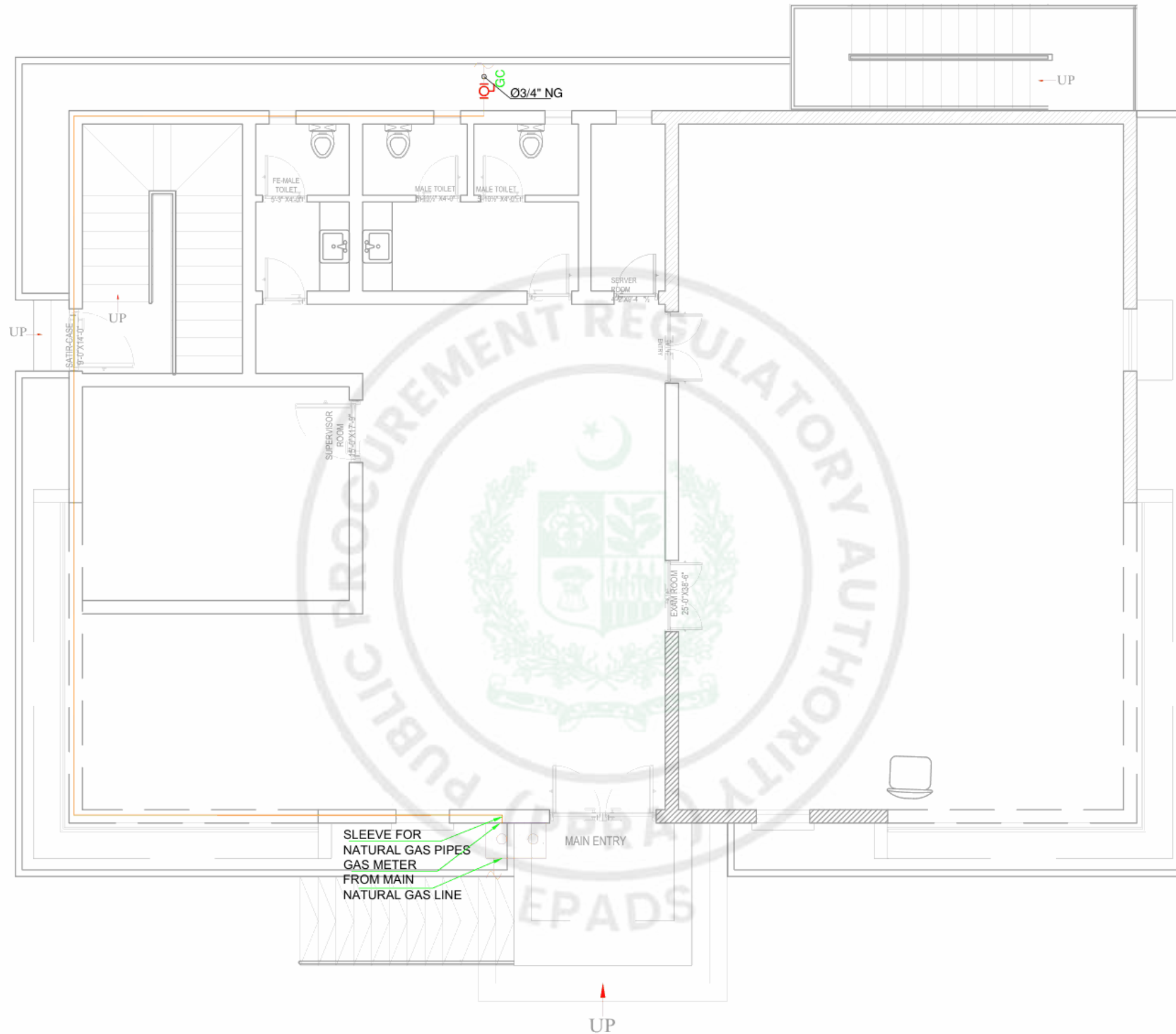
 **PAKISTAN CIVIL AVIATION AUTHORITY**

PROJECT:

PEL EXAMINATION CENTER KARACHI

Checked By	Syed Jawed Shah	
Drawing By	M. Noman	
	Mrs. Iram Jahangir	
Design By	Mrs. Iram Jahangir	
	Syed Jawed Shah	

Tender Drawings				TITLE	Job No.
				FIRST FLOOR WATER SUPPLY PLAN	Dwg. No. PL-14
REV.	DATE	DESCRIPTION	SCALE	AS SHOWN	Date
ORIGINAL SIZE A3					APRIL- 2026



DESIGN:



UMAR MUNSHI ASSOCIATES
CONSULTING ENGINEERS, ARCHITECTS
& PLANNERS

A-102, BLOCK-13-A, RAILWAYS EMPLOYEES CO-OPERATIVE
HOUSING SOCIETY, GULSHAN-E-IGBAL KARACHI-75300
PAKISTAN PHONE: (021) 34983541, 34980304,
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CLIENT:



PAKISTAN CIVIL AVIATION AUTHORITY

PROJECT:

PEL EXAMINATION CENTER KARACHI

Checked By	Syed Jawed Shah	
Drawing By	M. Noman	
	Mrs. Iram Jahangir	
Design By	Mrs. Iram Jahangir	
	Syed Jawed Shah	

Tender Drawings				TITLE	Job No.
				GROUND FLOOR NATURAL GAS PLAN	Dwg. No. PL-15
REV.	DATE.	DESCRIPTION	SCALE	AS SHOWN	Date
ORIGINAL SIZE A3					APRIL- 2026

List of Approved Banks

S. NO.	NAME OF BANK
Public Sector Banks	
1	National Bank of Pakistan
2	Sindh Bank Limited
3	The Bank of Punjab
Private Sector Banks	
4	Allied Bank Limited
5	Askari Bank Limited
6	Bank Al-Habib
7	Faysal Bank Limited
8	Habib Bank Limited
9	Habib Metropolitan Bank Limited
10	JS Bank Limited
11	MCB Bank Limited
12	Samba Bank Limited
13	Soneri Bank Limited
14	Standard Chartered Bank (Pakistan) Limited
15	United Bank Limited
16	Industrial & Commercial Bank of China Limited
Islamic Banks	
17	Al-Baraka Bank (Pakistan) Limited
18	Bank Islami Pakistan Limited
19	Dubai Islamic Bank (Pakistan) Limited
20	Meezan Bank Limited