

# **TENDER DOCUMENTS**

## **PROJECT:**

**CONSTRUCTION OF BOUNDARY WALL  
ALONG THE ACCESS ROADSIDES OF BHIKKI  
POWER PLANT, SHEIKHUPURA.**

## **CLIENT:**

**QUAID-E-AZAM THERMAL POWER LIMITED.**



## **CONSULTANT:**

**AZ ENGINEERING ASSOCIATES**



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**INVITATION  
FOR  
BIDS**

**TENDER NOTICE**  
**For**  
**Construction of Boundary Wall Along the Access Roadsides of Bhikki Power Plant**  
**Sheikhupura**

**Quaid-e-Azam Thermal Power Private Limited (QATPL)**

(Procurement No. 30-POWER PLANT-RLNG)

National Competitive  
Bidding

Sealed Tenders are invited from Firms / Companies for Construction of Boundary Wall along the Access Roadsides of Bhikki Power Plant Sheikhupura. Tender (Bidding) Documents can either be downloaded from PPRA website or obtained from the office of QATPL, 1<sup>st</sup> Floor, 7-C-1, Gulberg III, Lahore during office hours from the date of publication of this Notice till `25<sup>th</sup> July, 2024 (Thursday) at 03:00 pm, on payment of Rs.2,000/- (rupees two thousand only, Non-Refundable) on account of printing and provision of Tender (Bidding) Documents, in shape of Cash / Bank Draft in favour of "QATPL".

The Tenders / Bids must reach in the office of Manager Administration, QATPL, 1<sup>st</sup> Floor, 7-C-1, Gulberg III, Lahore before the closing date and time, i.e. `25<sup>th</sup> July, 2024 (Thursday) at 03:00 pm. The Technical Bids will be opened on the same date at 03:30 pm in Conference Room, QATPL, 1<sup>st</sup> Floor, 7-C-1, Gulberg III, Lahore, in the presence of the bidders who desire to attend. The financial bids of only technically qualified bidders will be opened on the date, time and venue communicated later. The detailed scope of work and TORs are given in the Tender /Bidding Documents.

1. Bidding will be carried out by adopting "Single Stage Two Envelopes" procedure as per Clause-38(2) (a) of Punjab Procurement Rule-2014.
2. The bid shall be a single package consisting of two separate envelopes, containing separately marked as "Technical Bid" and "Financial Bid".
3. Incomplete bids or bids covering partial scope of work will be rejected.
4. The acceptance / rejection of bids shall be governed by Punjab Procurement Rules - 2014.
5. The applicant must be registered with Registrar of Firms or SECP.
6. The Bid should accompany Bid Security (refundable) of PKR 1,599,178 in the shape of CDR / Pay Order / Bank Draft / Bank Guarantee in favour of QATPL which is the 2% of the estimated cost i.e., PKR 79.959 million.
7. The bidder shall provide his, National Income Tax Number, Punjab Revenue Authority Registration, undertaking on judicial paper that the Contractor / Firm / Company has not been blacklisted or past record of terminated / incomplete works of similar nature, by any Government, Semi-Government, autonomous Body or Organization and Undertaking on judicial paper for adherence to timeline.

Late bids will be rejected and returned unopened to bidders. The Procuring Agency reserves the right to reject all bids at any time prior to the acceptance of a bid.

**GENERAL MANAGER ADMINISTRATION**

Quaid-e-Azam Thermal Power Private Limited

1st Floor, 7-C-1, Gulberg 3, Lahore

Phone:042-35750936-38,

e-mail: [gadminhr@qathermal.com](mailto:gadminhr@qathermal.com)

**INSTRUCTIONS  
TO  
BIDDERS**

## INSTRUCTIONS TO BIDDERS

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

### A. GENERAL

#### IB.1 Scope of Bid

- 1.1 The Employer as defined in the Bidding Data hereinafter called “the Employer” wishes to receive bids for the construction and completion of works as described in these Bidding Documents, and summarized in the Bidding Data hereinafter referred to as the “Works”.
- 1.2 The successful bidder will be expected to complete the Works within the time specified in Appendix-A to Bid.

#### IB.2 Source of Funds

- 2.1 The Employer has the budget available under its head for the Construction of Boundary Wall along the access roadsides of Bhikki Power Plant, Sheikhpura. All the payments will be made according to the TORs defined in the bidding documents.

#### IB.3 Eligible Bidders

- 3.1 This Invitation for Bids is open to all bidders meeting following requirement:
  - Duly licensed by the Pakistan Engineering Council (PEC) in the category relevant to the value of the Works.

#### IB.4 One Bid per Bidder

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

#### IB.5 Cost of Bidding

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

**IB.6 Site Visit**

- 6.1 The bidders are advised to visit and examine the Site of Works and its surroundings and obtain for themselves on their own responsibility all information that may be necessary for preparing the bid and entering into a contract for construction of the Works. All cost in this respect shall be at the bidder's own expense.
- 6.2 The bidders and any of their personnel or agents will be granted permission by the Employer to enter upon his premises and lands for the purpose of such inspection, but only upon the express condition that the bidders, their personnel and agents, will release and indemnify the Employer, his personnel and agents from and against all liability in respect thereof and will be responsible for death or personal injury, loss of or damage to property and any other loss, damage, costs and expenses incurred as a result of such inspection.

**B. BIDDING DOCUMENTS****IB.7 Contents of Bidding Documents**

- 7.1 The Bidding Documents, in addition to invitation for bids, are those stated below and should be read in conjunction with any Addenda issued in accordance with Clause IB.9.
1. Instructions to Bidders.
  2. Bidding Data.
  3. General Conditions of Contract, Part-I (GCC).
  4. Particular Conditions of Contract, Part-II (PCC).
  5. Specifications - Technical Provisions.
  6. Form of Bid & Appendices to Bid.
  7. Bill of Quantities.
  8. Form of Contract Agreement.
  9. Forms of Performance Security.
  10. Drawings.
- 7.2 The bidders are expected to examine carefully the contents of all the above documents. Failure to comply with the requirements of bid submission will be at the Bidder's own risk. Pursuant to Clause IB.26, bids which are not substantially responsive to the requirements of the Bidding Documents will be rejected.

**IB.8 Clarification of Bidding Documents**

- 8.1 Any prospective bidder requiring any clarification (s) in respect of the Bidding Documents may notify the Employer in writing at the Employer's address indicated in the Invitation for Bids. The Employer will respond to any request for clarification which he receives earlier than 10 days prior to the deadline for submission of bids.



Copies of the Employer's response will be forwarded to all purchasers of the Bidding Documents, including a description of the enquiry but without identifying its source.

#### **IB.9 Amendment of Bidding Documents**

- 9.1 At any time prior to the deadline for submission of bids, the Employer may, for any reason, whether at his own initiative or in response to a clarification requested by a prospective bidder, modify the Bidding Documents by issuing addendum.
- 9.2 Any addendum thus issued shall be part of the Bidding Documents pursuant to Sub-Clause 7.1 hereof and shall be communicated in writing to all purchasers of the Bidding Documents. Prospective bidders shall acknowledge receipt of each addendum in writing to the Employer.
- 9.3 To afford prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer may extend the deadline for submission of bids in accordance with Clause IB.20

### **C. PREPARATION OF BIDS**

#### **IB.10 Language of Bid**

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

#### **IB.11 Documents Accompanying the Bid**

- 11.1 Each bidder shall:
  - (a) submit a written power of attorney authorizing the signatory of the bid to act for and on behalf of the bidder;
  - (b) update the information indicated and listed in the Bidding Data include the following:
    - (i) Evidence of access to financial resources alongwith average annual construction turnover;

- (ii) Financial predictions for the current year and the two following years including the effect of known commitments;
- (iii) Current Work commitments;
- (iv) Current litigation information; and
- (v) Availability of critical equipment.

and

- (c) furnish a technical proposal taking into account the various Appendices to Bid specially the following:

Appendix-C to Bid	Proposed Construction Schedule
Appendix-D to Bid	Method of Performing the Work
Appendix-E to Bid	List of Major Equipment
Appendix-F to Bid	Organization Chart for Supervisory Staff

- 11.2 Bids submitted by a joint venture of two (2) firms shall comply with the following requirements:

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

- 11.3 Bidders shall also submit proposals of work methods and schedule, in sufficient detail to demonstrate the adequacy of the Bidders' proposals to meet the technical specifications and the completion time referred to in Sub-Clause 1.2 hereof.

**IB.12 Bid Prices**

- 12.1 Unless stated otherwise in the Bidding Documents, the Contract shall be for the whole of the Works as described in Sub-Clause 1.1 hereof, based on the unit rates and / or prices submitted by the bidder.
- 12.2 The bidders shall fill in rates and prices for all items of the Works described in the Bill of Quantities. Items against which no rate or price is entered by a bidder will not be paid for by the Employer when executed and shall be deemed covered by rates and prices for other items in the Bill of Quantities.
- 12.3 All duties, taxes and other levies payable by the Contractor under the Contract, or for any other cause, as on the deadline for submission of bids shall be included in the rates and prices and the total Bid Price submitted by a bidder.

Additional / reduced duties, taxes and levies due to subsequent additions or changes in legislation shall be reimbursed / deducted.

**IB.13 Currencies of Bid and Payment**

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

For the purpose of payments, the exchange rates used in bid preparation shall apply for the duration of the Contract.

#### **IB.14 Bid Validity**

- 14.1 Bids shall remain valid for the period stipulated in the Bidding Data after the Date of Bid Opening specified in Clause IB.23.
- 14.2 In exceptional circumstances, prior to expiry of the original bid validity period, the Employer may request that the bidders extend the period of validity for a specified additional period which shall in no case be more than the original bid validity period. The request and the responses thereto shall be made in writing. A bidder may refuse the request without forfeiting his Bid Security. A bidder agreeing to the request will not be required or permitted to modify his bid, but will be required to extend the validity of his Bid Security for the period of the extension, and in compliance with Clause IB.15 in all respects.

#### **IB.15 Bid Security**

- 15.1 Each bidder shall furnish, as part of his technical bid, a Bid Security in the amount stipulated in the Bidding Data in Pak Rupees.
- 15.2 The Bid Security shall be, at the option of the bidder, in the form of Deposit at Call or a Bank Guarantee issued by a Scheduled Bank in Pakistan.
- 15.3 Any bid not accompanied by an acceptable Bid Security shall be rejected by the Employer as non-responsive.
- 15.4 The bid securities of unsuccessful bidders will be returned as promptly as possible, but not later than 28 days after the expiration of the period of Bid Validity.
- 15.5 The Bid Security of the successful bidder will be returned when the bidder has furnished the required Performance Security and signed the Contract Agreement.
- 15.6 The Bid Security may be forfeited:
  - (a) if the bidder withdraws his bid except as provided in Sub-Clause 22.1;
  - (b) if the bidder does not accept the correction of his Bid Price pursuant to Sub-Clause 27.2 hereof; or

- (c) In the case of successful bidder, if he fails within the specified time limit to:
  - (i) furnish the required Performance Security; or
  - (ii) sign the Contract Agreement.

#### **IB.16 Alternate Proposals by Bidder**

- 16.1 Should any bidder consider that he can offer any advantages to the Employer by a modification to the designs, specifications or other conditions, he may, in addition to his bid to be submitted in strict compliance with the Bidding Documents, submit any Alternate Proposal(s) containing (a) relevant design calculations; (b) technical specifications; (c) proposed construction methodology; and (d) any other relevant details / conditions, provided always that the total sum entered on the Form of Bid shall be that which represents complete compliance with the Bidding Documents.
- 16.2 Alternate Proposal(s), if any, of the lowest evaluated responsive bidder only may be considered by the Employer as the basis for the award of Contract to such bidder.

#### **IB.17 Pre-Bid Meeting**

- 17.1 The Employer may, on his own motion or at the request of any prospective bidder(s), hold a pre-bid meeting to clarify issues and to answer any questions on matters related to the Bidding Documents. The date, time and venue of pre-bid meeting, if convened, is as stipulated in the Bidding Data. All prospective bidders or their authorized representatives shall be invited to attend such a pre-bid meeting.
- 17.2 The bidders are requested to submit questions, if any, in writing so as to reach the Employer not later than ten (10) days before the deadline of submission of Bids.
- 17.3 Minutes of the pre-bid meeting, including the text of the questions raised and the replies given, will be transmitted without delay to all purchasers of the Bidding Documents. Any modification of the Bidding Documents listed in Sub-Clause 7.1 hereof which may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of an Addendum pursuant to Clause IB.9 and not through the minutes of the pre-bid meeting.
- 17.4 Absence at the pre-bid meeting will not be a cause for disqualification of a bidder.

**IB.18 Format and Signing of Bid**

- 18.1 Bidders are particularly directed that the amount entered on the Form of Bid shall be for performing the Contract strictly in accordance with the Bidding Documents.
- 18.2 All appendices to Bid are to be properly completed and signed.
- 18.3 No alteration is to be not made in the Form of Bid nor in the Appendices thereto except in filling up the blanks as directed. If any such alterations be made or if these instructions be not fully complied with, the bid may be rejected.
- 18.4 Each bidder shall prepare by filling out the forms completely and without alterations one (1) original and (2) two number of copies, specified in the Bidding Data, of the documents comprising the bid as described in Clause IB.7 and clearly mark them "ORIGINAL" and "COPY" as appropriate. In the event of discrepancy between them, the original shall prevail.
- 18.5 The original and all copies of the bid shall be typed or written in indelible ink (in the case of copies, Photostats are also acceptable) and shall be signed by a person or persons duly authorized to sign on behalf of the bidder pursuant to Sub- Clause 11.1(a) hereof. All pages of the bid shall be initialed and stamped by the person or persons signing the bid.
- 18.6 The bid shall contain no alterations, omissions or additions, except to comply with instructions issued by the Employer, or as are necessary to correct errors made by the bidder, in which case such corrections shall be initialed by the person or persons signing the bid.
- 18.7 Bidders shall indicate in the space provided in the Form of Bid their full and proper addresses at which notices may be legally served on them and to which all correspondence in connection with their bids and the Contract is to be sent.
- 18.8 Bidders should retain a copy of the Bidding Documents as their file copy.

**D. SUBMISSION OF BIDS****IB.19 Sealing and Marking of Bids**

- 19.1 Each bidder shall submit his bid as under:
- (a) ORIGINAL and each copy of the Bid shall be separately sealed and put in separate envelopes and marked as such.
  - (b) The envelopes containing the ORIGINAL and copies will be put in one sealed envelope and addressed / identified as given in Sub- Clause 19.2 hereof.

- 19.2 The inner and outer envelopes shall:
- (a) be addressed to the Employer at the address provided in the Bidding Data;
  - (b) bear the name and identification number of the contract as defined in the Bidding Data; and
  - (c) provide a warning not to open before the time and date for bid opening, as specified in the Bidding Data.
- 19.3 In addition to the identification required in Sub- Clause 19.2 hereof, the inner envelope shall indicate the name and address of the bidder to enable the bid to be returned unopened in case it is declared “late” pursuant to Clause IB.21
- 19.4 If the outer envelope is not sealed and marked as above, the Employer will assume no responsibility for the misplacement or premature opening of the Bid.

#### **IB.20 Deadline for Submission of Bids**

- 20.1 (a) Bids must be received by the Employer at the address specified no later than the time and date stipulated in the Bidding Data.
- (b) Bids with charges payable will not be accepted, nor will arrangements be undertaken to collect the bids from any delivery point other than that specified above. Bidders shall bear all expenses incurred in the preparation and delivery of bids. No claims will be entertained for refund of such expenses.
- (c) Where delivery of a bid is by mail and the bidder wishes to receive an acknowledgment of receipt of such bid, he shall make a request for such acknowledgment in a separate letter attached to but not included in the sealed bid package.
- (d) Upon request, acknowledgment of receipt of bids will be provided to those making delivery in person or by messenger.
- 20.2 The Employer may, at his discretion, extend the deadline for submission of bids by issuing an amendment in accordance with Clause IB.9, in which case all rights and obligations of the Employer and the bidders previously subject to the original deadline will thereafter be subject to the deadline as extended.

#### **IB.21 Late Bids**

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

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

**IB.22 Modification, Substitution and Withdrawal of Bids**

- 22.1 Any bidder may modify, substitute or withdraw his bid after bid submission provided that the modification, substitution or written notice of withdrawal is received by the Employer prior to the deadline for submission of bids.
- 22.2 The modification, substitution, or notice for withdrawal of any bid shall be prepared, sealed, marked and delivered in accordance with the provisions of Clause IB.19 with the outer and inner envelopes additionally marked "MODIFICATION", "SUBSTITUTION" or "WITHDRAWAL" as appropriate.
- 22.3 No bid may be modified by a bidder after the deadline for submission of bids except in accordance with Sub-Clauses 22.1 and 27.2.
- 22.4 Withdrawal of a bid during the interval between the deadline for submission of bids and the expiration of the period of bid validity specified in the Form of Bid may result in forfeiture of the Bid Security in pursuance to Clause IB.15.

**E. BID OPENING AND EVALUATION**

**IB.23 Bid Opening**

- 23.1 The Employer will open the bids, including withdrawals, substitution and modifications made pursuant to Clause IB.22, in the presence of bidders' representatives who choose to attend, at the time, date and location stipulated in the Bidding Data. The bidders' representatives who are present shall sign a register evidencing their attendance.
- 23.2 Envelopes marked "MODIFICATION", "SUBSTITUTION" or "WITHDRAWAL" shall be opened and read out first. Bids for which an acceptable notice of withdrawal has been submitted pursuant to Clause IB.22 shall not be opened.
- 23.3 The bidder's name, total Bid Price and price of any Alternate Proposal(s), any discounts, bid modifications, substitution and withdrawals, the presence or absence of Bid Security, and such other details as the Employer may consider appropriate, will be announced by the Employer at the opening of bids.



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

#### **IB.24 Process to be Confidential**

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

#### **IB.25 Clarification of Bids**

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

#### **IB.26 Examination of Bids and Determination of Responsiveness**

- 26.1 Prior to the detailed evaluation of bids, the Employer will determine whether each bid is substantially responsive to the requirements of the Bidding Documents.
- 26.2 A substantially responsive bid is one which (i) meets the eligibility criteria; (ii) has been properly signed; (iii) is accompanied by the required Bid Security; and (iv) conforms to all the terms, conditions and specifications of the Bidding Documents, without material deviation or reservation. A material deviation or reservation is one (i) which affect in any substantial way the scope, quality or performance of the Works; (ii) which limits in any substantial way, inconsistent with the Bidding Documents, the Employer's rights or the bidder's obligations under the Contract; or (iii) adoption/rectification whereof would affect unfairly the competitive position of other bidders presenting substantially responsive bids.

- 26.3 If a bid is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the non-conforming deviation or reservation.

### **IB.27 Correction of Errors**

- 27.1 Bids determined to be substantially responsive will be checked by the Employer for any arithmetic errors. Errors will be corrected by the Employer as follows:
- (a) where there is a discrepancy between the amounts in figures and in words, the amount in words will govern; and
  - (b) where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern, unless in the opinion of the Employer there is an obviously gross misplacement of the decimal point in the unit rate, in which case the line item total as quoted will govern and the unit rate will be corrected.
- 27.2 The amount stated in the Form of Bid will be adjusted by the Employer in accordance with the above procedure for the correction of errors and with the concurrence of the bidder, shall be considered as binding upon the bidder. If the bidder does not accept the corrected Bid Price, his Bid will be rejected, and the Bid Security shall be forfeited in accordance with Sub- Clause 15.6(b) hereof.

### **IB.28 Evaluation and Comparison of Bids**

- 28.1 The Employer will evaluate and compare only the Bids determined to be substantially responsive in accordance with Clause IB.26.
- 28.2 In evaluating the Bids, the Employer will determine for each Bid the evaluated Bid Price by adjusting the Bid Price as follows:
- (a) making any correction for errors pursuant to Clause IB.27;
  - (b) excluding Provisional Sums and the provision, if any, for contingencies in the Summary Bill of Quantities, but including competitively priced Day work; and
  - (c) making an appropriate adjustment for any other acceptable variation or deviation.
- 28.3 The estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the Contract, shall not be taken into account in Bid evaluation.

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

## **F. AWARD OF CONTRACT**

### **IB.29 Award**

- 29.1 Subject to Clauses IB.30 and IB.34, the Employer will award the Contract to the bidder whose bid has been determined to be substantially responsive to the Bidding Documents and who has offered the lowest evaluated Bid Price, provided that such bidder has been determined to be eligible in accordance with the provisions of Clause IB.3 and qualify pursuant to Sub-Clause IB 29.2.
- 29.2 The Employer, at any stage of the bid evaluation, having credible reasons for or *prima facie* evidence of any defect in supplier's or contractor's capacities, may require the suppliers or contractors to provide information concerning their professional, technical, financial, legal or managerial competence whether already pre-qualified or not:

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

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

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

**IB.31 Notification of Award**

- 31.1 Prior to expiration of the period of bid validity prescribed by the Employer, the Employer will notify the successful bidder in writing (“Letter of Acceptance”) that his Bid has been accepted. This letter shall name the sum which the Employer will pay the Contractor in consideration of the execution and completion of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Conditions of Contract called the “Contract Price”).
- 31.2 No Negotiation with the bidder having evaluated as lowest responsive or any other bidder shall be permitted, however, Employer may have clarification meetings to get clarify any item in the bid evaluation report.
- 31.3 The notification of award and its acceptance by the bidder will constitute the formation of the Contract, binding the Employer and the bidder till signing of the formal Contract Agreement.
- 31.3 Upon furnishing by the successful bidder of a Performance Security, the Employer will promptly notify the other bidders that their Bids have been unsuccessful and return their bid securities.

**IB.32 Performance Security**

- 32.1 The successful bidder shall furnish to the Employer a Performance Security in the form and the amount stipulated in the Bidding Data and the Conditions of Contract within a period of 10 days after the receipt of Letter of Acceptance.
- 32.2 Failure of the successful bidder to comply with the requirements of Sub-Clause IB.32.1 or Clauses IB.33 or IB.35 shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Security.

**IB.33 Signing of Contract Agreement**

- 33.1 Within 07 days from the date of furnishing of acceptable Performance Security under the Conditions of Contract, the Employer will send the successful bidder the Contract Agreement in the form provided in the Bidding Documents, incorporating all agreements between the parties.
- 33.2 The formal Agreement between the Employer and the successful bidder shall be executed within 07 days of the receipt of the Contract Agreement by the successful bidder from the Employer.

**IB.34 General Performance of the Bidders**

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

**IB.35 Integrity Pact**

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

**IB.36 Instructions not Part of Contract**

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

# **BIDDING DATA**

**BD-1  
BIDDING DATA**

**Bidding Data****1.1 Name and address of the Employer:**

*Quaid-e-Azam Thermal Power (Pvt.) Limited.*

*1<sup>st</sup> Floor, 7-C-1, Gulberg III, Lahore.*

**1.1.1 Name of the Project & Summary of the Works:**

*Construction of Boundary Wall along the Access Roadsides of Bhikki Power Plant Sheikhpura.*

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

*Quaid-e-Azam Thermal Power (Pvt.) Limited.*

**2.1 Amount and type of financing: N/A****3.1 Time limit for clarification:**

*Clarification may be requested not later than 10 days prior to submission deadline. The contact information for requesting clarification is 042-35750936-8*

**4.1 Bid language:**

*Proposal shall be submitted in English Language. All correspondence exchange shall be in English Language.*

**4.1(c) Furnish Technical Proposal (Mandatory):**

- Undertaking on E-stamp paper of PKR 200 that applicant is not blacklisted, information provided are correct, bankruptcy, conflict of interest and there being no pending litigation.
- Power of attorney on a stamp paper for authorized signatory of proposal.
- Registration certificate with FBR, PRA and SECP/ Registrar of Firms.
- Registration with PEC in C-4 and above having CE10 and EE04.
- Audit statement and FBR Tax return last 3 years
- In case of JV/ Consortium the memorandum of understanding on a E-stamp paper of PKR 1200 between the parties duly attested by Notary Public, should be in line with PEC Guide lines.
- Performance/ Completion certificates duly signed by the client.
- All pages of the bidding document duly signed and stamped by the bidder and shall be returned with technical Proposal.



5.1 *Bidders to quote entirely in Pak. rupees*

6.1 Period of Bid Validity:

*Proposal must remain valid for 180 days*

7.1 Amount of Bid Security:

The Bid should accompany Bid Security (refundable) of PKR 1,599,178 in the shape of CDR / Pay Order / Bank Draft / Bank Guarantee in favour of QATPL which is the 2% of the estimated cost of project shall be furnished by the bidder and attached with Technical Proposal.

8.1 Venue, time, and date of the pre-Bid meeting:

N/A

9.1 Number of copies of the Bid to be completed and returned:

*Technical proposal 01 original 02 copies.*

*Financial proposal 01 original.*

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

Quaid-e-Azam Thermal Power Limited, 1<sup>st</sup> Floor, 7-C-1, Gulberg III, Lahore

10.1(a) Deadline for submission of bids:

Date and time: 25<sup>th</sup> July, 2024 (Thursday) at 03:00 pm.

**D-4**

11.1 Venue, time, and date of Bid opening:

Manager Administration, QATPL, 1<sup>st</sup> Floor, 7-C-1, Gulberg III, Lahore.

Date and time: 25<sup>th</sup> July, 2024 (Thursday) at 03:30 pm.

Venue: Conference Room, QATPL, 1<sup>st</sup> Floor, 7-C-1, Gulberg III, Lahore.

12.1 Standard form and amount of Performance Security acceptable to the Employer:

*Performance security @05% of the contract value in the form of Bank Guarantee by scheduled bank by State Bank of Pakistan.*

### 13.1 SELECTION PROCEDURE:-

The bidder shall be selected under the selection method of Least Cost Selection (LCS) according to Punjab Procurement Rules, 2014. The procedure for opening of proposals will follow the principles of P.E.C. and PPRA **Single stage – Two Envelope procedure**, which is presented as follows.

- The bid shall comprise a **single package** containing two separate envelopes. Each envelope shall contain **separately the financial proposal** and the **technical proposal** and clearly marked as “**FINANCIAL PROPOSAL**” and “**TECHNICAL PROPOSAL**” in bold and legible letters to avoid confusion.
- Initially, only the envelope marked “**TECHNICAL PROPOSAL**” be opened and the envelope marked as “**FINANCIAL PROPOSAL**” shall be retained in the custody of the procuring agency without being opened.
- The procuring agency shall evaluate the technical proposal in a manner prescribed in the Bidding Documents.
- During the technical evaluation no amendments in the technical proposal shall be permitted. After the evaluation and approval for the Technical Proposal, the procuring agency, shall at a time within the bid validity period, publicly open the *FINANCIAL PROPOSALS* of the technically qualified firms at a time, date and venue announced and communicated to the bidders in advance for the attendance of their authorized representative duly notified in advance.

### 14.1 The weightage given to the Technical & Financial proposals are:-

**Technical:** Proposal passing the technical score of 70 & above shall be treated and evaluated on the basis of cost only. Less than 70 score in Technical Proposal bid will not entertained for Financial Proposal.

**Financial:** The selection will be made on the basis of lowest financial bid among the technically qualified bidders.

#### 14.1 EVALUATION CRITERIA:-

##### a) General Experience

Sr. No.	Description	Marks Assigned	Explanation for Marks Obtained
a)	Projects of similar nature and complexity completed in last ten years. Civil and Electrical Works	25	<ul style="list-style-type: none"> <li>25 Marks are given if the contractor has completed at least 3 projects of similar nature in last ten years.</li> <li>16 Marks for 2 projects completed during last ten years.</li> <li>No Mark is awarded for less than 02 Projects.</li> </ul>
b)	Projects of similar nature and complexity in-hand. Civil and Electrical Works	10	<ul style="list-style-type: none"> <li>10 Marks are given if the contractor has 02 projects of similar nature in-hand.</li> <li>05 Marks for 01 Project in-hand</li> <li>No Mark is awarded for less than 01 Projects.</li> </ul>
<b>Total Marks Allocated</b>			<b>35</b>

##### b) Personnel Capabilities

Credit Marks will be awarded under this category using the following criteria:

Sr. No.	Description	Marks Assigned	Explanation for Marks Obtained
i)	B.Sc. Engineer registered with Pakistan Engineering Council (PEC)	9	<p><b><u>Experience (4.5-Marks for each Graduate Engineer) :</u></b></p> <ul style="list-style-type: none"> <li>4.5 Marks will be given if the individual experience of at least 1 No. B.Sc. Civil Engineer (professional) is equal to 07 years or above.</li> <li>1 No. BSc. Electrical. Engineer (professional) is equal to 05 years or above.</li> <li>No Mark will be given if the experience of Graduate Engineer is less than 07 years.</li> </ul> <p><b><u>Strength of Engineers (9 Marks)</u></b></p>

ii)	<p>Associates Engineers (DAE)</p> <p>Minimum requirement is 2 No. Associate Engineers – DAE comprising of 1 No. Civil, 1 No. Electrical (DAE in relevant technology).</p>	6	<p><b><u>Experience (3-Marks for each Associate Engineer) :</u></b></p> <ul style="list-style-type: none"> <li>3 Marks will be awarded for each Associate Engineer (DAE) if the individual experience of at least 2 No. Associate Engineers is 08 years or above.</li> <li>No Mark is given if the individual experience is less than 08 years.</li> </ul> <p><b><u>Strength of Associate Engineers (6 Marks).</u></b></p>
<b>Total Marks Allocated</b>			<b>15</b>

c). **Equipment Capability**

Critical equipment required for the Project is listed below:

Sr. No.	Description	Marks Assigned	Explanation for Marks Obtained
<b><u>Equipment &amp; Machinery</u></b>			
1	Survey Equipment 2 Sets	02	<ul style="list-style-type: none"> <li>Full Marks for each equipment are given if the Contractor meets the prescribed requirements for each item.</li> <li>If the available quantity of each equipment is more than the minimum equipment requirement, full marks will be given.</li> </ul>
2	Dumper Trucks / Tractor Trolley 01 No with copy of Registration of Tractor/Dumper and owner name as proof.	02	
3	Steel cutting & Bending Machine 1 No.	02	
4	Generator 1 No	01	
	Road Roller 1 No	01	
5	Welding Machine 1 No	01	
<b><u>Minimum Essential Requirement:</u></b>			
6	Equipment Lift 01 No.	02	
9	<p>i) Concrete Mixer 1 Bags capacity - 2 Points</p> <p>ii) Concrete Mixer 2 Bag Capacity- 4 Points</p> <p>iii) Vibrators 03 No. - 3 Points</p> <p><b>Total Marks = 2+4+3 = 09 Marks</b></p>	09	<ul style="list-style-type: none"> <li>Total Marks :</li> </ul>
<b>Total Marks Allocated</b>			<b>20</b>

d) **Financial Soundness**

- For Financial Status assessment, the Applicants may be required to submit **Audited Financial Statements** for the last three years or any other document which verifies their Financial Status.
- Credit marks shall be awarded on the basis of following criteria:

Sr. No.	Description	Marks Assigned	Criteria for Marks Obtained
a)	Available Bank Credit Line (Proof to be attached which can be subject to verification from Bank)	10	<ul style="list-style-type: none"> <li>• Full marks are given if the available bank credit line limit is equal to 20 Million or above.</li> <li>• 07 Marks for 15 Million to 19.99 bank credit line limit.</li> <li>• 4 Marks for credit limit falling between 05 M to 14.99 M proportionate marks will be given.</li> <li>• No Mark is given if available bank credit line limit is less than 4.99 Million.</li> </ul>
b)	Annual Turnover and Annual Audit Report of last 3 years duly certified by the Chartered Accountant is Compulsory.	10	<ul style="list-style-type: none"> <li>• Full marks are given if Turnover for last three years is equal to 50 Million.</li> <li>• 07 Marks for if the available average Turnover for last three years is equal to 35 to 50 Million</li> <li>• If average Turnover for last three years falls between 20 M to 35 M proportionate marks will be given.</li> <li>• No Mark shall be given if working capital is less than 20 Million.</li> </ul>
c)	<p><b>Bid Capacity:</b></p> <p><b>Net Bid Capacity</b> = Available Capital – 20% of the cost of all balance works in hand.</p> <p><b>Available Capital</b> = Available Bank Credit Line + Average Working Capital of last three years as per Annual Audit Report.</p> <p><i>Note : Cost of balance works in hand should be attached</i></p>	10	<ul style="list-style-type: none"> <li>• Full marks shall be given if the <b>Bid Capacity</b> is Rs. 50.0 Million or more.</li> <li>• 7 Marks shall be given if the net <b>Bid Capacity</b> is equal to Rs 30.0 Million to 50 Million</li> <li>• 4 Marks shall be given if the net <b>Bid Capacity</b> is equal to Rs 20.0 Million to 30 million.</li> <li>• For <b>Bid Capacity</b> less than Rs 20.0 Million no mark shall be given.</li> </ul>
<b>Total Marks Allocated</b>			<b>30</b>

- \* For completed projects completion certificate Or Contract Agreement of respective project is mandatory. No marks shall be awarded if completion certificate or contract agreement of respective project is not attached.
- \*\* Proposal passing the technical score of 70 & above shall be treated and evaluated on the basis of cost only. Less than 70 score in Technical Proposal bid will not entertained for Financial Proposal.
- \*\*\* The selection will be made on the basis of lowest financial bid among the technically qualified bidders.

**FORM OF BID  
AND  
APPENDICES TO BID**

**FORM OF BID**

Bid Reference No. \_\_\_\_\_  
 (Name of Contract/Works)

To:  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Gentleman,

1. Having examined the Bidding Documents including Instructions to Bidders, Bidding Data, and Conditions of Contract. Specifications, Drawings and Bill of Quantities and Addenda Nos. \_\_\_\_\_ for the execution of the above-named Works, we, the undersigned, offer to execute and complete such Works and remedy any defects therein in conformity with the Conditions of Contract. Specifications, Drawings, Bill of Quantities and Addenda for the sum of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_) or such other sum as may be ascertained in accordance with the said conditions.
2. We understand that all the Appendices attached hereto form part of this Bid.
3. As security for due performance of the undertakings and obligations of this Bid, we submit herewith a Bid Security in the amount of Rupees \_\_\_\_\_ (Rs. \_\_\_\_\_) drawn in your favour or made payable to you and valid for a period of \_\_\_\_\_ days beginning from the date Bids are opened.
4. We undertake, if our Bid is accepted, to commence the Works and to complete the whole of the Works comprised in the Contract within the time stated in Appendix-A to Bid.
5. We agree to abide by this Bid for the period of \_\_\_\_\_ days from the date fixed for receiving the same and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
6. Unless and until a formal Agreement is prepared and executed, this Bid, together with your written acceptance thereof, shall constitute a binding contract between us.
7. We do hereby declare that the Bid is made without any collusion, comparison of figures or arrangement with any other bidder for the Works.



8. We understand that you are not bound to accept the lowest or any Bid you may receive.

Dated this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_\_

Signature: \_\_\_\_\_

In the capacity of \_\_\_\_\_ duly authorized to sign Bids for and on behalf of

\_\_\_\_\_  
(Name of Bidder in Block Capitals)  
(Seal)

Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Witness:

Signature: \_\_\_\_\_

Name: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_

Occupation \_\_\_\_\_

**SPECIAL STIPULATIONS**

**Clause**

**Conditions of Contract**

1.	Engineer's Authority to issue Variation in emergency	2.1	2% of the Contract Price stated in the Letter of Acceptance.
2.	Amount of Performance Security	10.1	05% of Contract Price stated in the Letter of Acceptance.
3.	Time for Furnishing Programme	14.1	Within 10 days from the date of receipt of Letter of Acceptance.
5.	Time for Commencement	41.1	Within 07 days from the date of receipt of Engineer's Notice to Commence which shall be issued within fourteen (14) days after signing of Contract Agreement.
6.	Time for Completion	43.1, 48.2	150 days from the date of receipt of Engineer's Notice to Commence.
7.	Amount of Liquidated Damages	47.1	0.1% for each day of delay in completion of the Works subject to a maximum of 10% of Contract Price stated in the Letter of Acceptance.
8.	Defects Liability Period	49.1	365 days from the effective date of Taking Over Certificate.
9.	Percentage of Retention Money	60.2	10% of the amount of Interim Payment Certificate.
10.	Time of Payment from delivery of Engineer's Interim Payment Certificate to the Employer.	60.10	28 days in case of local currency

**BILL OF QUANTITIES**

**A. Preamble**

1. The Bill of Quantities shall be read in conjunction with the Conditions of Contract, Specifications and Drawings.
2. The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work executed and measured by the Contractor and verified by the Engineer and valued at the rates and prices entered in the priced Bill of Quantities, where applicable, and otherwise at such rates and prices as the Engineer may fix as per the Contract.
3. The rates and prices entered in the priced Bill of Quantities shall, except insofar as it is otherwise provided under the Contract include all costs of Contractor's plant, labour, supervision, materials, execution, insurance, profit, taxes and duties, together with all general risks, liabilities and obligations set out or implied in the Contract. Furthermore all duties, taxes and other levies payable by the Contractor under the Contract, or for any other cause, as on the date 28 days prior to deadline for submission of Bids, shall be included in the rates and prices and the total Bid Price submitted by the Bidder.
4. A rate or price shall be entered against each item in the priced Bill of Quantities, whether quantities are stated or not. The cost of items against which the Contractor will have failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities.
5. The whole cost of complying with the provisions of the Contract shall be included in the items provided in the priced Bill of Quantities, and where no items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related items of the Works.
6. General directions and description of work and materials are not necessarily repeated nor summarised in the Bill of Quantities. References to the relevant sections of the Bidding Documents shall be made before entering prices against each item in the priced Bill of Quantities.
7. Provisional sums included and so designated in the Bill of Quantities shall be expended in whole or in part at the direction and discretion of the Engineer in accordance with Sub-Clause 58.2 of Part I, General Conditions of Contract.

**BOQ is attached as Annexure-A**



**METHOD OF PERFORMING THE WORK**

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

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

**LIST OF MAJOR EQUIPMENT – RELATED ITEMS**

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

Appendix-E to Bid

LIST OF MAJOR EQUIPMENT

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

**CONSTRUCTION CAMP AND HOUSING FACILITIES**

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

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

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

1. Site Preparation (clearing, land preparation, etc.).
2. Provision of Services.
  - a) Power (expected power load, etc.).
  - b) Water (required amount and system proposed).
  - c) Sanitation (sewage disposal system, etc.).
3. Construction of Facilities
  - a) Contractor's Office. Workshop and Work Areas (areas required and proposed layout, type of construction of buildings, etc.).
  - b) Warehouses and Storage Areas (area required, type of construction and layout).
  - c) Housing and Staff Facilities (Plans for housing for proposed staff, layout, type of construction, etc.).
4. Construction Equipment Assembly and Preparation (detailed plans for carrying out this activity).
5. Other Items Proposed (Security services, etc.).



**LIST OF SUB-CONTRACTORS**

**[Sub-contractors are not allowed]**

## Appendix-H to Bid

**ESTIMATED PROGRESS PAYMENTS**

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

<b>Quarter/ Year/ Period</b>	<b>Amounts (1,000 Rs.)</b>
<b>1</b>	<b>2</b>
1 <sup>st</sup> Month	
2 <sup>nd</sup> Month	
3 <sup>rd</sup> Month	
4 <sup>th</sup> Month	
5 <sup>th</sup> Month	
6 <sup>th</sup> Month	
<b>Bid Price</b>	

**BK-1**

**Appendix-I to Bid**

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

(INTEGRITY PACT)

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

Contract No. \_\_\_\_\_ Dated \_\_\_\_\_  
Contract Value: \_\_\_\_\_  
Contract Title: \_\_\_\_\_

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

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

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

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

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

Name of Buyer: .....  
Signature: .....  
[Seal]

Name of Seller/Supplier: .....  
Signature: .....  
[Seal]

**FORMS**

**PERFORMANCE SECURITY  
CONTRACT AGREEMENT**

**FORM OF PERFORMANCE SECURITY  
(Bank Guarantee)**

Guarantee No. \_\_\_\_\_  
Executed on \_\_\_\_\_  
Expiry date \_\_\_\_\_

[Letter by the Guarantor to the Employer]

Name of Guarantor (Bank) with address: \_\_\_\_\_  
(Scheduled Bank in Pakistan)

Name of Principal (Contractor) with address: \_\_\_\_\_

Penal Sum of Security (express in words and figures) \_\_\_\_\_

Letter of Acceptance No. \_\_\_\_\_ Dated \_\_\_\_\_

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

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

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

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

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

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

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

	_____ Guarantor (Bank)
Witness:	
1. _____	Signature _____
_____	Name _____
Corporate Secretary (Seal)	Title _____
2. _____	
_____	_____
Name, Title & Address	Corporate Guarantor (Seal)

## FORM OF CONTRACT AGREEMENT

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

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

NOW this Agreement witnesseth as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.
2. The following documents after incorporating addenda, if any, except those parts relating to Instructions to Bidders shall be deemed to form and be read and construed as part of this Agreement, viz:
  - a) The Contract Agreement;
  - b) The Letter of Acceptance;
  - c) The completed Form of Bid;
  - d) Special Stipulations (Appendix-A to Bid);
  - e) The General Conditions of Contract – Part I;
  - f) The Particular Conditions of Contract – Part II;
  - g) The priced Bill of Quantities ;
  - h) The completed Appendices to Bid (B, C, E to J);
  - i) The Drawings;
  - j) The Specifications.
3. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy defects therein in conformity and in all respects with the provisions of the Contract.
4. The Employer hereby covenants to pay the Contractor, in consideration of the execution and completion of the Works as per provisions of the Contract, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.



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

Signature of the Contactor

Signature of Employer

\_\_\_\_\_  
(Seal)

\_\_\_\_\_  
(Seal)

Signed, Sealed and Delivered in the presence of:

Witness:

Witness:

\_\_\_\_\_

\_\_\_\_\_

(Name, Title and Address)

(Name, Title and Address)

**PART I - GENERAL CONDITIONS OF CONTRACT (GCC)**

General Conditions of Contract used in these Bidding Documents were prepared by the International Federation of Consulting Engineers (Federation International des Ingenieurs-Conseils, or FIDIC), and are commonly known as the FIDIC Conditions of Contract. The version used in these Bidding Documents is the fourth edition, 1987, reprinted in 1992 with further amendments.

Copies of the FIDIC Conditions of Contract can be obtained from:

FIDIC Secretariat

PO Box 86

1000 Lausanne 12

Switzerland

E-mail: [fidic.pub@fidic.org](mailto:fidic.pub@fidic.org)

[www.FIDIC.org/bookshop](http://www.FIDIC.org/bookshop)

**PART II - PARTICULAR CONDITIONS OF CONTRACT**

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

**1.1 Definitions**

(a) (i) The Employer is .....  
.....(insert name along with his full address).

(a) (iv) The Engineer is .....  
.....(insert name of the Firm/Company/Person nominated as Engineer along with his full address), or any other competent person appointed by the Employer, and notified to the Contractor, to act in replacement of the Engineer. Provided always that except in cases of professional misconduct, the outgoing Engineers is to formulate his certifications/recommendations in relation to all outstanding matters, disputes and claims relating to the execution of the Works during his tenure.

The following paragraph is added:

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

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

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

The following paragraph is added:

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

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

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

**2.1 Engineer's Duties and Authority**

With reference to Sub-Clause 2.1(b), the following provisions shall also apply;

The Engineer shall obtain the specific approval of the Employer before carrying out his duties in accordance with the following Clauses:

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

(ii) Certifying additional cost determined under Sub-Clause 12.2 “Not Foreseeable

Physical Obstructions or Conditions”.

- (iii) Any action under Clause 10 “Performance Security” and Clauses 21,23,24 & 25 “Insurance” of sorts.
- (iv) Any action under Clause 40 “Suspension”.
- (v) Any action under Clause 44 “Extension of Time for Completion”.
- (vi) Any action under Clause 47 “Liquidated Damages for Delay” or Payment of Bonus for Early Completion of Works (PCC Sub-Clause 47.3).
- (vii) Issuance of “Taking Over Certificate” under Clause 48.
- (viii) Issuing a Variation Order under Clause 51,except:
  - a) in an emergency\* situation, as stated herebelow, or
  - b) if such variation would increase the Contract Price by less than the amount stated in the Appendix-A to Bid.
- (ix) Fixing rates or prices under Clause 52.
- (x) Extra payment as a result of Contractor’s claims under Clause 53.
- (xi) Release of Retention Money to the Contractor under Sub-Clause 60.3 “Payment of Retention Money”.
- (xii) Issuance of “Final Payment Certificate” under Sub-Clause 60.8.
- (xiii) Issuance of “Defect Liability Certificate” under Sub-Clause 62.1.
- (xiv) Any change in the ratios of Contract currency proportions and payments thereof under Clause 72 “Currency and Rate of Exchange”.

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

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



## **2.2 Engineer's Representative**

The following paragraph is added:

The Employer shall ensure that the Engineer's Representative is a professional engineer as defined in the Pakistan Engineering Council Act 1975 (V of 1976)

The following Sub-Clauses 2.7 and 2.8 are added:

## **2.7 Engineer Not Liable**

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

## **2.8 Replacement of the Engineer**

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

## **5.1 Language(s) and Law**

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

## **5.2 Priority of Contract Documents**

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

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

In case of discrepancies between drawings, those of larger scale shall govern unless they are superseded by a drawing of later date regardless of scale. All Drawings and Specifications shall be interpreted in conformity with the Contract and these Conditions. Addendum, if any, shall be deemed to have been incorporated at the appropriate places in the documents forming the Contract.

The following Sub-Clauses 6.6 and 6.7 are added:

#### **6.6 Shop Drawings**

The Contractor shall submit to the Engineer for review 3 copies of all shop and erection drawings applicable to this Contract as per provision of relevant Sub-Clause of the Contract.

Review and approval by the Engineer shall not be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory and that the Engineer's review or approval shall not relieve the Contractor of any of his responsibilities under the Contract.

#### **6.7 As-Built Drawings**

At the completion of the Works under the Contract, the Contractor shall furnish to the Engineer 4 copies and one reproducible of all drawings amended to conform with the Works as built. The price of such Drawings shall be deemed to be included in the Contract Price.

#### **10.1 Performance Security**

The text is deleted and substituted with the following:

The Contractor shall provide Performance Security to the Employer in the prescribed form. The said Security shall be furnished or caused to be furnished by the Contractor within 28 days after the receipt of the Letter of Acceptance. The Performance Security shall be of an amount equal to 05% of the Contract Price stated in the Letter of Acceptance. Such Security shall, at the option of the bidder, be in the form of either (a) bank guarantee from any Scheduled Bank in Pakistan or (b) bank guarantee from a bank located outside Pakistan duly counter-guaranteed by a Scheduled Bank in Pakistan

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

The following Sub-Clause 10.4 is added:

#### **10.4 Performance Security Binding on Variations and Changes**

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

#### **14.1 Programme to be Submitted**

The programme shall be submitted within 10 days from the date of receipt of Letter of Acceptance, which shall be in the form of:

- i) a Bar Chart identifying the critical activities.
- ii) a CPM identifying the critical path/activities.  
*(Employer to select appropriate one)*

#### **14.3 Cash Flow Estimate to be Submitted**

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

The following Sub-Clause 14.5 is added:

#### **14.5 Detailed Programme and Monthly Progress Report**

- a) For purposes of Sub-Clause 14.1, the Contractor shall submit to the Engineer detailed programme for the following:
  - (1) Execution of Works;
  - (2) Labour Employment;
  - (3) Local Material Procurement;
  - (4) Material Imports, if any; and
  - (5) Other details as required by the Engineer.
  
- (b) During the period of the Contract, the Contractor shall submit to the Engineer not later than the 8<sup>th</sup> day of the month, 06 copies each of Monthly Progress Reports covering the following:
  - (1) A Construction Schedule indicating the monthly progress in percentage;
  - (2) Description of all work carried out since the last report;
  - (3) Description of the work planned for the next 56 days sufficiently detailed to enable the Engineer to determine his programme of inspection and testing;
  - (4) Monthly summary of daily job record;
  - (5) Photographs to illustrate progress ;and
  - (6) Information about problems and difficulties encountered, if any, and proposals to overcome the same.
  
- (c) During the period of the Contract, the Contractor shall keep a daily record of the work progress, which shall be made available to the Engineer as and when requested. The daily record shall include particulars of weather conditions, number of men working,

deliveries of materials, quantity, location and assignment of Contractor's equipment.

The following Sub-Clauses 15.2 and 15.3 are added:

### **15.2 Language Ability of Contractor's Representative**

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

### **15.3 Contractor's Representative**

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

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

The following Sub-Clauses 16.3 and 16.4 are added:

### **16.3 Language Ability of Superintending Staff of Contractor**

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

### **16.4 Employment of Local Personnel**

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

The following Sub-Clauses 19.3 and 19.4 are added:

### **19.3 Safety Precautions**

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

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

#### **19.4 Lighting Work at Night**

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

#### **20.4 Employer's Risks**

The Employer's risks are:

Delete the text and substitute with the following:

- (a) in so far as they directly affect the execution of the Works in Pakistan:
  - (i) war and hostilities (whether war be declared or not), invasion, act of foreign enemies,
  - (ii) rebellion, revolution, insurrection, or military or usurped power, or civil war,
  - (iii) ionizing radiations, or contamination by radioactivity from any nuclear fuel, or from any nuclear waste from the combustion of nuclear fuel, radioactive toxic explosive or other hazardous properties of any explosive nuclear assembly or nuclear component thereof,
  - (iv) pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds,
  - (v) riot, commotion or disorder, unless solely restricted to the employees of the Contractor or of his Subcontractors and arising from the conduct of the Works;
- (b) loss or damage due to the use or occupation by the Employer of any Section or part of the Permanent Works, except as may be provided for in the Contract;
- (c) loss or damage to the extent that it is due to the design of the Works, other than any part of the design provided by the Contractor or for which the Contractor is responsible; and
- (d) any operation of the forces of nature (insofar as it occurs on the Site) which an experienced contractor:
  - (i) could not have reasonably foreseen, or
  - (ii) could reasonably have foreseen, but against which he could not reasonably have taken at least one of the following measures:
    - (a) prevent loss or damage to physical property from occurring by taking appropriate measures, or
    - (b) insure against.

#### **21.1 Insurance of Works and Contractor's Equipment**

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

#### **21.4 Exclusions**

The text is deleted and substituted with the following:

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

The following Sub-Clause 25.5 is added:

#### **31.3 Co-operation with other Contractors**

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

The following Sub-Clauses 34.2 to 34.12 are added:

#### **34.2 Rates of Wages and Conditions of Labour**

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

#### **34.3 Employment of Persons in the Service of Others**

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

#### **34.4 Housing for Labour**

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

### **34.5 Health and Safety**

Due precautions shall be taken by the Contractor, and at his own cost, to ensure the safety of his staff and labour at all times throughout the period of the Contract. The Contractor shall further ensure that suitable arrangements are made for the prevention of epidemics and for all necessary welfare and hygiene requirements.

### **34.6 Epidemics**

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

### **34.7 Supply of Water**

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

### **34.8 Alcoholic Liquor or Drugs**

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

### **34.9 Arms and Ammunition**

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

### **34.10 Festivals and Religious Customs**

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

### **34.11 Disorderly Conduct**

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

The contractor will be responsible for the following damage to reinstall.

- a. Green belt, grass, road, cable, and cable pipe replenishment if damaged.
- b. Trees replenishment if damaged or removed during excavation.

- c. Any third party/ neighbouring field damage must be restored by the contractor.
- d. Waste generated during construction like excavated mud must be shifted by contractor.
- e. Contractors must follow the applicable safety rules and regulations of the company.

#### **34.12 Compliance by Subcontractors**

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

The following Sub-Clauses 35.2 and 35.3 are added:

#### **35.2 Records of Safety and Health**

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

#### **35.3 Reporting of Accidents**

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

The following Sub-Clause 36.6 is added:

#### **36.6 Use of Pakistani Materials and Services**

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

#### **41.1 Commencement of Works**

The text is deleted and substituted with the following:

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

The following Sub-Clause 47.3 is added:

#### **47.3 Bonus for Early Completion of Works**



N/A

**48.2 Taking Over of Sections or Parts**

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

## **51.2 Instructions for Variations**

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

## **52.1 Valuation of Variations**

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

## **53.4 Failure to Comply**

This Sub-Clause is deleted in its entirety.

## **54.3 Customs Clearance**

(Employer may vary this Sub-Clause)

## **54.5 Conditions of Hire of Contractor's Equipment**

The following paragraph is added:

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

The following Sub-Clauses 59.4 & 59.5 are added:

## **59.4 Payments to Nominated Sub-Contractors**

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

## **59.5 Certification of Payments & Nominated Subcontractors**

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

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

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

#### **60.1 Monthly Statements**

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

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

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

(in case Clause 60.11 is applicable)

#### **60.10 Time for Payment**

The text is deleted and substituted with the following:

The amount due to the Contractor under any Interim Payment Certificate issued by the Engineer pursuant to this Clause, or to any other terms of the Contract, shall , subject to Clause 47, be paid by the Employer to the Contractor within 45 days after such Interim Payment Certificate has been jointly verified by Employer and Contractor, or, in the case of the Final Certificate referred to in Sub Clause 60.8, within 60 days after such Final Payment Certificate has been jointly verified by Employer and Contractor; Provided that the Interim Payment shall be caused in 60 days.

#### **60.11 Secured Advance on Materials**

a) The Contractor shall be entitled to receive from the Employer Secured Advance against an indemnity bond acceptable to the Employer of such sum as the Engineer may consider proper in respect of non-perishable materials brought at the Site but not yet incorporated in the Permanent Works provided that:

- (1) The materials are in accordance with the Specifications for the Permanent Works;
- (2) Such materials have been delivered to the Site and are properly stored and protected against loss or damage or deterioration to the satisfaction of the Engineer but at the risk and cost of the Contractor;
- (3) The Contractor’s records of the requirements, orders, receipts and use of materials are kept in a form approved by the Engineer, and such records shall be available for inspection by the Engineer;
- (4) The Contractor shall submit with his monthly statement the estimated value of the materials on Site together with such documents as may be

required by the Engineer for the purpose of valuation of materials and providing evidence of ownership and payment therefor;

- (5) Ownership of such materials shall be deemed to vest in the Employer and these materials shall not be removed from the Site or otherwise disposed of without written permission of the Employer; and
  - (6) The sum payable for such materials on Site shall not exceed 75% of the (i) landed cost of imported materials, or (ii) ex-factory / ex-warehouse price of locally manufactured or produced materials, or (iii) market price of other materials.
- (b) The recovery of Secured Advance paid to the Contractor under the above provisions shall be effected from the monthly payments on actual consumption basis.

### **63.1 Default of Contractor**

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

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

### **65.2 Special Risks**

The text is deleted and substituted with the following:

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

### **67.3 Arbitration**

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

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

The following paragraph is added:

The place of arbitration shall be Lahore, Pakistan.

### **68.1 Notice to Contractor**

The following paragraph is added:

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

## **68.2 Notice to Employer and Engineer**

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

- a) The Employer :  
Quaid-e-Azam Thermal Power Limited

## **70.1 Increase or Decrease of Cost**

This clause is deleted.

## **73.1 Payment of Income Tax**

The Contractor, Subcontractors and their employees shall be responsible for payment of all their income tax, super tax and other taxes on income arising out of the Contract and the rates and prices stated in the Contract shall be deemed to cover all such taxes.

## **73.2 Customs Duty & Taxes**

(Employer may incorporate provisions where applicable)

## **74.1 Integrity Pact**

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

- (a) recover from the Contractor an amount equivalent to ten (10) times the sum of any commission, gratification, bribe, finder's fee or kickback given by the Contractor or any of his Sub-Contractors, agents or servants;
- (b) terminate the Contract; and
- (c) recover from the Contractor any loss or damage to the Employer as a result of such termination or of any other corrupt business practices of the Contractor or any of his Sub-Contractors, agents or servants.

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

## **75.1 Termination of Contract for Employer's Convenience**

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

- (a) shall proceed as provided in Sub-Clause 65.7 hereof; and
- (b) shall be paid by the Employer as provided in Sub-Clause 65.8 hereof.

#### **76.1 Liability of Contractor**

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

#### **77.1 Joint and Several Liability**

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

#### **78.1 Details to be Confidential**

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

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## SPECIFICATIONS - TECHNICAL PROVISIONS

Detail specification of Infrastructure Development Authority of Punjab (IDAP), Govt. of Punjab is attached as **Annexure-C** for Construction of Boundary Wall has been given in the detail tender drawings & allied works and Bill of Quantities attached with the Tender Documents.

### TECHNICAL FIELD TESTING REQUIREMENT

Following tests for construction materials and works shall be carried out:

Sr. No.	Material	Test	Reference
1	Concrete	1. Slump Test	ASTM C 143
		2. Compression test of 6"x6"x6" cube concrete samples at 28 days or cylinder strength 6"x12"	BS 1881-108
2	Bricks	Compressive Strength 2000 Psi	ASTM C 0067-03a
3	Reinforcing Steel	1. Tensile Strength	ASTM A 370
		2. Elongation Test	ASTM A 370

- The Contractor will pay all the expenses relating to material testing including but not limited to the cost of material, sample preparation, carriage and testing fee etc.
- The Contractors shall make available at site the equipment / apparatus required for testing of material as directed by the Engineer Incharge.
- The quantity of samples and the frequency of tests will be as per above Standards or as directed by the Engineer Incharge.

# **DRAWINGS**

**Tender Drawings are attached as Annexure-B**

# **PROJECT SPECIFICATIONS**

**Project Specifications are attached as Annexure-C**



# **BOQ**

**CONSTRUCTION OF 9" THICK MASONRY BOUNDARY  
WALL WITH RC PILLARS @ 10' C/C  
ALONG ACCESS ROAD OF QATP PLANT, BHIKKI,  
DISTRICT SHEIKHUPURA**

**Length of Boundary Wall = 6480 Rft**



**CONSULTANT**

**AZ ENGINEERING ASSOCIATES**

207-SCOTCH CORNER UPPER MALL, LAHORE

Ph : 042-35958641-42 FAX : 042-35958643

email:-azeassociates@gmail.com

## BOQ

Construction of 9" thick Masonry Boundary Wall with RCC pillars @ 10' c/c  
along Access Road of QATP PLANT, Bhikki, District Sheikhpura  
**Expansion Joint at 100 ft. c/c**

Sr. No.	Description of Item of Work	Quantity	Unit for Qty.	Rate	Amount
1	Excavation in foundation of building, bridges and other structures, including dagbelling, dressing, refilling in layers around structure with excavated earth, watering and ramming lead up to one chain (30 m) lift up to 5 ft (1.5m)				
	ii) Ordinary soil	60,798.1	Cft		
2	Cement concrete plain including placing, compacting, finishing and curing complete (including screening and washing of stone aggregate): (i) Ratio 1: 4: 8	8,685.4	Cft		
3	Pacca brick work in foundation and plinth in:-  i) Cement, sand mortar:- Ratio 1:4 : F&P	29,773.5	Cft		
4	Reinforced cement concrete in slab of rafts / strip foundation, base slab of column and retaining walls; etc and footing beams, other structural members other than those mentioned in 6(a) (i)&(ii) above not requiring form work (i.e. horizontal shuttering) complete in all respects  Type B (nominal mix 1: 1½: 3)	12,202.1	Cft		
5	Reinforced cement concrete in roof slab, beams, columns lintels, girders and other structural members laid in situ or precast laid in position, or prestressed members cast in situ, complete in all respects  Type B (nominal mix 1: 1½: 3)	5,469.5	Cft		
6	Fabrication of mild steel reinforcement for cement concrete, including cutting, bending, laying in position, making joints and fastenings, including cost of binding wire and labour charges for binding of steel reinforcement (also includes removal of rust from bars) Deformed bars (Grade-40)	63,884.7	Kg		
7	Pacca brick work other than building up to 10ft. (3 m ) height i) cement, sand mortar:- Ratio 1:4	33,562.9	Cft		
8	Cement plaster 1:4 up to 20' (6.00 m) height:-  b) ½" (13 mm) thick	138,654.4	Sft		
9	Cement concrete plain including placing, compacting, finishing and curing complete (including screening and washing of stone aggregate): (f) Ratio 1: 2: 4 PCC 1:2:4 coping : 1.5" at edges & 2.5" at centre, 11" in width. For Columns PCC 1:2:4 coping 15.5" x 15.5", 1.5" at edges & 2.5" at centre.	1,215.0	Cft		
10	Extra labour for:- MRS Item a) coping	1,215.0	Cft		
<b>Total Cost for 6480 Rft of Boundary Wall</b>					

# BOQ

## Detailed Estimate for the Construction of M.S. Gates & Gate Pillars, Access Road of Bhikki Power Plant, Sheikhupura **2 Gates complete + 1 opening with two Pillars**

Sr. No.	Description of Item of Work	Quantity	Unit for Qty.	Rate	Amount
1	Making and fixing steel grated door with 1/16" thick (1.5mm) sheeting, including angle iron frame 2"x2"x3/8" (50x50x10 mm) and 3/4" (20 mm) square bars 4" (100 mm) centre to centre, with locking arrangement	320	Sft		
2	Painting new surface:- Preparing surface and painting guard bars, gates of iron bars, gratings, i) priming coat. ii) each subsequent coat of paint.	640 1280	Sft Sft		
<b>Pillars for M.S. Gates: 2 Gates &amp; 1 opening</b>					
3	Excavation in foundation of building, bridges and other structures, including dagbelling, dressing, refilling in layers around structure with excavated earth, watering and ramming lead up to one chain (30 m) lift up to 5 ft (1.5m)  ii) Ordinary soil : <b>2 Gates &amp; 1 opening</b>	432	Cft		
4	Cement concrete plain including placing, compacting, finishing and curing complete (including screening and washing of stone aggregate): (i) Ratio 1: 4: 8	48	Cft		
5	First class brick walling laid in 1:3 cement sand mortar. ii) 4½" (113 mm) thick walling without hoop iron. Without hoop iron: [20,205.35-17,488.50=2716.85	618.75	Sft		
6	Fabrication of mild steel reinforcement for cement concrete, including cutting, bending, laying in position, making joints and fastenings, including cost of binding wire and labour charges for binding of steel reinforcement (also includes removal of rust from bars) Deformed bars (Grade-40)				

	ii) Deformed Bars Grade-40	831.08	kg		
7	<p>Providing and laying reinforced cement concrete (including prestressed concrete), using Ordinary Portland Cement / Sulphate resisting cement / Slag cement as may be required; coarse sand and screened graded and washed aggregate, in required shape and design, including forms, moulds, shuttering, lifting, compacting, curing, rendering and finishing exposed surface, complete (but excluding the cost of steel reinforcement, its fabrication and placing in position, etc.):-</p> <p>(a)(iii) Reinforced cement concrete in slab of rafts / strip foundation, base slab of column and retaining walls; etc and footing beams, other structural members other than those mentioned in 6(a) (i)&amp;(ii) above not requiring form work (i.e. horizontal shuttering) complete in all respects:-</p> <p>(2) Type B (nominal mix 1: 1½: 3)</p>	281.63	Cft		
8	<p>Cement plaster 1:4 up to 20' (6.00 m) height:-</p> <p>b) ½" (13 mm) thick</p>	742.50	Sft		
9	<p>Cement concrete plain including placing, compacting, finishing and curing complete (including screening and washing of stone aggregate): (f) Ratio 1: 2: 4 PCC 1:2:4 <b>coping</b> : 1.5" at edges &amp; 2.5" at centre, 11" in width. For Columns PCC 1:2:4 coping 15.5" x 15.5", 1.5" at edges &amp; 2.5" at centre.</p> <p>: <math>4 \times 29" \times 29" \times (1.5") + 6 \times 1/3 \times 29^2 = 9251</math> cubic inch = 5.353 cft</p>	5.84	Cft		
	<b>Totl Cost of 2 No. Gates Complete + 2 No. Pillars only</b>				

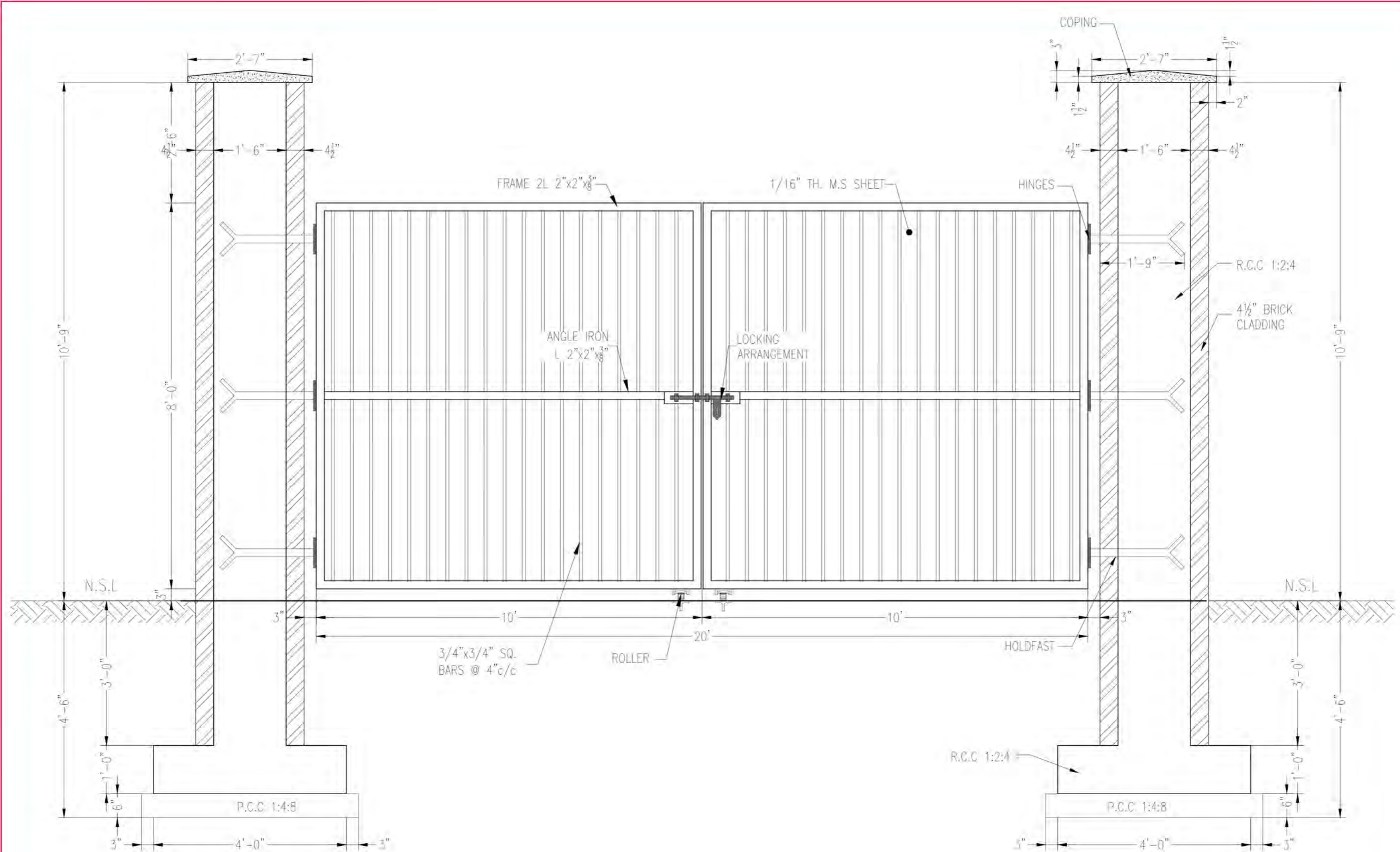


# BOQ

## Detailed Estimated Cost for Provision of Hume Pipe Culverts Crossing Access Road of Bhikki Power Plant, Sheikhpura

Sr. No.	Description of Item of Work	Quantity	Unit for Qty.	Rate	Amount
1	Earth work excavation in open cutting for sewers and manholes as shown in drawing including shuttering of wooden vertical planks, struts and beams, dressing to correct section and dimension according to templates and levels and removing surface water in all types of soil except shingle, gravel and rock. i) 0 ft. to 7.0 ft. (0 to 2.10 m) depth  ii) Ordinary soil - Columns	4,410.0	Cft		
2	Cement concrete plain including placing, compacting, finishing and curing complete (including screening and washing of stone aggregate): (i) Ratio 1: 4: 8 - F & P	787.9	Cft		
3	Pacca brick work in foundation and plinth in:- i) Cement, sand mortar:- Ratio 1:4 - Masonry in parapet wall	192.1	Cft		
4	Cement concrete plain including placing, compacting, finishing and curing complete (including screening and washing of stone aggregate): 3" thick 1:1.5:3 concrete Topping	10.7	Cft		
5	Providing and laying R.C.C. pipe, moulded with cement concrete conforming to ASTM Specification C-76-20, Class IV, Wall B, including carriage of pipes from factory to site of work, lowering in trenches to correct alignment and grade, jointing with rubber ring, cutting pipes where necessary, testing, etc. complete:-  v) 610 mm (24") i/d	240.0	Rft		
	<b>Cost for 4 No. 60 ft Long RCC Pipe Culverts</b>				





CLIENT:-

CONSULTANT:-



**AZ ENGINEERING ASSOCIATES**  
 207 SCOTCH CORNER UPPER MALL, LAHORE  
 TEL:-042-35958641-42 FAX:- 042-35958643  
 email:- azeassociate@gmail.com

PROJECT:-

**CONSTRUCTION OF SPORTS  
 COMPLEX AT BHIKKI POWER  
 PLANT, SHEIKHU PURA.**

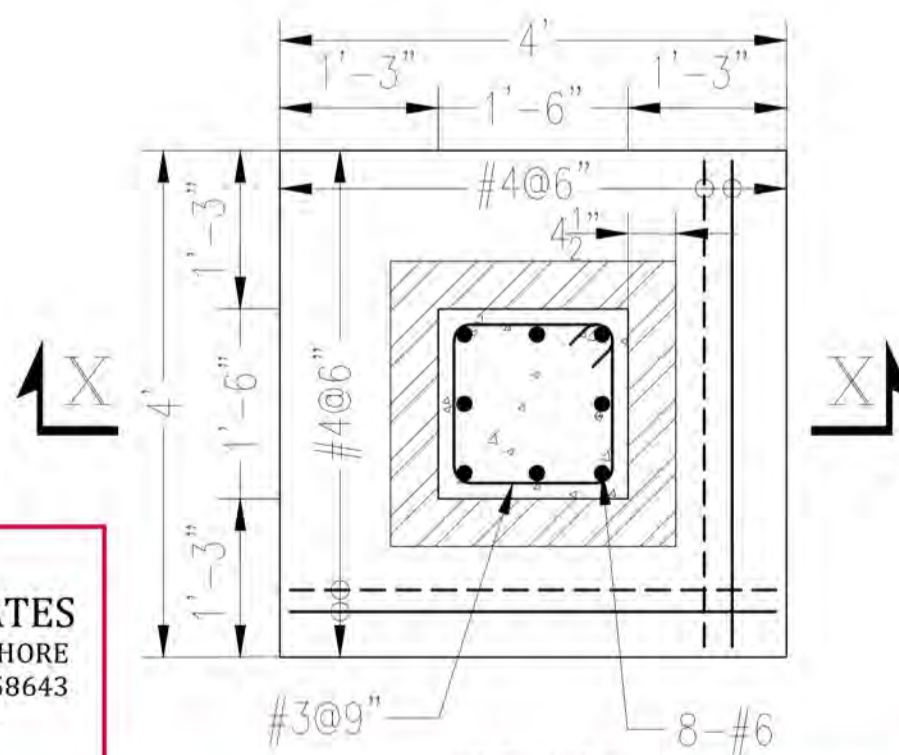
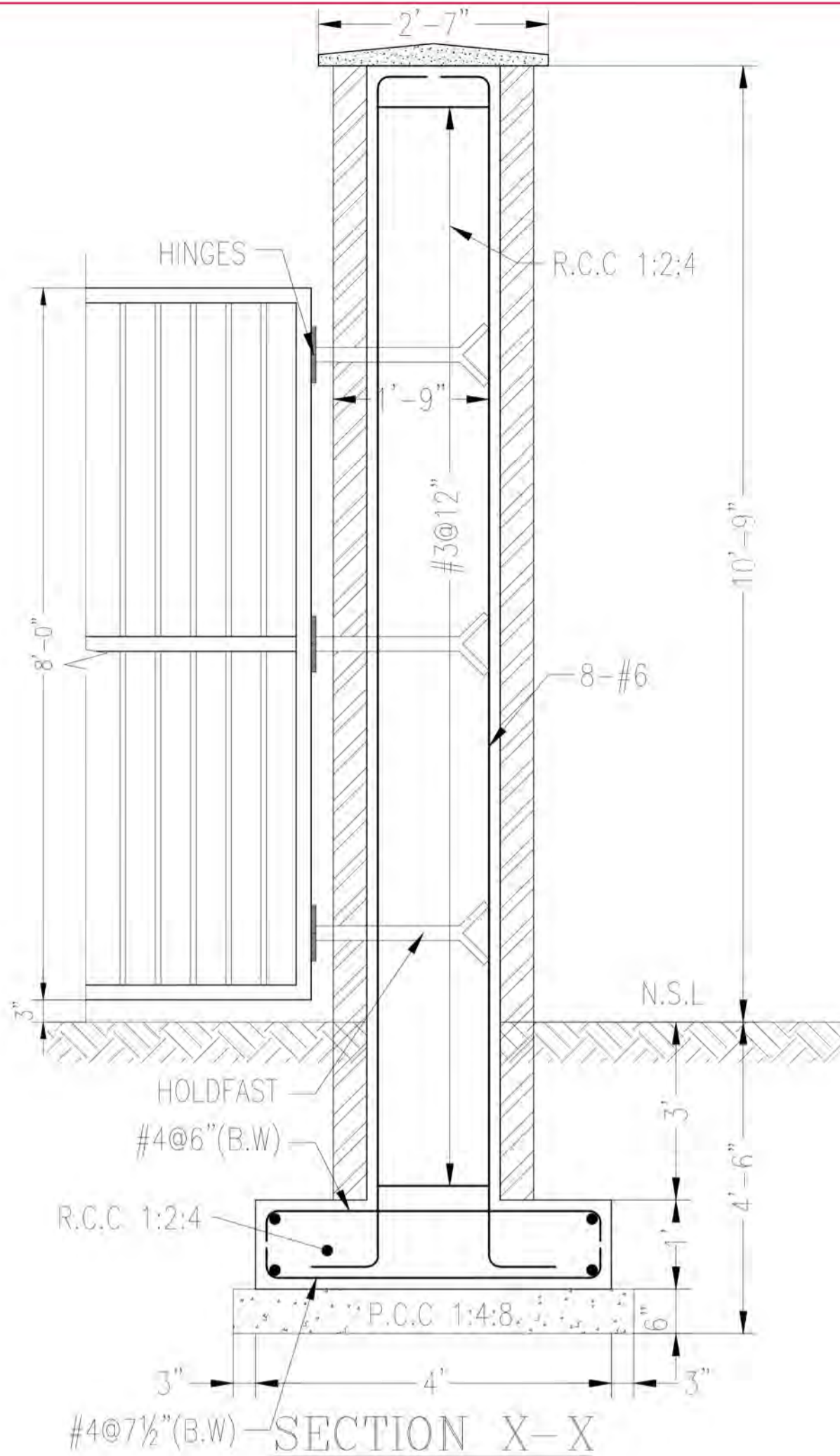
TITLE:-

**GATE ELEVATION**

Rev.	DATED	DESCRIPTION

DESIGNED BY:  
**Mr. JAVAID KHALID**  
 CHECKED BY:  
 DRAWN BY:  
**Mr. M.HAFEEZ**

SCALE:  
 N.T.S  
 DATE:  
 02-05-2024  
 GT-01



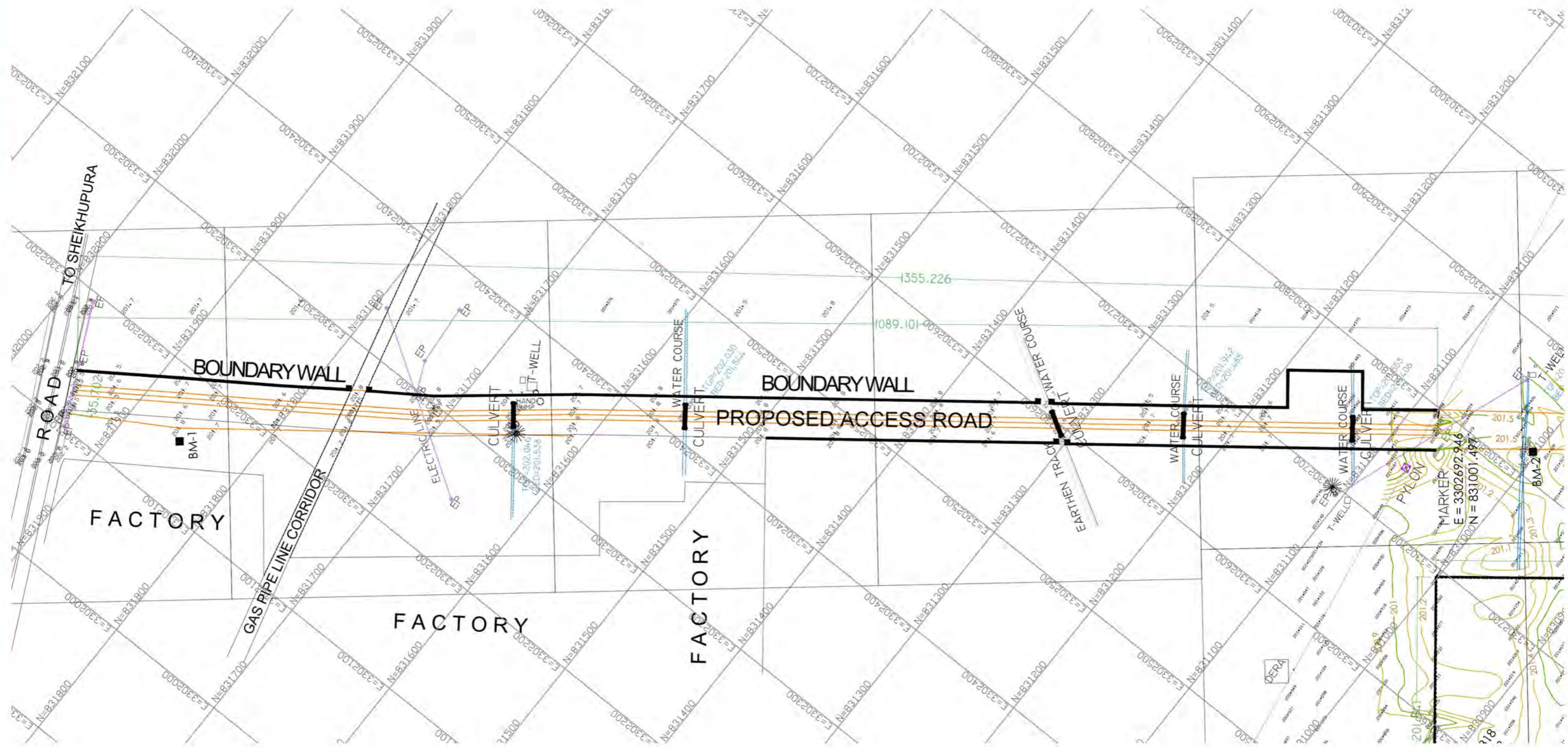
CONSULTANT:-  
**AZ ENGINEERING ASSOCIATES**  
 207 SCOTCH CORNER UPPER MALL, LAHORE  
 TEL:-042-35958641-42 FAX:- 042-35958643  
 email:- azeassociate@gmail.com


PROJECT:-  
**CONSTRUCTION OF SPORTS  
 COMPLEX AT BHIKKI POWER  
 PLANT, SHEIKHU PURA.**

TITLE:-  
**GATE PILLAR  
 PLAN & SECTION**

DESIGNED BY:  
 Mr. JAVAID KHALID  
 CHECKED BY:  
 DRAWN BY:  
 Mr. M.HAFEEZ

SCALE:  
 N.T.S  
 DATE:  
 02-05-2024  
 GT-02



CLIENT:-	CONSULTANT:-	PROJECT:-	TITLE:-		DESIGNED BY:	SCALE:												
	 <b>AZ ENGINEERING ASSOCIATES</b> 207 SCOTCH CORNER UPPER MALL, LAHORE TEL:-042-35958641-42 FAX:- 042-35958643 email:- azeassociate@gmail.com	<b>CONSTRUCTION OF SPORTS          COMPLEX AT BHIKKI POWER          PLANT, SHEIKHU PURA.</b>	<b>BOUNDARY WALL &amp;          CULVERTS SHOWING          ON PLAN</b>	<table border="1"> <thead> <tr> <th>Rev.</th> <th>DATED</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table>	Rev.	DATED	DESCRIPTION										Mr. JAVAID KHALID	N.T.S
Rev.	DATED	DESCRIPTION																
					CHECKED BY:	DATE:												
					DRAWN BY:	01-06-2024												
					Mr. M.HAFEEZ	BW-01												

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# PROJECT SPECIFICATION

## PROJECT:

CONSTRUCTION OF BOUNDARY WALL  
ALONG THE ACCESS ROADSIDE OF BHIKKI  
POWER PLANT, SHEIKHUPURA.

## CLIENT:

QUAID-E-AZAM THERMAL POWER LIMITED.



## CONSULTANT:

AZ ENGINEERING ASSOCIATES





## 5. EARTHWORK

### 5.1. SCOPE

All excavation and earthwork required to be performed under the Contract Documents, and for all related purposes, and as may be required by the Engineer, shall be performed and executed in accordance with the stipulations and requirements stated herein. These stipulations and requirements shall apply except when such stipulations and requirements are specifically modified in writing by the Engineer for any item of work. The work shall include furnishing of all labor, material, plant, equipment and services related to items of the work.

### 5.2. CODES AND STANDARD

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

ASTM D15 56-Latest	Test Method for Density and Unit weight of Soil in Place by the Sand Cone method.
ASTM D15 57- Latest	Test Method for Laboratory Compaction characteristic of soil using Modified Effort (2700 KN-m/m <sup>3</sup> )
ASTM D2167-Latest	Test Method for Density and Unit Weight of soil in place by the Rubber Balloon Method.
BS 1377-Latest	Method of Test for Soil for Civil Engineering Purpose

### 5.3. SUBMITTALS

#### a) Records of Excavation

Ground elevation shall be taken at specified intervals duly witnessed by the Engineer immediately after the Contractor has completed the under listed jobs.

The layout and levels will constitute the basis for measurements and shall be submitted for necessary approval to the Engineer prior to commencement of work.

#### b) Records of Fill

The Contractor shall submit the drawings showing layout plan and sections showing elevations before and after the fill to the Engineer.

#### c) Records of Tests

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

Laboratory test results as specified by the Engineer.

Field test result for compaction, max dry density and relative density.



**d) Methodology**

The Contractor shall submit the following to the Engineer for his review and approval before starting Earthwork.

Proposed sources of fill material and samples of proposed fill.

Details of plant, equipment and method of excavation, fill and compaction.

Proposal for dewatering the areas of excavation if required.

**5.4. CLASSIFICATION OF MATERIALS**

No classification will be made for payment purpose of any material excavated as to its class, nature, origin or condition.

**5.5. EXCAVATION**

**5.5.1. General**

The Contractor shall acquaint himself with the nature of the ground, existing structures, foundations and subsoil which might be encountered during excavation or other earthworks.

If not supplied with the Tender, the Geotechnical Investigation Report is available with the Engineer for reference. However, the Employer does not guarantee or warrant in any way that the material to be found in the excavation will be similar in nature to that of any samples which may have been exhibited or indicated in the Report, Drawings or in any other Contract Documents or to material obtained from boring or trial holes. The Contractor shall be deemed to have made local and independent inquiries as to and shall take the whole risk of the nature of the ground subsoil or material to be excavated or penetrated and the Contractor shall not be entitled to receive an extra or additional payment nor to be relieved from any of his obligations by reasons of the nature of such ground subsoil or material.

All excavation shall be made in accordance with the provisions of this Clause and to the lines and grades shown on the Drawings or established by the Engineer. Excavation against which structures or other required construction are to be placed shall be finished accurately to the required grade and dimensions and, if required by the Engineer, shall be moistened with water and tamped or rolled with suitable tools or equipment for the purpose of forming a firm foundation on. If, at any point in the excavation on, material is excavated beyond the established lines and grades, the over excavation shall be filled in by the contractor at his own expense to the required lines, dimensions and grades with lean concrete or with selected materials thoroughly compacted by tamping or rolling in layers not more than 6 inch thick as approved by the Engineer. Whenever the natural foundation material is disturbed or loosened because of the Contractor's excavation operations, it shall be consolidated by tamping





original lines and grades established by the Engineer. All such excavated material shall be disposed off, as directed by the Engineer.

## 5.7. EXCAVATED MATERIALS

### 5.7.1. Disposal

All materials from required excavations not required for or not suitable for use in the construction required under these Specifications shall be placed in disposal location. The material shall be disposed-off to the location as approved by the Engineer. The contractor shall be responsible to bear all the cost of this activity.

### 5.7.2. Fill Materials

Where sufficient suitable materials are not available from the required excavations for fill, backfill and other required earthwork construction shown on the Drawings or directed by the Engineer, the same shall be obtained by blending the excavated material with other materials, as approved by the Engineer so as to conform to the designated gradation limits of the materials for fills, backfills and other required Earthwork, or suitable materials shall be obtained from designated borrow areas as approved by the Engineer. The gradation of the fill material shall conform to the following limits:

Material Size (U.S. Sieve Series)	Percent Finer Than (By Weight)
No. 10	100
No. 50	70 - 95
No. 100	25 - 75
No. 20	0 - 15

The Engineer may, however, change the gradation limits of the materials for fills, backfills and other required earthwork during the execution of work.

### 5.7.3. Fill around Structures

All fill or refill around structures that is within the slopes and limits of the established pay lines for excavation and backfill for the structures shall be placed as backfill or compacted backfill except as otherwise specifically shown on the Drawings or provided herein.

### 5.7.4. Objectionable Materials

Excavated materials containing stumps, roots, vegetable matter and other objectionable materials and excavated materials that are not required or are not suitable for fills, backfills and other permanent construction required under these Specifications shall be placed in disposed-off location or if required out of project site as approved by the Engineer.



## 5.8. BACKFILLING

### 5.8.1. General

Backfill designated on the Drawings or directed by the Engineer as "compacted" shall be compacted to the lines, grades and slopes shown on the Drawings or established by the Engineer. The Contractor's operations in the excavation of backfill materials shall be such as will result in an acceptable gradation of materials when placed.

### 5.8.2. Method

Prior to and during placement operations, the material shall have the optimum practicable moisture content required for the purpose of compaction, as determined by the Engineer, and the moisture content shall be uniform throughout each layer. As determined by the Engineer, the material shall be brought to the proper moisture content at the site of excavation. Optimum moisture content shall be determined in accordance with ASTM Designation D1557-Latest, "Test Method for Laboratory Compaction Characteristic of Soil Using Modified Effort (2700 KN-m/m<sup>3</sup>)", or other approved method. In no case shall the moisture content be less than 2 percent drier or more than 2 percent wetter than the optimum moisture content. If the moisture content is less than optimum for compaction, the compaction operations shall not proceed, except with the specific approval of the Engineer, and the moisture shall be supplemented by sprinkling and reworking the material at the site of compaction. If the moisture content is greater than optimum for compaction, the compaction operations shall be delayed until such time as the material has dried by reworking, mixing with dry materials or other approved means. The material to be compacted shall be deposited in horizontal layers not more than 6-inch-thick after being compacted, and the distribution of material shall be such that the compacted material will be homogeneous and free from lenses, pockets, streaks or other imperfections. The excavation and placing operations shall be such that the material when compacted will be blended sufficiently to secure the best practicable degree of compaction, impermeability and stability.

When the material has been conditioned and placed as specified, it shall be compacted with compaction rollers of adequate weight and size. The following four types of rollers will be permitted at the option of the Contractor: pneumatic rollers of an approximate weight of 14,000 kilograms including ballast; grid rollers with an approximate weight of 14,000 kilograms including ballast; sheep foot tamping rollers with an approximate weight of 8,000 kilograms including ballast; and vibratory rollers of adequate weight and size to obtain compaction meeting the requirements of these Specifications. All types of compaction rollers are to be equipped with cleaner bars. When sheep foot tamping rollers are used the tamping knobs and cleaner bars shall be properly maintained and the spaces between the tamping feet shall be kept clear of materials, which impair the effectiveness of the tamping roller.



### 5.8.3. Operations Adjacent to Structures

For those portions of backfill adjacent to structures including concrete and steel pipe, where compacted backfill is required and it is not possible to obtain adequate compaction with rolling equipment, the backfill shall be compacted with mechanical tampers of adequate weight and design so as to obtain the same degree of compaction as the adjacent compacted backfill. Depth of compacted layers and moisture contents of material placed adjacent to structures shall be as specified above and particular care shall be taken to ensure adequate bonding of materials with any adjacent backfill or the ground surface. The Contractor shall be responsible for any damage to structures caused by his operations in placing or compacting backfill material to adjoining structures and any such damage shall be repaired at the expense of the Contractor.

In placing and compacting backfill adjoining concrete and steel pipes, sufficient material shall be carefully placed on both sides of the pipe and tamped around the pipe as it is laid to hold the pipe firmly to established line and grade. The material shall then be placed and compacted in layers as herein specified equally on both sides of the pipe to prevent displacement of the pipe during the placing and compacting of the adjoining material.

### 5.8.4. Compaction of Materials

The material compacted backfill shall be compacted until the dry density of the compacted material is not less than 95 percent of the maximum dry density calculated to ASTM Designation "D1557-Latest," Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (2700 KN-m/m<sup>3</sup>)", unless otherwise specified for a particular part of the Works. The in place density shall be determined by the sand cone method in accordance with ASTM Designation "D1556-Latest," Test Method For Density and Unit Weight of Soil In Place by the Sand Cone Method", or by the rubber balloon method in accordance with ASTM Designation "D2167-Latest," Test Method for Density and Unit Weight of Soil In Place by the Rubber Balloon Method". The Engineer will take samples of the material being compacted and will perform the tests required to determine that the compaction meets the requirements of these Specifications. The Contractor shall aid the Engineer in obtaining representative samples for testing.

### 5.8.5. Tolerances

The excavation shall be uniformly completed to the prescribed lines, dimensions and grades shown on the drawings or established by the Engineer. Minor deviations in the foundation level and side slopes, as approved by the Engineer, will be permitted to extend into the excavation lines by an amount not to exceed 2.5 inch measured vertically.



## 5.9. MEASUREMENT AND PAYMENT

### 5.9.1. General

The Contract unit price in the Bill of Quantities for the excavation and earthwork shall include the applicable costs of all labor, equipment and materials used in excavating the required materials; of clearing and stripping all areas designated by the Engineer to be cleared and stripped; of performing all required sprinkling or drying and mixing for proper compaction, when required; of excavating the required materials; of transporting all excavated materials in fills, disposal of material within the designated area and stockpiles for backfill; of confining excavated material to the designated areas; and all other works incidental to the Contractor's excavation operations. No separate payment will be made for removal and disposing of sand, sandy soils and other materials blown or drifted into excavations and other parts of the Works.

No separate payment will be made for any clearing and stripping performed under these Specifications and the cost of all clearing and stripping and the removal of fences, walls, building, ruins and other structures, shall be included in the Contract unit price in the Bill of Quantities for the applicable excavation item. No separate or additional payment will be made above the Contract unit price in the Bill of Quantities on account of any materials being wet or on account of the method or type of equipment used in making the required excavations. No separate or additional payment will be made on account of any delays occasioned thereby.

The cost of transporting excavated materials, the cost of placing excavated materials in disposal locations, stockpiles for backfill, fills, and in other permanent construction, except backfill, required under these Specifications; and all costs in connection with any re-handling of excavated material to facilitate the Contractor's construction operations, except re-handling of material for backfill, shall be included in the Contract unit price in the Bill of Quantities for the applicable excavation item.

No measurement for payment will be made of excavation made for the convenience of the Contractor for any purpose or reason, for over-excavation beyond the established lines and grades, for removal of material disturbed or loosened because of the Contractor's operations and all such excavations, over-excavation, and removal of disturbed material shall be refilled and replaced where required by the Engineer in accordance with the requirements of these Specifications at the expense of the Contractor. No measurement for payment will be made for the removal and disposal of sand, sandy soils and other materials deposited by wind or drifted into excavations or other parts of the Works. Payment will be made under the applicable item or the Bill of Quantities for excavation of unsuitable foundation material, excavation of slide materials from slides which were beyond the control of the Contractor and such excavations as directed and approved by the Engineer. Payment will be made under the applicable item of the Bill of Quantities for placing of backfill and such payment



## 8. CONCRETE

### 8.1. SCOPE

This Section covers the manufacturing, forming, transporting, placing, stripping of forms, finishing and curing of plain and reinforced concrete in the structures included herein.

### 8.2. CODES AND STANDARDS

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

ACI 301 - Latest	Specifications for Structural Concrete
ACI 304R - Latest	Guide for Measuring, Mixing, Transporting and Placing Concrete.
ACI 304.2R - Latest	Placing Concrete by Pumping Methods.
ACI 308 - Latest	Standard Practice for Curing Concrete.
ACI 309R - Latest	Guide for Consolidation of Concrete
ACI 318 - Latest	Building Code Requirements for Reinforced Concrete
ACI 350R - Latest	Code Requirements for Environmental Engineering Concrete Structures.
ASTM C31/31M - Latest	Standard Practice for Making and Curing Concrete Test Specimens in the Field.
ASTM C33 - Latest	Standard Specifications for Concrete Aggregates
ASTM C39 - Latest	Standard Test Methods for Compressive Strength of Cylindrical Concrete Specimens.
ASTM C42 / 42M - Latest	Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
ASTM C78 - Latest	Standard Test Method for Test for Flexural Strength of Concrete (using simple beam with third point loading).
ASTM C136 - Latest	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates.
ASTM C143 / 143M - Latest	Standard Test Method for Slump of Hydraulic Cement Concrete.
ASTM C150 - Latest	Standard Specifications for Portland Cement.
ASTM C260 - Latest	Standard Specifications for Air-entraining Admixtures for Concrete.
ASTM C295 - Latest	Guide for Petrographic Examination of Aggregates for Concrete.
ASTM 309 - Latest	Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete.



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ASTM 404 Latest	Standard Specifications for Aggregate for Masonry Grout
ASTM C494-Latest	Standard specification for chemical Admixture for concrete.
ASTM C566-Latest	Standard Test Method for total moisture content of Aggregate by Drying
ASTM 0596- Latest	Practice for Reporting Results of Water Analysis.
ASTM 01411-Latest	Standard test Method for Admixture in Graded Aggregate Road Mixes
BS-12 Latest	Specification for Portland Cement

### 8.3. SUBMITTALS

The Contractor shall submit for the approval of the Engineer, before commencement of any work, his Method Statement which would provide complete details of the procedures and equipment to be used for the satisfactory execution of the work required under this section. The approval of such Method Statement shall not relieve the Contractor of his responsibility under the Contract.

The Contractor shall also submit the following to the Engineer:

#### 8.3.1. Delivery and Storage Record

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

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

#### 8.3.2. Details of Constructional Plants

Particulars and details of major constructional plants such as mixers, lifts, concrete pumping equipment/ accessories, hoists and cranes, along with the general layout plans and flow diagrams for the Engineer's review and prior approval.

#### 8.3.3. Shop Drawings

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

#### 8.3.4. Methodology

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



- The method statement shall also include proposal for:
- Construction joints if not shown on the Drawings
- Installation of water stops
- Sequence of concrete placement
- Arrangement for concreting during rain, hot or cold weather and during night
- Welding, etc.

#### 8.3.5. Samples and Specimens

The Contractor shall submit to the Engineer for his approval:

- Samples and specimens of all constructional materials together with the supplier/manufacturer's literature containing his instructions/recommendations. Afterwards the approved samples of aggregate, admixtures and the embedded items shall be submitted properly labelled and identified for future reference.
- A minimum of two units or portions of units of each of the architectural and in-situ concrete, of a size as required by the Engineer, shall be submitted. These specimens will be reviewed and approved on the basis of color, texture, dimensional accuracy, surface finish and general appearance.
- Samples/specimens, when accepted, will describe the allowable limits between which variation can be acceptable.
- Approved specimen/samples shall remain at Site, well protected from damage and dilapidation, as required by the Engineer.

#### 8.3.6. Certificate and Mill Test Dates

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

Cement, pozzolan or slag, reinforcing steel, admixtures, joint sealing compound, expansion joint material, water proof membrane, PVC / Stainless steel water stop, aggregate (light weight, fire-resistant), expansion joint assembly etc.

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

#### 8.3.7. Result of Routine Tests and Daily Reports

The routine shall include submission of the results of all the specified and required tests performed at the job site including, but not limited to, analysis of aggregate, slump



test, compressive strength tests, etc. and detailed report of works performed on the preceding day.

#### 8.3.8. Bar-Bending Schedule

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

#### 8.3.9. Concreting Record

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

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

For each specified grade and type of concrete

- Volume of concrete placed per batch and the total concrete.
- Volume of concrete wasted or rejected.
- Quantities of cement, pozzolan or slag, aggregates, water, reinforcing steel, admixtures, embedded items used in the work.

For each location, structure or part of structure

- The precise position or location of placement, (e.g. reference number, mark identification or element, structure, bay or lift).
- Concrete mixes placed.
- Total volume of each grade and type of concrete placed.
- Records of concrete works, detailing the date, time, humidity, temperature and weather conditions when each part of works was completed.

#### 8.4. COMPOSITION AND QUALITY

Concrete shall be composed of Portland cement, water, fine and coarse aggregate and any admixtures as and when specified or required by the Engineer.

The concrete mixtures will be designed by the Engineer who will determine the required quality of the concrete for the structures covered by these Specifications. The required strengths of concrete for various parts of the Project have been shown on the Drawings.

#### 8.5. CEMENT

##### 8.5.1. General

The work to be done under this Clause consists of furnishing, transporting, storing and handling all Portland cement required in the construction of the work.

##### 8.5.2. Portland Cement

Portland cement shall be Pakistani manufactured, unless otherwise approved by the Engineer. Portland cement shall conform to British Standard 12-Latest, "Specifications





for Portland Cement" or to ASTM Designation C 150-Latest, "Standard Specification for Portland Cement for Type I" or may include Slag or pozzolan's as per the requirements. Sulphate resistant type V & II may be used in certain parts of the works as mentioned in the drawings or directed by the engineer.

#### 8.5.3. Tests

Cement in the custody of the Contractor shall be sampled and tested at the discretion and under the supervision of the Engineer at the expense of the Contractor either in accordance with the requirements of ASTM Designation C 150-Latest or the equivalent tests of the British Standards Institution as designated by the Engineer. The Contractor shall notify the Engineer when and where the cement is to be manufactured and the Engineer, shall have the right at all times to inspect the materials, the process of manufacture, the laboratory records of analysis and tests made at the cement plant and to take samples of the cement for testing. The Contractor shall provide all necessary assistance to the Engineer for obtaining the samples. Additional tests will be made by, or under the supervision of the Engineer, and at the expense of the Employer. No cement shall be used until notice has been given by the Engineer that the cement tested meets the Specification test requirements. In the event of the cement failing to meet the requirements of these Specifications, the cement shall be resampled and retested. If retests prove that the cement delivered is unsatisfactory, it shall be promptly removed from the site. Cement, which has been in storage at the site longer than three months, shall not be used until retesting proves it to be satisfactory.

#### 8.5.4. Transport of Cement

Manufacturer's Transport of the cement from the mill to the batching and to the point of use shall be accomplished in such a manner that the cement is completely protected from exposure to moisture. Cement, which has been adversely affected by moisture, as determined by the Engineer, shall be rejected.

Cement in sacks shall be delivered in strong and well-made paper or cloth bags, each plainly marked with the Manufacturer's name, brand, type of cement and the weight of cement contained therein. Packages varying more than three percent from the weight marked thereon may be rejected and if the average weight of packages in any shipment, as shown by weighing fifty packages taken at random, is less than that marked on the packages the entire shipment may be rejected. Packages received in broken or damaged condition shall be rejected or may be accepted only as fractional packages as determined by the Engineer.

#### 8.5.5. Storage

Cement shall be stored in dry, weather tight and properly ventilated structures. All storage facilities shall be subject to approval and shall be such as to permit easy



supervision of the Engineer, and at the expense of the Employer. An air-entraining admixture which has been in storage at the Site for longer than 6 months or which has been subjected to freezing shall not be used until retest proves it to be satisfactory.

#### 8.6.2.3. Water Reducing Admixtures

The source, brand, and types of suitable water-reducing cement dispersing admixtures, if required, shall be selected by the Engineer. The water-reducing admixture will be compatible with the air-entraining admixture specified above and shall be batched and added to the concrete in the manner specified for the adding of air-entraining admixture but separate from the portion of the mixing water containing the air-entraining admixture. The quantities of water reducing, cement dispersing admixture to be used shall be in accordance with the instructions of the Manufacturer, as approved by the Engineer. Water reducing admixture will conform to the requirements of ASTM Designation C 494-Latest "Specification for Chemical Admixtures for Concrete" Water-reducing admixtures shall be sampled at the source of supply and tested at the expense of the Contractor. Additional tests will be made by or under the supervision of the Engineer, and at the expense of the Employer.

### 8.7. AGGREGATES

#### 8.7.1. Requirements

Aggregates for normal concrete shall conform to ASTM Designation C33 - Latest, "Standard Specifications for Concrete Aggregates". The water-soluble chloride content of the aggregate shall be established by the methods described in ASTM D1411- Latest, "Standard Test Method for Admixture in Graded Aggregate Road Mixes", and petrographic examination in accordance with ASTM C295-latest, "Guide for Petrographic Examination of Aggregates for Concrete", shall be performed to determine the suitability of the aggregates for the intended use. Following tests shall also be carried out by the Contractor at his own Cost as per relevant ASTM Standards and as directed by the Engineer.

- Alkali Re-activity Potential
- Abrasion and Soundness test

The nominal maximum size of the aggregate shall not be larger than one fifth of the narrowest dimension of the finished wall or slab, nor larger than three-fourths of the minimum clear spacing between individual reinforcing bars, bundles of bars or embedment. These limitations may be waived if, in the judgement of the Engineer, workability and methods of consolidation be such that the concrete can be placed without honeycombing or voids.

#### 8.7.2. Composition

The use of natural sand or a combination of natural and manufactured sands may be permitted, provided that the fine aggregate meets the applicable requirements of the



Specifications herein, for the particular use intended. Coarse aggregate shall consist of gravel, crushed gravel or a combination thereof.

#### 8.7.3. Sources

The Contractor shall obtain concrete aggregates from deposits of natural sand and gravel or shall produce crushed aggregate from approved deposits. The Contractor shall be responsible for obtaining all necessary rights and permits and for ascertaining the extent of work, including type of equipment required and amount of waste involved in producing a sufficient quantity of acceptable aggregate from the source finally selected by him and approved by the Engineer. The Contractor may alternatively obtain the aggregate from any of the quarries which produce the aggregate meeting with the Specifications contained herein, as approved by the Engineer.

#### 8.7.4. Sampling and Testing

During construction, aggregates will be sampled and tested once for every 100 metric tons or part thereof as delivered to the mixer to determine compliance with the Specifications. The Contractor shall provide facilities as may be necessary for the ready collection of representative test samples. The Engineer shall obtain and test such samples, at the expense of the Contractor, using appropriate standard test methods selected by the Engineer. Testing of concrete aggregates by the Engineer shall not relieve the Contractor of his responsibility to maintain control, to ensure the production, stockpiling and handling of both fine and coarse aggregates in accordance with these Specifications. Tests shall be carried out only in Laboratories approved by the Engineer.

#### 8.7.5. Processed Aggregates

Aggregates, as delivered to the mixer, shall consist of clean, hard and uncoated particles. Light-weight elements (chalk, clay, coal, etc.) will be separated by segregation under water by vibration. Where required, fines shall be removed from the coarse aggregate by adequate washing. The coarse aggregate shall be re-screened just prior to delivery to the concrete batching plant bins. The re-screening plant shall be so located as to avoid water dripping into the storage bin of the batching plant and shall be arranged and operated in a manner which will ensure delivery to the mixers of uniformly graded and dewatered coarse aggregates. The moisture content shall conform to the provisions of Clause 8.7.7, "Moisture Control". Compliance with the aggregate grading and uniformity requirements will be determined at the mixer. All aggregates shall be sieved and washed with clean water. The aggregates shall conform to the following specific requirements.

##### 8.7.5.1. Fine Aggregates

The grading and uniformity of fine aggregates as delivered to the mixers shall conform to the following requirements:



Sieve Designation U.S. Standard Square Mesh	Percent Passing
3/8 inch	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	5 to 30
No. 100	0 to 10

The sand equivalent value of the fine aggregates as determined by ASTM Designation D2419-Latest "Test Method for Sand Equivalence value of soils and Fine aggregates", shall not be less than 75. The Fineness Modulus shall range between 2.31 and 2.51.

#### 8.7.5.2. Coarse Aggregates

The grading of the coarse aggregates within the separated size groups shall conform to the following requirements as delivered to the mixer:

U.S standard Sieve Size	Percent by Weight finer than each laboratory sieve		
	2.5 in. to 1.5 in (63 mm to 38 mm)	1.5 in. to 0.75 in (38 mm to 19 mm)	0.75 in. to No.4 (19 mm to 4.75 mm)
3 inches (75 mm)	100	-	-
2.5 inch (63 mm)	90 to 100	-	-
1.5 inch (50 mm)	35 to 70	100	-
1.5 inch (38 mm)	0 to 15	90 to 100	-
1 inch (25 mm)	-	20 to 55	100
0.75 inch (19 mm)	0 to 5	0 to 15	90 to 100
0.38 inch (9.5 mm)	-	0 to 5	20 to 55
No. 4 (4.75 mm)	-	-	0 to 10
No. 8 (2.35 mm)	-	-	0 to 5

#### 8.7.5.3. Particle Shape

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

#### 8.7.5.4. Soft Particles



The Contractor in planning his aggregate processing operations and plant shall make whatever provisions are necessary, as regards methods and equipment, to ensure effective elimination of soft particles from all aggregates to the degree that the percentage of soft particles present in the processed coarse aggregate shall not exceed 3 percent by weight, as per standard test methods selected by the Engineer. Test samples shall be representative of the three size groups of processed aggregate specified in Clause, 8.7.5.2.

#### 8.7.5.5. Uniformity of Coarse Aggregates

In order to minimize variations in consistency and workability of the concrete, the uniformity of proportions of crushed gravel to natural gravel in any one size group of coarse aggregate shall be maintained relatively constant and in no event exceed a variation of  $\pm 5$  percent in either component of a combination of crushed and natural gravel in any 24 hour period of mixing plant operation, except No. 4 (4.75 mm) to 0.75 in. (19 mm) group, for which a variation larger than  $\pm 5$  percent will be permitted. The limits of this larger variation will be determined by the Engineer after the gradation of fine aggregates has been approved by the Engineer.

#### 8.7.5.6. Deleterious Substances

##### I. Fine Aggregates

The maximum percentages of deleterious substances in the fine aggregates, as delivered to the mixer, shall not exceed the limits specified in ASTM Designation C33 -Latest, "Standard Specification for Concrete Aggregates".

##### II. Coarse Aggregates

The maximum percentage of deleterious substances in any size of coarse aggregates, as delivered to the mixer, shall not exceed the following values:

Substance	Percentage by Weight
Material Passing No. 200 Sieve	1.0
Shale	1.0
Clay lumps	0.5
Other deleterious substance	1.0

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

#### 8.7.6. Storage

Aggregates shall be stored at the Site in such a manner as to prevent its deterioration or the inclusion of foreign matter. Aggregate which has deteriorated, or which has been contaminated shall not be used for concrete. All methods employed by the Contractor



for unloading, handling and stockpiling aggregates shall be subject at all times to the approval of the Engineer. Sufficient aggregate shall be maintained at the Site at all times to assure continuous placement and completion of any pour of concrete started.

#### 8.7.7. Moisture Control

All fine aggregates and the smallest size group of the coarse aggregates shall remain in free-draining storage at the Site for at least 72 hours immediately prior to use. The free moisture content of the fine aggregates and of the smallest size group of coarse aggregates, as delivered to the mixer, shall be controlled so as not to exceed 4.0 and 1.0 respectively, expressed in percent by weight of the saturated surface dry aggregates unless higher limits are allowed by the Engineer. The moisture content of the other sizes of the coarse aggregates shall be controlled so that the aggregates are delivered to the mixers with the least amount of free moisture and the least variation in free moisture practicable under the job conditions. The moisture content of the aggregates shall be determined in accordance with ASTM Designation C566-Latest, "Test Method for Total Moisture Content of Aggregate by Drying". In addition to the limits on the maximum amounts of free moisture in aggregates, the moisture content shall be controlled so that for each size the variation in the percent of free moisture will not be more than 0.5 percent during any one hour of mixing plant operation and not more than 2.0 percent during any 8-hour period of mixing plant operation. Under no conditions shall the aggregates be delivered to the mixing plant being dripping wet.

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

### 8.8. WATER

#### 8.8.1. General

Water for washing aggregates and for mixing and curing concrete shall be clean, potable and free from injurious amount of oil, acid, alkali, salts, silt, organic matter, or other deleterious substances as determined by standard tests selected by the Engineer. It shall meet the following requirements:

- The water for curing concrete should not have a pH value lower than 5 and shall not contain impurities which cause discoloration of concrete.
- Total solid contents shall not be more than 2000 ppm, as measured by ASTM Designation D1888-Latest, "Standard Test Method for Particulate and Dissolved Matter, Solids or Residue in Water"
- The mixing water, including that contained as free water in aggregates, shall not contain more than 250 ppm of chlorides as determined by ASTM Designation D512-Latest, "Test Method for Chloride Ion in Water".
- A comparison of the proposed mixing water properties shall be made with distilled water by performing the following tests:



- a) Soundness, in accordance with ASTM Designation C151-Latest, "Test Method for Autoclave Expansion of Portland Cement". The results obtained for the proposed mixing water shall not be more than +0.10 above those obtained for distilled water.
- b) Time of Setting, in accordance with ASTM Designation C191-Latest "Test Method for Time of Setting of Hydraulic Cement by Vicat Needle". The results obtained for the proposed mixing water shall be within  $\pm 10$  minutes for initial setting time and  $\pm 1$  hour for final setting time of those obtained for distilled water.
- c) Compressive Strength in accordance with ASTM Designation C109/C109M-Latest, "Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm or 2-in., Cube Specimens)". The results obtained for the proposed mixing water shall not be lower by more than 10% of those obtained for distilled water.

## 8.9. PROPORTIONING OF CONCRETE

### 8.9.1. Control

Trial mixes and tests will be made by the Engineer for the purpose of designing the mixes and for quality control. The Contractor shall co-operate and assist the Engineer in obtaining samples and/or conducting field tests. The proportions of all materials entering into the concrete shall be as directed by the Engineer. The proportions will be changed whenever such change is necessary to maintain the standard of quality required for the structure covered by these Specifications and to meet the varying conditions encountered during construction. The Contractor will be entitled to no compensation additional to that included in the prices for the applicable items in the Bill of Quantities because of such changes.

### 8.9.2. Measurement

All materials entering into the concrete shall be mechanically measured by weight or by volume as approved by the Engineer.

### 8.9.3. Cement Content

The cement content of concrete for the various parts of the structure will range approximately minimum range from 11.20 lbs/ft<sup>3</sup> to 31.20 lbs/ft<sup>3</sup> depending on the size, type and gradation of the aggregates used, and on the structural requirements. The table below gives the estimated minimum cement content per cubic feet of different classes of concrete to be used in different works:

Class	Minimum Cement Content (lbs/ft <sup>3</sup> )
A	31.20
B	28.08



C	24.96
D	18.72
E	14.05
F	11.20

#### 8.9.4. Aggregate Content

The maximum size of aggregate to be used in the various parts of the structure shall be as shown on the Drawings and, where not shown, shall be as directed by the Engineer. Concrete mixes shall be designed to use the largest size and maximum amount of coarse aggregate practicable.

#### 8.9.5. Water Content

##### 8.9.5.1. Water Cement Ratio

In general, the Engineer's design will provide for water cement ratios by weight (exclusive of water absorbed by the aggregates), which will be determined on the basis of producing concrete having suitable workability, density, impermeability, durability and the required strength without the use of excessive amounts of cement.

##### 8.9.5.2. Consistency

The amount of water used in the concrete will be regulated as required by the Engineer to secure concrete of proper consistency taking into account the effect of use of the specified admixtures and any variation in either or both the moisture content or grading of the aggregates as they enter the mixer. Addition of water to compensate for hardening of the concrete before placing will not be permitted. Uniformity in concrete consistency from batch to batch will be required.

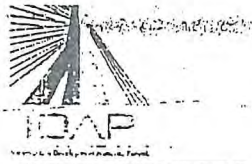
#### 8.9.6. Concrete Strength

Concrete for the structures and parts thereof shall have compressive strengths at least equal to the minimum allowable strength shown in the following Table, except as otherwise shown on the Drawings or as directed by the Engineer:

Class of Concrete	28-days Minimum Compressive strength Cylinder strength
A	6000 psi (41 MPa)
B	5000 psi (35 MPa)
C	4000 psi (28 MPa)
D	3000 psi (21 MPa)
E	2000 psi (14 MPa)
F	1000 psi (07 MPa)

#### 8.9.7. Slump





kept continuously wet for at least eighteen hours during the twenty-four-hour period prior to placing concrete except as otherwise directed by the Engineer. All free water shall be removed, and the construction joint shall be completely surface dry prior to placement of concrete. All concrete placing equipment and methods shall be subject to approval of the Engineer. Concrete placement will not be permitted, when, in the opinion of the Engineer, weather conditions prevent proper placement and consolidation.

The Contractor may use pumps for concreting if so desired or directed by the Engineer. All pump concrete shall be placed as per requirements of ACI 304.2R-Latest. The Contractor shall submit his method statement in this regard. The Contractor shall also submit the list of all the equipment and machinery to be used for pump concrete for approval of the Engineer prior to concreting operations.

#### 8.13.2. Time interval between mixing and placing

Concrete mixed in stationary mixers and transported by non-agitating equipment shall be placed within thirty minutes after it has been mixed, unless otherwise authorized. When a truck mixer or an agitator is used for transporting concrete, the concrete shall be delivered to the site of the work and discharge shall be completed within one and a half hours after introduction of the cement to the aggregates. The concrete shall be placed within 20 minutes after it has been discharged. In all cases, concrete shall be placed and compacted well within the initial setting time.

#### 8.13.3. Placing temperature

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

- Thin Sections

Concrete for thin sections shall be delivered to the forms at the coolest temperature, which is practicable to produce under current conditions but in no case at a temperature in excess of 32°C. Except as otherwise determined by the Engineer, sections to which this provision shall apply will be considered to be sections less than 20 inch in thickness.

- Moderate Sections

Concrete for moderate sections shall have a temperature of not more than 21°C, when placed. A moderate section will be one that is 20 inch or greater in thickness.

- Mass Concrete Sections

Concreting having a measure of 3 ft or more in thickness shall have a temperature not exceeding 18°C.



#### 8.13.4. Lift in concrete

Concrete shall be installed in lifts or depths as shown on the Drawings. The placement of concrete shall be carried on at such a rate and in such a manner that formation or of cold joints is prevented. Slabs shall be placed in one lift, unless otherwise authorized or directed. In walls, lifts shall terminate at such levels as shall conform to structural details. Where slabs and beams are placed continuously with walls and columns, the concrete in walls and columns shall have been in place for at least two hours, or for a longer period when directed by the Engineer, before placing concrete in the slabs and beams. The top surface of vertically formed lifts shall be generally levelled. The concrete in columns shall be placed in one continuous operation, unless otherwise authorized. In general, the construction joints in foundation slab shall be located at 36 feet in either direction or as shown on the Drawings and concrete shall be placed in the sequence indicated on the Drawings or as authorized by the Engineer. The maximum differential in height between the various pours of the structure shall be as shown on the Drawings or as directed by the Engineer.

#### 8.13.5. Elapsed time between placement of lifts

Except as otherwise approved on the basis of lift drawings submitted by the Contractor, a minimum of 72 hours shall elapse between the placing of successive lifts of walls and thin sections and 120 hours shall elapse between placing lifts of moderate sections. Thin sections and moderate sections are defined in Clause 8.13.3.

#### 8.13.6. Time between adjacent pours

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

#### 8.13.7. Concrete above and around openings

If concrete is placed monolithically around openings having vertical dimensions greater than 2 feet, or if concrete in floor slabs, or other similar parts of structure is placed monolithically with supporting concrete, the following instructions shall be strictly observed:

- Placing of concrete shall be delayed from one to three hours at the top of openings and at the bottom of bevels under floor slabs, or other similar parts of structure when levels are specified and at the bottom of such structural members when levels are not specified; but in no case shall the placing be delayed so long that the vibrating unit will not readily penetrate on its own weight in the concrete placed before the delay. When consolidating concrete is placed after the delays, the vibrating unit shall penetrate and revibrate the concrete placed before the delay.



- The last 2 feet or more concrete placed immediately before the delay shall be placed with as low a slump as practicable and special care shall be exercised to effect thorough consolidation of the concrete.
- The surface of concrete where delays are made shall be clean and free from loose and foreign material, when concrete placing is started after the delay.
- Concrete placed over openings and in slabs and other similar part of structure shall be placed with as low a slump as practicable and special care shall be exercised to effect thorough consolidation of the concrete.

#### 8.13.8. Concrete for second stage and block out

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

Second stage concrete for filling the openings left for the installation of equipment and fittings shall be anchored to the first stage concrete. The size and spacing of the concrete fixing sockets, if any, to be embedded in the first stage concrete shall be subject to the approval of the Engineer. Different components of structures to be built from second stage concrete like partition walls, slabs, beams and other part of structure indicated on Drawings as second stage shall be connected to the first stage concrete through dowels. Dowels not shown in first stage concrete Drawings shall be drilled as approved by the Engineer.

#### 8.13.9. Placing concrete through reinforcement

In placing concrete through reinforcement, care shall be taken that no segregation of the coarse aggregate occurs. In certain cases, like the bottom of beams and slabs, the congestion of steel near the forms may make placing difficult. In such cases, as decided by the Engineer, a layer of mortar of a composition compatible with the required concrete strength shall be first deposited to cover the surface to a depth of 0.60 inch.

#### 8.13.10. Vibration of concrete

"Guide for Consolidation of Concrete", ACI 309R -Latest, shall be followed for concrete consolidation. Concrete shall be compacted with mechanical vibrating equipment supplemented by hand spading and tamping. In no case shall vibrators be used to transport concrete inside the forms. The vibrating equipment shall be of the internal type and shall at all times be adequate in number of units and power of each unit to properly consolidate all the concrete. Form or surface vibrators shall not be used unless specifically approved. The intensity (amplitude) of vibration shall be sufficient



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(frequency not less than 8,000 impulses per minute) to produce satisfactory consolidation. The duration of vibrations shall be limited to that necessary to produce satisfactory consolidation. Excessive surface working will not be permitted.

#### 8.13.11. Moving pre-cast elements

Precast concrete elements if any shall not be moved until they have attained at least 75 percent of their required 28 days strength and shall be picked up only by their lifting hooks.

### 8.14. FORMS

#### 8.14.1. General

The work shall include design, erecting, supporting, bracing and maintaining formwork so that it will safely and rigidly support all vertical and lateral loads encountered during construction. Forms shall be true to line and grade, mortar tight and sufficiently rigid to prevent objectionable deformation under load. Where forms for continuous surfaces are placed in successive units, care shall be taken to fit the forms over the completed surfaces so as to obtain accurate alignment of the surface and to prevent leakage of mortar. Responsibility for their adequacy shall rest with the Contractor; however, the type, shape, size, quality and strength of all materials of which the forms are made shall be subjected to specific approval by the Engineer. Bolts and rods used for internal ties shall be so arranged, that when the forms are removed, metal will not be less than 2 inches away from any concrete surface. Wherever form ties are used, their arrangement and spacing shall be in a regular pattern, in accordance with the dimensions of the formwork panels and as instructed by the Engineer. The use of bolts and ties penetrating linearly through the concrete section will not be permitted. Wire-ties will not be permitted where the concrete surface will be exposed to weathering and where discoloration will be objectionable. Depressions resulting from removal of the form ties shall be filled in accordance with the provisions of Clause 8.16, "Repair of Concrete". Suitable openings as required shall be provided in the formwork for the passage of piping, ducts, channels, etc. All forms shall be so constructed that they can be removed without damaging the concrete. All exposed joints, edges and external corners shall be chamfered 0.70 inch at 45 degrees except as otherwise shown. Internal corners shall be filleted where indicated or required. Forms to be used more than once shall be maintained in serviceable condition and shall be thoroughly cleaned before re-use.

#### 8.14.2. Coating

- Shortly before concrete is placed, forms for exposed surfaces shall be coated with approved non-staining form oil, which shall not interfere with the setting of the concrete nor be otherwise deleterious. After oiling, surplus oil on the form surfaces and any oil on the reinforcing steel or other surfaces requiring bond with the concrete shall be



removed to the satisfaction of the Engineer. Forms for unexposed surfaces may be thoroughly wetted, in lieu of oiling, immediately before the placing of concrete.

#### 8.14.3. Removal

The Contractor shall be responsible for ensuring that sufficient time has elapsed for the concrete to attain sufficient strength before removal of forms but no forms may be removed without prior approval of the Engineer. Forms shall be removed with care so as to avoid injury to the concrete. Forms shall be removed as soon as practicable, keeping in view the minimum time requirements, to avoid delay in water curing and to enable earliest practicable repair of surface imperfections. In order to avoid excessive stresses in the concrete that might result from swelling of the forms, wood forms for wall openings shall be loosened as soon as this can be accomplished without damage to the concrete. Forms for the openings shall be constructed in such a manner as to facilitate such loosening. Forms shall not be removed until the strength of the concrete is such that form removal will not result in perceptible cracking, spalling and breaking of edges of surfaces or other damage to the concrete. Forms shall not be removed before the expiration of the minimum time indicated below, except as otherwise directed or specifically authorized by the Engineer:

Beams and slabs	Bottom	14 days
	Side	72 hours
Columns and walls		36 hours
Moderate Sections		36 hours

#### 8.15. TOLERANCES FOR CONCRETE CONSTRUCTION

Permissible surface irregularities for the various classes of concrete surface finish as specified in Clause 8.17, "Finishes and Finishing", are defined as finishes, and are to be distinguished from tolerances as described herein. In general, the permissible construction tolerances for reinforced concrete shall conform to the requirements of the following tabulated values, as applicable. The specific tolerances for each structure and part thereof shall be as determined by the Engineer. Notations on the Drawings of specific maximum or minimum tolerances in connection with any dimension shall be considered as supplemental to the tolerance specified herein and shall control. The Contractor shall be responsible for setting and maintaining concrete forms sufficiently within the tolerances limit to ensure that the completed work will be within the tolerances specified herein. Concrete work that exceeds the tolerance limits specified herein shall be remedied or removed and replaced by and at the expense of the Contractor:

##### I. Variation from plumb:



- In the lines and surfaces of columns, walls, and in arises:
  - In any 10 ft length 0.25 inch
  - Maximum for the entire length 0.75 inch
- For exposed corner columns, control joint grooves, and other conspicuous lines:
  - In any 20 ft length 0.25 inch
  - Maximum for the entire length 0.50 inch

**II. Variation from the level or from the grades specified on the Drawings:**

- In slab soffits, ceilings, beam soffits and in arises, measured before removal of supporting shores
  - In any 10 ft length 0.25 inch
  - In any bay or in any 20 ft length 0.40 inch
  - Maximum for the entire length 0.75 inch
- In exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines:
  - In any bay or in 20 ft length 0.25 inch
  - Maximum for the entire length 0.50 inch

**III. Variation of the linear building lines from established position in plan and related position of column, walls, and partitions:**

- In any bay or in any 20 ft length 0.50 inch
- Maximum for the entire length 1.00 inch

**IV. Variation in the sizes and location of sleeves, floor openings, and wall openings:**

- Maximum + 0.25 inch

**V. Variation in cross-sectional dimension of columns and beams and in the thickness of slabs and walls:**

- Minus 0.25 inch
- Plus 0.50 inch

**VI. Footings**

- Variations in dimensions in plan
  - Minus 0.50 inch
  - Plus 2.00 inch
- Misplacement or eccentricity
  - 2 percent of the foundation width in the direction of misplacement but not more than 2.00 inch
- Thickness



Decrease in specified thickness 5%

**VII. Variation in steps:**

- In a flight of stairs

Riser	0.125 inch
Tread	0.250 inch

- In consecutive steps:

Riser	0.787 inch
Tread	0.125 inch

**8.16. REPAIR OF CONCRETE**

**8.16.1. General**

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

**8.16.2. Material**

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

**8.16.3. Protrusions**

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

**8.16.4. Depressions**

**8.16.4.1. General**

All fillings for depressions shall be bonded tightly to the surfaces of holes and shall be sound and free from shrinkage cracks and dummy areas after the fillings have been cured and have dried. All fillings in surfaces of structure prominently exposed to public view shall contain sufficient white Portland cement to produce the same color as that of the adjoining concrete. Repairs shall be made with concrete filling, mortar filling, or dry-pack filling except where repairs with epoxy concrete and/or epoxy mortar are



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directed to be made by the Engineer. Concrete, mortar, and dry-pack mortar filling shall each be mixed in proportions approved by the Engineer to produce a repair at least equivalent in strength, density and durability to the concrete in which the repair is required.

**8.16.4.2. Concrete fillings**

Concrete filling shall be used for holes extending entirely through concrete sections; for holes in which no reinforcement is encountered and which are greater in area than 1 square feet and deeper than 4 inches; and for holes in reinforced concrete which are greater in area than 0.5 square feet and which extend beyond the reinforcement.

**8.16.4.3. Mortar filling**

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

**8.16.4.4. Dry pack mortar fillings**

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

**8.16.4.5. Surface finished of patched areas**

The Contractor shall correct all imperfections on the concrete surfaces as necessary to produce surfaces that conform to the requirements specified for the adjacent area in Clause 8.17, "Finishes and Finishing". Unless otherwise approved, repair of imperfections in formed concrete shall be completed within 24 hours after removal of forms. Fins and encrustations shall be neatly removed from the surfaces.

**8.17. FINISHING AND FINISHING**

**8.17.1. General**

Allowable deviations from plumb or level and from the alignment, profile grades, and dimensions shown on the Drawings specified in Clause 8.15, Tolerances for Concrete Construction, are defined as tolerances and are to be distinguished from irregularities in finish as described herein. The classes of finish and the requirements for finishing of concrete surfaces shall be generally specified in this Clause and as indicated on the





Drawings. Finishing of concrete surfaces shall be performed only by workmen who are skilled concrete finishers.

The Contractor shall keep the Engineer advised as to when finishing of concrete will be performed. Unless inspection is waived in each specific case, finishing of concrete shall be performed only in the presence of the Engineer. Concrete surfaces will be tested by the Engineer where necessary to determine whether surface irregularities are within the limits hereinafter specified. Surface irregularities are classified as abrupt or gradual. Offsets caused by displaced or misplaced form sheathing or linging or form sections, or otherwise defective form lumber will be considered as abrupt irregularities and will be tested by direct measurements. All other irregularities will be considered as gradual irregularities and will be tested by the use of a template, consisting of a straight edge or the equivalent thereof for cured surfaces. The length of the template will be 5 feet.

#### 8.17.2. FINISHES

##### 8.17.2.1. General

The classes of finish for concrete surfaces shall be as shown on the Drawings or as directed by the Engineer. Interior surfaces shall be sloped for drainage where shown on the Drawings or directed. Surfaces which will be exposed to the weather and which would normally be level shall be sloped for drainage. Unless the use of other slopes or level surfaces is indicated on the Drawings or directed, narrow surfaces, such as tops of walls shall be sloped approximately 0.40 inch per 12 inches. No grinding will be required on such formed surfaces other than that necessary for repair of surface imperfections as specified herein.

##### 8.17.2.2. Ordinary Finish

Ordinary finish (OF) applies to surfaces upon or against which fill material or concrete is to be placed. If unformed, the finishing operation shall consist of sufficient levelling and screeding to produce even uniform surfaces. When formed, the surfaces require no treatment after form removal except for repair of defective concrete and filling of holes left by the removal of fasteners from the end of the tie rods as required under Clause 8.16, Repair of Concrete. Correction of surface irregularities shall be required for depression only and only for those which exceed 1 inch when measured as described in Clause 8.17.1. "General".

##### 8.17.2.3. Rough Concrete Finish

Rough concrete finish (RC) applies to surfaces which are intended to receive ceramic tiles, metallic lining or other applications as indicated on the Drawings. After consolidation and levelling of the concrete to the specified tolerances, the surface shall be roughened with stiff brushes or rakes before final set. Where rough concrete finish



is specified for wall surfaces, the same shall be obtained by use of formwork suitable to produce the required finish. Surface irregularities measured as described in Clause 8.17.1, "General", shall not exceed 0.25 inch for floors and 0.12 inch for walls.

#### 8.17.2.4. Ordinary Slab Finish

Ordinary slab finish (OS) applies to floor surfaces which are not intended to receive any floor coverings. After the concrete has been placed, consolidated, struck-off and levelled, and its surface has stiffened sufficiently, floating shall be performed by use of hand or power-driven equipment, and shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture. Floating shall be continued until a small amount of mortar without excess water is brought to the surface so as to permit effective troweling. Steel troweling shall be started when the surface has hardened sufficiently to prevent excess of fine material from being drawn to the surface. Steel troweling shall be performed with firm pressure such as will flatten the sandy texture of the floated surface and produce a dense uniform surface, free from blemishes and trowel marks. Surface irregularities measured as described in Clause 8.17.1, "General" shall not exceed 0.25 inch.

#### 8.17.2.5. Fair Faced Finish

Faced (FF) concrete surface shall have a fair and smooth appearance, considered acceptable by the Engineer. The contractor shall use formwork of such a quality that can ensure the production of such surfaces. Fair faced concrete surfaces will require no treatment after the removal of forms except the filling of holes left by the removal of fasteners if used.

### 8.18. CURING

#### 8.18.1. Curing of Concrete

All concrete including Concrete repair work shall be cured by an approved method or combination of methods in accordance with ACI 308-Latest, "Standard Practice for Curing Concrete". The Contractor shall have all equipment and materials needed for adequate curing and protection of the concrete in hand and ready to use before actual concrete placement begins. Means shall be provided for the protection of concrete from the sun, drying winds, and traffic until the specified curing has been completed.

The curing medium shall be applied so as to prevent loss of moisture from the concrete. Concrete shall be protected from heavy rains for 24 hours and direct rays of the sun for 14 days. All concrete shall be adequately protected from damage. No fire or excessive heat, including the heat resulting from welding, shall be permitted near or in direct contact with the concrete at any time. All galleries, conduits and other formed openings through the concrete shall be closed during the entire curing period.



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

#### 8.18.2. Moist Curing

Concrete shall be moist-cured by maintaining all surfaces continuously (not periodically) wet for at least 28 days immediately following the placing or until covered with fresh concrete. Precast elements shall be water-cured for not less than 14 days. Curing water shall be removed without allowing stagnant pools of water to form on the exposed lift surface. Water for curing shall comply with the applicable requirements of Clause 8.8; "Water". Surfaces of concrete, which are to be permanently exposed, shall be cleaned if a water is used which stains the surfaces during curing. Where forms of tongue-and-groove or shiplap sheathing are used and are left in place during curing, the sheathing shall be kept wet, at all times. When in contact with concrete, steel forms shall be kept wet. Horizontal construction joints and finished horizontal surfaces cured with sand shall be covered with a minimum uniform thickness of 2 inches of sand which shall be kept continuously saturated. The following exceptions to be requirements for moist curing are permitted:

- Horizontal construction joints may be allowed to dry for six hours immediately prior to the placing of the following lift.
- Moist curing of surfaces, against which backfill is to be placed within 24 hours of concrete placement, will not be required.

#### 8.19. CONSTRUCTION, EXPANSION, CONTRACTION AND CONTROL JOINTS

##### 8.19.1. General

Joints shall be provided at the locations indicated on the Drawings and according to the details shown or as otherwise approved. The methods and materials used in the construction of such joints shall be subject to the approval of the Engineer.

Water stop-type joints shall be provided in the foundation raft between its segments and in the vertical wall joints, where indicated on the Drawings.

##### 8.19.2. Expansion Joints

Expansion joints shall be provided at the locations indicated and according to the details shown on the Drawings. In no case shall any fixed metal, embedded in concrete be continuous through an expansion joint.

##### 8.19.2.1. Expansion Joint Filler

Where indicated on the Drawings, expansion joint filler shall be installed using materials of the type and quality indicated. Expansion joint filler will consist of sponge rubber, self-expanding cork or any other material and type as directed by the Engineer,



meeting the requirements of ASTM Designation D1752-Latest, (Reapproved 1978), "Standard Specifications for Preformed Sponge Rubber and Cork Expansion Joint filler for concrete paving and structural Construction".

#### 8.19.2.2. Expansion Joint Sealer

Sealing compound shall be either of the cold application type conforming to ASTM Designation D1850-Latest, (Reapproved 1979), "Standard Specifications for Concrete Joint Sealer, Cold-Application Type", or of the single or multiple component type or of the hot poured type conforming to the requirements of ASTM Designation D1190-Latest (Reapproved 1980) "Standard Specification for Concrete Joint Sealer, Hot Poured Elastic Type".

#### 8.19.3. Contraction Joints

Contraction joints shall be provided at the locations indicated and according to the details shown on the Drawings. In no case shall any metal, embedded in concrete, be continuous through a contraction joint.

#### 8.19.4. Control Joints

Control joints shall be provided at the locations indicated on the Drawings and according to the details shown or otherwise approved by the Engineer.

#### 8.19.5. Construction Joint Treatment

##### 8.19.5.1. General

As soon as a lift is completed, the top surface shall be immediately and carefully protected from any condition that will damage the concrete. Reinforcing dowels shall be protected as specified in section "Reinforcement".

##### 8.19.5.2. Cleaning

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

##### I. Air - Water Cutting

Air-water cutting of a construction joint shall be performed when approved by the Engineer. The surface shall be cut with a high-pressure air-water jet to remove all laitance and to expose clean, sound aggregate, but not so as to undercut the edges of the larger particles of the aggregate. The air pressure used in the jet shall be 100



Stiffness in flexure, 0.5  
in. span, not less than

3

400 psi

571

#### 8.19.6.3.1. Installation

Splices in the continuity or at the intersections of run of PVC Waterstops shall be performed by heat sealing the adjacent surfaces in accordance with the Manufacturer's recommendations or as directed by the Engineer. A thermostatically controlled electric source of heat shall be used to make all splices. The correct temperature at which splices should be made will differ with the material used but should be sufficient to melt but not char the plastic. After splicing, a remolding iron with ribs and corrugations to match the pattern of the Waterstops shall be used to reform the ribs at the splices. The continuity of the characteristic components of the cross-section of the Waterstops design (ribs, tubular center axis, protrusions, and the like) shall be maintained across the splice.

### 8.20. MEASUREMENT AND PAYMENT

#### 8.20.1. General

Except as otherwise specified hereunder, measurement of concrete will be made on the basis of the actual volume of concrete in place within the neat lines of the structure, as indicated on the Drawings or as otherwise established by the Engineer. Measurement for payment will not be made of concrete, nor do any ingredients including cement in concrete which is placed outside of the pay lines shown on the Drawings. Measurement of concrete placed against the sides of any excavation without the use of intervening forms will be made only within the pay lines of the structure. Unless otherwise specified, payment for concrete will be made at the respective Contract unit price per cubic feet for the various Items of the Bill of Quantities, which price shall include the cost of all labor, materials and the use of all equipment and tools required to complete the batching, mixing, transporting, placing protecting, curing and other concrete work; except the cement, reinforcement, concrete admixtures, waterproofing layer, and embedded parts which are specified to be paid for separately. The Contract unit prices per cubic feet for concrete will include the cost of formwork (unless specifically included in a separate BOQ Item), form oils, aggregates, water, preparation of joints, joint fillers, tar paper, asphalt impregnated cork, bituminous coatings, bond breaking and curing compounds, handling and incorporating the cement admixtures into the work, mixing, cooling, specified cleaning and other preparation of surface to receive concrete, placing, finishing, curing and all other work required to complete the concrete structures covered hereunder. The Contract unit prices per cubic feet for concrete shall also include the removal of temporary first stage concrete or temporary recess concrete required to be removed for which payment is not herein below specifically provided. No measurement or payment for patching faulty concrete with Portland cement mortar, epoxy mortar or by any other method will be made. The Items for Concrete Work are specified hereinafter.



## 9. STEEL REINFORCEMENT

### 9.1. GENERAL

The Contractor shall furnish, cut bend, fabricate and place all steel reinforcement including rods and fabric, as indicated on the Drawings or otherwise required by the Engineer. All reinforcement, when surrounding concrete is placed, shall be free from loose flaky rust and scale, and free from oil, grease or other coating, which might destroy or reduce its bond with the concrete. All placing shall be in accordance with the Drawings furnished or approved. The use of reinforcement for the transmission of current for welding will not be permitted. All reinforcement, including dowels, remaining exposed in the work shall be suitably protected until embedded in concrete.

### 9.2. CODES AND STANDARDS

ACI 315 Latest	Manual of standard Practice for Detailing Reinforced Concrete Structures
ACI A615 Latest	Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement
ACI A706 Latest	Standard Specification for Low Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
AWS D12.1	Recommended Practice for Welding Reinforcing Steel, Metal Insert and Connector

### 9.3. SUBMITALS

The contractor shall submit the following to the Engineer for his approval/record before execution of work.

- a) Samples of materials as specified and as otherwise may be requested by the Engineer including names, sources and descriptions as required.
- b) Mill Certificate or Laboratory test reports as required.

### 9.4. DELIVERY AND STORAGE

- a) All reinforcement bundled, tagged and marked with complete identification shall be delivered at site.
- b) Reinforcement shall be stored at site and protected from mud and other deleterious materials.



#### 9.5. CUTTING AND BENDING

Steel reinforcement may be mill or field cut and bent. All bending shall be in accordance with standard approved practice and by approved machine methods. When bending is required, it shall be performed prior to embedding the bars in the concrete. In all such cases, the bars shall be cold bent. Bending or straightening of bars partially embedded in set concrete shall not be permitted except in isolated cases where corrective action or a field change is required and is specifically approved by the Engineer.

The Contractor shall ensure that the bars do not get cracked or damaged during bending and fabrication.

#### 9.6. QUALITY

Steel bar reinforcement shall be deformed bars conforming to the provisions of ASTM Designation A615-Latest, "Standard Specifications for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement" or A 706-Latest "Standard Specification for Low Alloy Steel Deformed and Plain bars for concrete Reinforcement" and shall have minimum yield strength of 60,000 psi (414 MPa) Grade 60 or as per mentioned information in the drawings.

At least 45 days prior to issuing each order for reinforcing steel, the Contractor shall notify the Engineer in writing of the Contractor's proposed sources of supply so that the Engineer may make arrangements for plant examination, testing, and inspection. A similar notification shall be given prior to each shipment to the Site. The Contractor shall provide such assistance, instruments, machines, labor, and materials as are required for examining, measuring and testing the quality, weight or quantity of steel at the mill and at the Site. All samples shall be supplied by the Contractor at his own cost. No steel shall be incorporated in the works without prior approval of the Engineer.

#### 9.7. SPACING OF BARS

The spacing of bars shall be as shown on the Drawings or as directed by the Engineer. The variation from indicated spacing, provided that the total area of reinforcement is in accordance with the Drawings, shall not be more than 1 inch.

#### 9.8. RELATION OF BARS TO CONCRETE SURFACES

The cover for all main reinforcement shall conform to the dimensions shown on the Drawings. The protective covering shall not be less than, and shall not exceed by more than 0.25 inch, the values specified on the Drawings. The dimensions, as shown on the Drawings, indicate the clear distance from the edge of the main reinforcement to the concrete surface. The concrete covering of stirrups, spacer bars, and similar secondary reinforcement may be reduced by the diameter of such bars.



#### 9.9. SPLICING

Except as otherwise shown on the Drawings or specified herein, all splices, lengths of laps, splice locations, placement and embedment of reinforcement shall conform to the applicable requirements of ACI 318-Latest, "Building Code Requirements for Reinforced Concrete". All splices and locations of laps in reinforcement shall be as shown on the Drawings or as directed by the Engineer. Additional bar splices shall be provided as required, subject to the approval of the Engineer. Lapped ends of bars may be placed in contact and securely wired or may be separated sufficiently to permit the embedment of the entire surface of each bar in concrete.

Splicing of the reinforcing bars by butt-welding or by approved mechanical methods such as Cad welds splices or other splices using positive connectors (mechanical splicing) shall be adopted where directed by the Engineer. Butt-welding of reinforcing bars shall conform to the requirements of AWS D.12.1, "Recommended Practice for Welding Reinforcing Steel, Metal Inserts and Connectors". Concrete shall be protected from heat during welding operations.

#### 9.10. SUPPORTS

All reinforcement shall be secured in place by use of metal or concrete supports, spacers, or ties, as approved by the Engineer. Such supports shall be of sufficient strength to maintain the reinforcement in place throughout the concreting operations. The supports shall be used in such a manner that they will not be exposed or contribute in any way to the discoloration or deterioration of the concrete. Concrete supports shall be manufactured of the same concrete strength as used in the structure to be concreted.

#### 9.11. EMBEDDED ITEMS

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

#### 9.12. EARTHING OF REINFORCEMENT

All steel reinforcement and the metallic frames in the building shall be systematically earthed. The electrical continuity of the building as a whole will be insured by tack-welding. The steel reinforcement in columns shall be welded with the slab reinforcement at each junction.





### 9.13. MEASUREMENT AND PAYMENT

#### 9.13.1. Measurement

Weight will be calculated of the number of kilograms/Tons of reinforcing steel acceptably placed on the basis of the lengths of bars installed in accordance with the approved Drawings or bar schedules or as directed, converted to weights for the size of bars listed by the use of unit weights per linear foot as follows:

BAR DESIGNATIONS NO.	UNIT WEIGHT (lb/ft)
2	0.167
3	0.376
4	0.668
5	1.043
6	1.502
7	2.044
8	2.67
9	3.40
10	4.303
11	5.313

\*All Steel laps as may be required to be provided due to the design and other consideration during the fixing of steel reinforcement shall be borne by the contractor. All waste of steel reinforcement during steel fixing shall also be borne by the contractor.

#### 9.13.2. PAYMENT

Payment will be made for the number of kilograms/Tons measured as provided above at the Contract unit price per kilogram/Tons for Furnish and Install Reinforcing Steel and shall constitute full compensation for furnishing, delivering, storing, handling, bending, cutting, cleaning, placing, tack welding, supporting and fixing the bars and all other work related to the item.



## 11. BLOCK MASONRY

### 11.1. GENERAL

The work under this section of the Specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with the supply and installation of cement concrete block masonry walls grouting of pressed steel door/panel frames occurring in concrete masonry walls and partitions including wall ties, anchors, damp-proof courses, complete in strict accordance with this section of the Specifications and applicable drawings, and subject to the terms and conditions of the Contract.

### 11.2. CODES AND STANDARDS

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

#### PS (Pakistan Standards)

232	Ordinary Portland Cement
419	Properties & Specification of blocks

#### ACI (American Concrete Institute)

530	Building code requirement for masonry structure
531.1	Specifications for concrete masonry construction

#### ASTM (American Society for Testing and Material)

C129	Non-Load bearing concrete Masonry Units
C140	Sampling and testing of concrete masonry units
C144	Aggregate for masonry mortar
C145	Solid load bearing concrete masonry units
C149	Bond strength of mortar to masonry units
C270	Mortar for concrete masonry
C331	Lightweight aggregate for concrete masonry units
C404	Aggregate for Masonry Grout
C426	Test method for Drying shrinkage of concrete Block.
C150	Portland Cement
C90	Specification for Load Bearing Concrete Masonry Units
C476	Specification for Grout for Masonry



**BSI (British Standards Institution)**

743	Material for Damp proof course
3148	Test Method for Making concrete
1243	Specification for Metal Ties for cavity wall construction
4887	Mortar Plasticizer
1221Pt-1	Brick and Block Masonry
122 Pt-2	Wall and Partition of Blocks and Slabs

All design detailing, materials and workmanship shall conform to ACI-530.

**11.3. PRODUCT, DELIVERY, STORAGE AND HANDLING**

Deliver concrete masonry units stacked on pallets.

Store units above ground on level platforms allowing air circulation under stacked units. Cover and protect units against wetting prior to use.

Handle units on pallets or flatbed barrows. Do not permit free discharge from conveyor units or transporting in mortar trays.

**11.4. MATERIALS**

Materials for masonry shall conform to the requirements as specified herein, or on the drawings, whichever are more stringent.

**11.4.1. Block**

Cement, aggregates and water for concrete blocks shall conform to the requirements as specified in the section- "Concrete" or as approved by the Engineer.

**11.4.2. Mortar**

**11.4.2.1. Aggregate**

Aggregate for mortar shall comply with the requirements of ASTM C144. Sand that has been in contact with seawater shall not be used unless it has been thoroughly washed to the satisfaction of the Engineer.

**11.4.2.2. Cement**

Cement shall be Ordinary Portland Cement conforming to C150.

**11.4.2.3. Water**

Water shall be clean and free from any harmful impurity. Where the quality of the water is doubtful, it shall be tested in accordance with BS-3148.

**11.4.2.4. Additives**

Additives where used, shall be proprietary products used the proportions and manner recommended by the manufacturer. The additives shall in no way adversely affect the



mortar strength or contain chemicals, which may be harmful to other building materials. To add gypsum to cement is strictly forbidden.

#### 11.4.2.5. Mortars and Grout

Materials for mortar, sand binding agent and water, shall be mixed by volume or by weight for at least 3 minutes with the minimum amount of water to produce a correctly mixed mortar or grout of workable consistency in a mechanical batch mixer. For small jobs, hand mixing may be permitted, the ingredients being mixed with sufficient water to produce a correctly mixed workable mortar.

Mortar used in masonry construction shall conform to ASTM C270 types, having average minimum compressive strength of 50 mm (2 in.) cube of mortar as 12.5 MPa.

Grout shall conform to ASTM C-476 and shall be proportioned by volume as shown in Table 2 of Standard ASTM C-476.

Mortars shall be mixed in batches, which can be used within a period before the setting process commences. Once a mix begins drying off, it shall be rejected. No ingredients shall be added to it once the setting process has begun.

### 11.5. CONCRETE BLOCK MAKING

The blocks shall be machine molded. The block making machines shall be of the standard approved by the Engineer. They shall be operated according to the instructions laid down by the manufacturers.

The blocks shall be continuously water cured by sprinkling water for a minimum of 10 days and covered between sprinkling operations with 4 mils thick polyethylene sheeting. After the 10 days water-curing period the blocks shall be air-dried. Under no circumstances will blocks be used in the work until they are completely dry. During curing period no surfaces of the block will be allowed to dry.

Cured concrete blocks shall be stored off the ground, stacked on level platforms, which allow air circulation under stacked units. Units shall be covered and protected against wetting.

Care shall be exercised in the handling of all concrete blocks. No damaged blocks shall be used in the work.

The block cast on different dates shall be stacked separately and must be labelled showing the dates on which they were cast.

#### 11.5.1. Properties of Blocks

All blocks shall be of the size and shape required to complete the work shown in the Drawings or as instructed by the Engineer.



Walls or partitions abutting concrete columns or walls shall be securely anchored and tied with metal anchors or ties at not more than 450 mm (18 in.) vertical centers. Wall ties cast in with concrete shall be bent down after the removal of formwork and shall be securely jointed into the mortar beds of walling.

#### 11.7.1. Scaffolding

Contractor 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 Engineer shall not be used until it has been strengthened and made safe for use of workmen. Cost of scaffolding etc., shall be included by the Contractor in the unit rate for masonry items.

Damage to masonry from scaffolding or from any other object shall be repaired by the Contractor at his own cost.

#### 11.7.2. Jointing

Jointing is the forming of joints as work proceeds. Joints shall be as follows:

Exterior exposed joints shall be tightly formed to weather joint with the point of the trowel.

Interior exposed joints shall be tightly formed to a concave joint.

Joints which are subsequently covered with plaster or other materials shall be struck flush

#### 11.7.3. Damp Proof Course

Damp-proof course shall be laid on an even mortar board free from Projections which may puncture the material. Where the damp proof course is to be stepped, only flexible membrane shall be used. All damp proof courses, unless otherwise specified, shall consist of class 'C' cement concrete 50 mm thick, mixed with 2.5 kg. Of puddle per bag of cement or other approved quality water proofing compound, as per manufacturer's specifications and shall be laid at required levels as per drawings and instructions of the Engineer. The D.P.C shall be tamped, consolidated, leveled, edges and corners made to the requirements of concerned drawings including finishing and curing complete

#### 11.7.4. Protection of Work

Protect surrounding work from mortar dripping or other damage during construction

Remove misplaced mortar or grout immediately.

Cover top of walls with non-staining waterproof coverings when work is not in progress.

#### 11.7.5. Built in Work

Avoid cutting and patching.



Install bolts, anchors, nailing blocks, inserts, frames, reinforcements, and other built-in items as masonry work progresses.

Solidly grout voids and spaces around built-in items and metal doorframes.

#### 11.7.6. Chase

Build in chases, do not cut block or cut in after laying.

Chases shall be plumb and be minimum one-unit length from jambs of openings.

#### 11.7.7. Striking of Joints and Cleaning

At final completion of masonry work, fill holes in joints and strike with tool.

Cut out and re-point defective joints.

Dry brush masonry surface after final striking of joint when mortar has set.

Leave work and surrounding surfaces clean and free of mortar spots and drippings.

#### 11.7.8. Curing and Repairs

All block masonry shall be water cured and shall be kept wet for at least seven days, by an approved method which will keep all surfaces to be cured continuously wet. Water used for curing shall meet the requirements of the specifications for water used in the manufacture of blocks.

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

#### 11.8. TOLERANCES

All block work shall be erected plumb and true to line and level with the maximum variation in any story height or any length of wall being one mm in one meter. The maximum tolerance in the length, height or width of any single masonry wall shall be  $\pm 3$ mm.

#### 11.9. MEASUREMENT AND PAYMENT

##### 11.9.1. General

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

- Chiseling of masonry, wherever required.



- Providing and fixing all horizontal/vertical reinforcing bars and steel anchors.
- Providing and laying damp proof courses.
- Provide & apply setting mortar
- Scaffolding & other supports to carry out work.
- Raking out joint and cleaning
- Curing and repairs
- concrete mix used in making up short fall in height of wall, filling of specified hollow blocks around door, windows, openings, as shown on the drawings.
- Insulation
- Reinforced concrete members such as stiffener columns and tie beams.

#### 11.9.2. Measurement

Measurement of works against respective item(s) given in the Bill of Quantities, acceptably completed in-conformance with the specifications under this Section, shall be made to the neat lines shown on the drawings and on the basis of No. of Units given in the Bill of Quantities. All openings left in the masonry wall shall be deducted.

#### 11.9.3. Payments

Payment of acceptable completed works against respective item(s) given in the Bill of Quantities, as measured above, shall be made on the basis of Unit Rate quoted in the Bill of Quantities and shall constitute full compensation for all incidentals/associated works specified in this Section relevant to the item(s).

## 12. BRICK MASONRY

### 12.1. GENERAL

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

### 12.2. CODES AND STANDARDS

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

ACI 530	Building code requirements for Masonry structure
ACI 530.1	Specification for masonry structures
PS 208	Classification, strength and properties of bricks
ASTM C67	Standard Method for sampling and testing bricks and structural clay tiles
ASTM C144	Standard specification for Aggregates for masonry mortar

### 12.3. SUBMITTALS

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

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

### 12.4. TOLERANCES

#### 12.4.1. Brick

No overall dimension of brick (width, height and length) shall differ from the specified standard dimension by more than 3 mm. Standard dimensions of brick is 230 x 115 x 75mm<sup>3</sup> and fair face brick (gutka) is 230 x 62 x 62 mm<sup>3</sup>.

#### 12.4.2. Brick Work

All brick work shall be erected true to line, plumb and level and the variation from plumb in any length of wall shall not exceed 2mm in one meter or 10 mm in a story height or 25mm in the entire height.





## 12.5. INSPECTION AND TESTING

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

### 12.5.1. Inspection

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

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

### 12.5.2. Testing

Burnt bricks shall be of uniform color, finish and free from cracks, warpage, exposed stones, pebbles or particles of lime. The size of the bricks shall be in accordance with that shown on the Drawings. The testing of bricks shall comply with ASTM C67. Physical requirements of the bricks shall be as given as shown below or mentioned in the drawings.

Bricks	Minimum Compressive strength (brick flat wise)	Maximum Water Absorption in 5 hours	Maximum saturation co-efficient
Individual	800 Psi	25%	0.9
Average of 3 bricks	1000 Psi	22%	0.88

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

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



If 10 bricks per thousand are defective or if the average weight of nominal 9" 230 mm x115x75mm<sup>3</sup> brick is less than 3.5 kg or the bricks are out of dimension the whole lot shall be rejected and the Contractor shall remove the rejected lots from the Site.

## 12.6. DELIVER AND STORAGE

### 12.6.1. Delivery

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

### 12.6.2. Storage

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

## 12.7. MORTAR

### 12.7.1. Cement

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

### 12.7.2. Sand

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

Sieve Size		Percentage passing (By Weight)
Sieve Size	Sieve No.	
4.76 mm	4	100
2.38 mm	8	95 to 100
1.18 mm	16	70 to 100
600 µm	30	40 to 75
300 µm	50	10 to 35
149 µm	100	Max. 25
74 µm	200	Max. 10

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



### 12.7.3. Water

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

### 12.7.4. Surkhi

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

### 12.7.5. Mortar Composition

#### 12.7.5.1. Cement Sand Mortar

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

#### 12.7.5.2. Mortar for fair face Brick Cladding (gutka)

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

Cement	Surkhi
1	4

OR

Swan pozzolana in the ratio as recommended by manufacturer.

#### 12.7.5.3. Mortar Batching

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



## 12.8. BRICKS

### 12.8.1. Bricks Material

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

### 12.8.2. Bricks Manufacture

All bricks shall be manufactured by the Trench Kiln Method or other standard method approved by the Engineer. The molds to be used in the manufacture of bricks shall be thoroughly sanded before each use and shall be sufficiently larger than the size of the bricks being manufactured to allow for shrinkage in drying and burning. Each finished brick shall be a nominal 230x115x75 mm<sup>3</sup> in size, shall weigh between 3.2 and 4.1 kilograms and shall have a "frog" 6-millimeter-deep on the upper face. The bricks shall be thoroughly burnt but without being vitrified. The bricks used shall be well burnt, uniform in shape, size, texture, color and should produce a ringing sound when struck. The bricks shall be free from flaws, cracks, chips, stone nodules of lime or kankar or other blemishes. Bricks over burnt, vitrified, irregular in shape or not having uniform color or under burnt shall not be used. Bricks of uniform size shall be used throughout the work and the source of supply shall not be diversified.

### 12.8.3. Stacking and Sampling

The bricks shall be sorted and arranged in stacks of one or two thousand or as directed by the Engineer. Each stack shall be 10 courses high and two bricks thick so that at least 0.6 meters space between the stacks shall be left for the purpose of inspection. Each size or class of brick shall be stacked separately. For purposes of inspection and tests the sample bricks shall be selected by the Engineer or a person authorized by the Engineer for this purpose. These samples shall be furnished by the Contractor without charge. The sampling shall conform to ASTM C 67. For the modulus of rupture, compressive strength and absorption determinations at least 10 bricks shall be selected from each lot of 25,000 bricks or a fraction thereof. For larger lots five additional bricks shall be selected from each 50,000 bricks or a fraction thereof contained in the lot. In no case shall less than 3 bricks be taken.

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

## 12.9. SCAFFOLDING

Contractor shall provide safe scaffolding of adequate strength for use of workmen at all levels and heights. Scaffolding which in the opinion of the Engineer is un-safe, shall



not be used until it has been strengthened and made safe for use of workmen to the satisfaction of the Engineer.

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

## 12.10. EXECUTION

### 12.10.1. Placing Brick Masonry

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

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

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

### 12.10.2. Curing

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



to be cured continuously wet. Water used for curing shall meet the requirement for water used in the manufacture of bricks.

#### 12.10.3. Finishing

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

#### 12.10.4. Cement Mortar Coating

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

#### 12.10.5. Pointing

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

#### 12.11. REPAIR

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

At the completion of the work, all holes and defective mortar joints shall be cut and repainted. Exposed masonry shall be protected against staining or other damages and excess mortar shall be cleared off the surfaces as the work progresses. All exposed masonry shall be clean, smooth, plumb and shall be of acceptable finish. In the event ordinary cleaning is not adequate, special methods such as sand blasting or otherwise as approved by the Engineer, shall be used to clean the surfaces.



## 12.12. DAMP PROOF COURSE

### 12.12.1. Horizontal Damp Proof Course

All Horizontal damp proof courses unless otherwise specified in the drawings shall consist of cement concrete (210 kg/cm<sup>2</sup>) 38mm thick, mixed with approved quality water proofing chemical as per manufacturer's specifications and shall be laid at required levels or as per drawings and instructions of the Engineer. The D.P.C shall be tamped, consolidated, leveled and edges/corners made to the requirements of the relevant drawings including finishing and curing complete. Including two float coats of hot bitumen.

### 12.12.2. Vertical Damp Proof Course

All vertical damp proof courses unless otherwise specified in the drawings shall consist of 20mm thick cement sand plaster in 1:3, mixed with approved quality water proofing chemical as per manufacturer's specifications and shall be applied at required elevation or as per drawings and instructions by the Engineer.

## 12.13. MEASUREMENT AND PAYMENT

Measurement for payment purposes shall be made against the respective item(s) of works given in the Bill of Quantities which have been completed in accordance with the Scope of Works specified in this Section:

The item rates quoted by the Contractor shall be deemed to include full compensation of works executed at any floor and at any height except where otherwise specifically stated in the relevant item of the Bill of Quantities or Contract Documents.

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

- Cutting & chiseling of masonry wherever required.
- Cement sand mortar used in laying bricks including wastage.
- Curing and repairing the masonry work.
- All joint reinforcing bars, reinforcing anchor bars or hoop iron
- Scaffolding for masonry work.
- 75 mm long steel nails to be fixed in brick masonry after every 5<sup>th</sup> course at a distance 150 mm c/c for fair face cladding.
- Cement sand mortar 1:4 at the back of the fair face brick (gutka) cladding to make it in plumb if required.



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In case of different thickness of slab in different areas or room or for any other reason whatsoever, if chiseling of masonry is required, the Contractor shall do so at his own cost where, for any reason whatsoever, the height, of the wall is short of ceiling height, of the actual height shall be made good with 210 kg/cm<sup>2</sup> nominal mix concrete. This concrete shall neither be measured nor be paid under item of concrete but will be paid for under item of wall masonry. Similarly where the lintel heights are such that the Contractor has to chisel the masonry or provide cast-in-place concrete to make up the height of the course, no payment will be made for chiseling, but where such cast-in-place concrete is provided, payment for the same will be made at the unit rate for masonry.

**12.13.1. Measurement**

Measurement of works against respective item(s) given in the Bill of Quantities, acceptably completed in-conformance with the specifications under this Section, shall be made to the neat lines shown on the drawings and on the basis of No. of Units given in the Bill of Quantities.

**12.13.2 Payment**

Payment of acceptably completed works against respective item(s) given in the Bill of Quantities, as measured above, shall be made on the basis of Unit Rate quoted in the Bill of Quantities and shall constitute full compensation for all incidentals/ associated works specified in this Section relevant to the item(s).





## 17. CEMENT PLASTER AND POINTING

### 17.1. SCOPE

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

### 17.2. APPLICABLE STANDARDS

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

#### Pakistan Standard

ASTM (American Society for Testing Ordinary Portland Cement Material)

C. 144	Aggregate for Masonry mortar.
C. 150	Specification for Portland Cement.
C. 631	Bonding compounds for interior plastering.

#### BSI (British Standards Institution)

812	Methods for sampling and testing of mineral aggregates, sands and fillers.
1199	Sands for external renderings Internal plastering with lime and Portland cement and floor screeds.
1369	Metal lathing (steel) for plastering.
4027	Specification for sulphate resisting Portland cement.
5262	External rendered finishes.
5492	Internal plastering.

### 17.3. GENERAL

17.3.1. Except as may be otherwise shown on drawing specified, all plaster work, both internal and external shall be ordinary Portland Cement plaster of the required thickness as shown on the drawings

17.3.2. Plastering shall not commence until all electric conduits, drainage and sanitary pipes, inlets to tanks, brackets, clamps, doors and window frames and all sorts of inserts and embedded items are fixed in position. It shall be the responsibility of the Contractor to make sure that all such work is carried out by other contractors before starting of plaster work. Pointing work, chiseling and repairing of cement plaster shall not be permitted without the approval of the Engineer.



17.3.3. Sample of materials shall be submitted to the Engineer for his approval prior to use in the works.

#### 17.4. MATERIALS

17.4.1. Cement for plaster shall be Ordinary Portland Cement (ASTM C 150 B.S 12 or P.S 232). Sulphate resisting cement (B.S 4027 or P.S. 612) as specified and shall conform to requirements specified in the section "Plain and Reinforced Concrete".

17.4.2. Sand for plaster shall comply with the requirements of BS 1199, BS 1200 or the draft Pakistan Standard "Sand for Plaster" as directed by the Engineer.

17.4.3. Water for plaster shall conform to requirements specified in the section for "plain and reinforced concrete".

17.4.4. Lime putty shall pass 100% through a sieve of 1.4 mm and shall not be retained more than 2% on a sieve of 300 um.

17.4.5. Corner beads shall be fabricated from less than 26 US Standard gauge galvanized steel sheets, shall have 3mm radius corner and shall have expanded wings not less than 65mm width.

17.4.6. Angle beads, stop beads, depth gauge beads, edging profiles, plaster dividing profiles, interior angle profiles, plaster borders and the like shall all be manufactured from sheet steel and galvanized after fabrication, all beads shall be perforated at edges to ensure good adhesion of the plaster work. Thickness and dimensions shall suit particular locations and plaster thickness.

17.4.7. All materials and workmanship for plaster, not explained in these Specifications or, shall comply with the requirements of relevant BS CP 5262 and BS 5492 as directed by the Engineer.

#### 17.5. PROPORTIONING AND MIXING

17.5.1. Measurement of materials by volume shall be by containers of known capacity to maintain consistent proportions. No lumpy or caked material shall be used. Mixing equipment boxes and tools shall be clean. Materials shall be proportioned as specified on the Drawings, in the Bill of Quantities or as directed by the Engineer. Plaster in gradients shall be thoroughly mixed either by hand on a clean cement concrete platform or by a mechanical mixer.

17.5.2. Quick lime shall be slaked by stirring it into excess of water in a tank where it will hydrate and generate heat. Slaking shall be complete in about 12 hours when temperature shall cease to rise. Lime shall then be sieved through 1.4 mm mesh and stored under water and left to mature. Maturing period shall be from one to three weeks as directed by the Engineer. Matured material known as lime putty, shall then be ready for use in plastering.

17.5.3. Only limited water shall be added for proper workability and such quantity of mortar shall be prepared which can be consumed in thirty minutes after preparation. Preparation of mortar in bulk quantity for use during the entire day or for any other time



more than that stipulated above is expressly prohibited. Re-tempering shall not be permitted and all mortar which has begun to stiffen shall be discarded.

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

### 17.6. PREPARATION OF SURFACE TO BE PLASTERED

17.6.1. Concrete surface to be plastered shall be cleaned to remove all grease, form oil and other surface impurities which will otherwise adversely affect the adhesion of plaster to the surface concerned. The surface of all concrete ceilings, beams and columns shall be lightly hacked by approved means to give the required key for plastering.

17.6.2. All masonry surface to be plastered shall be cleaned to remove all matter which will otherwise adversely affect the adhesion of plaster to the surface concerned. The surface shall be washed with clean water and kept damp for 24 hours before further treatment. The surface thus prepared shall be treated uniformly with cement and sand slurry. The slurry to be used shall be one-part cement to one-part sand by volume with water added to make a stiff creamy mix. The slurry shall be applied with a stiff brush on surface which has previously been well wetted. The surface so treated shall be left to cure for three (3) days.

17.6.3. For pointing all joints shall be raked to make a groove of 20mm deepened surface cleaned with a wire brush.

### 17.7. APPLICATION OF PLASTER

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

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



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

#### 17.8. METAL LATH OVER REINFORCED CONCRETE AND MASONRY JOINT

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

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

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

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

#### 17.9. BEADS

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

#### 17.10. INTERNAL/EXTERNAL PLASTER OVER CONC/BRICK SURFACES

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

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

#### 17.11. POINTING

##### 17.11.1. General

Brick masonry and stone masonry which are intended to be pointed shall be given flush pointing or struck pointing as required in 1:3 cement sand mortar unless otherwise specified on the Drawings.



handle, lay, joint and test pipe, fittings, including sleeves, nuts, sockets, plugs, bitumen coating and all other work related to the item.

Measurement will be made for the number of sluice (gate) valves, indication plates, washouts, check valves and air valves acceptably provided & installed complete in all respects as per relevant Drawings or as directed by Engineer.

### 2.8.2. Payment

Payment of acceptably completed works against respective item(s) given in the Bill of Quantities, as measured above, shall be made on the basis of unit rate quoted in the Bill of Quantities and shall constitute full compensation for all incidentals/associated works specified in this Section relevant to the item(s).

## 3 SEWERAGE NETWORK

### 3.1 SOIL AND WASTE PIPES

#### 3.1.1. uPVC Pipe and Fittings

Unplasticised polyvinyl chloride (uPVC) pipes conforming to BS-4514/5255 (above ground) and BS-4660 (underground) (Soil, Waste, and vents):

There are two types of fittings available as per ISO 3633:

- ❖ uPVC fittings with Solvent Cement (SC) socket joint conforming to ISO 3633:1991.
- ❖ uPVC fittings with rubber ring socket joint conforming to DIN 19560, which is compatible with ISO 3633/PS 3214.

##### 3.1.1.1. Jointing of uPVC Pipes via Rubber Rings

The rubber rings may either be Synthetic or natural conforming to PS 1915:1987 & ISO 4633/1983 (E). uPVC pipes shall be used for domestic installation inside the buildings for soil and waste discharge, ventilation and drainage.

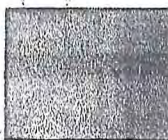
The material shall consist substantially of poly-vinyl chloride (PVC) to which may be added only those additives that are needed to facilitate the manufacture of pipes and fittings having good mechanical strength and opacity.

The pipes and fittings shall be tested mechanically and physically in accordance with the relevant Standards as and when directed by the Engineer, before and during installation.

#### 3.1.2. RCC Pipe and Fittings

The reinforced cement concrete pipes to be furnished and installed under this contract shall be of the strength Class and Wall as specified on the Drawings.

Following technical criteria shall be adhered to e.g.:





Class of Pipe	Class III Wall "B"
Concrete Strength	4000 Psi (Cylinder Test)

The design requirements for these classes of reinforced cement concrete pipes shall be as described in ASTM Designation C-76 for the respective strength classes. Pipe less than 12" diameter shall conform to ASTM C-14.

#### 3.1.2.1. Testing of RCC Pipes

Acceptance of reinforced cement concrete pipes will be on the basis of three edge bearing and material tests as per ASTM Designation C-76-91 or latest revision and inspection of manufactured pipes for defects and imperfections. The Contractor shall bear the cost of such tests and pay fees etc., and also pay for the carriage of such samples and all other expenses contingent to tests. The strength test requirements in pounds per linear foot of pipe under the three-edge-bearing method shall be either the D-Load (test load expressed in pounds per linear foot per foot of diameter) to produce 0.01 in crack, or D-loads to produce the 0.01 in crack and the ultimate load as specified below, multiplied by the internal diameter of the pipe in ft.

D-Load to produce a 0.01 in crack = 1000 pounds

D-Load to produce the ultimate load = 1500 pounds

Lift holes in the walls of reinforced cement concrete pipes will not be permitted for the purpose of handling and laying. Other approved lifting methods shall be employed.

#### 3.1.2.2. Joints for Concrete Sewer Pipes

Rubber gasket joints shall be used for either tongue and groove or bell and spigot pipes.

Rubber gasket joints shall be made using specially designed rubber gaskets, made to fit the applicable tongue and groove or bell and spigot pipes and adequately tested under operating conditions. Special care must be taken in the selection and handling of the concrete pipes for use with rubber gasket joints, to ensure that pipe ends shall be smooth and concentric with tolerance which closely conform to the requirements of the manufacturer of the rubber gaskets. The tongue or spigot end of each pipe shall be specially designed to perform groove or offsets to fit the manufacturer's rubber gaskets design.

The rubber gasket joints shall conform to all applicable requirements of the latest revision of ASTM Designation C443, entitled "Joints for Circular Concrete Sewer and Culvert pipe, using Flexible Watertight Rubber Type Gaskets" except that the test pressure need not exceed 10 feet of head at which the complete sewers shall meet the infiltration or ex-filtration limits set forth hereinafter. The groove end of tongue and groove of pipes shall have at least one line of wire reinforcement of 8 gauge size placed in the centre of the groove.



### 3.4.2. Excavation and Backfill

The excavation and backfill for sewer installations shall be as specified in applicable provisions of these technical specifications. The required type of bedding may be placed. All excavation shall be carried out as necessary for the construction of the works. Excavation for pipe trenches shall not be less than 600mm wider than the diameter of the pipes and the ground near beds shall be carefully graded. All excavation shall be kept free from water at all times by pumping or temporary drainage. In the event of the excavations being made deeper than required level, it shall be filled to the proper level with lean concrete.

In backfilling of the excavation, only selected hard dry material free from lumps exceeding 75mm in size and from stones shall be used in the initial refilling and shall be carefully placed next to the permanent work and well packed and well rammed in layers of 150mm. The remainder of the excavations shall be filled in with the excavated material, in layers of not more than 300mm deep. Each layer shall be thoroughly rammed before the next layer is placed. Surplus soil shall be piled on top of the filling to the extent of possible subsidence. All refilled trenches shall be maintained to the satisfaction of the Engineer. For site clearance for excavation and excavated material disposal, the chapters of "Building works" (Section 2) and "Roads" (Section 1) may be consulted/studied in conjunction with the below specifications. Also, for any further clarity, the engineer's decision/description will prevail.

#### 3.4.2.1. Brick Ballast Bedding

The brick ballast shall be clean material of 1 to 1.5" gauge broken from first class bricks or bats, or from dense over burnt bricks. No under-burnt bricks or bats nor those which have become spongy or porous in the process of burning shall be broken up for brick ballast.

The material shall be evenly spread over the full width of the formation in 4 inches loose layers and compacted with hand or mechanical hammers until the full thickness as shown on the drawings for the particular pipe size has been built up and finished not more than 1/2" below required level. The Contractor shall note that it is essential that the material at the sides of the pipes is adequately compacted. Before the subsequent placing of pipe surrounding material, pipe joints shall be protected. Protection may take the form of a twist of yarn lightly pressed into the annular joints space or other equal protection approved by the Engineer's Representative.

#### 3.4.2.2. Crushed Stone Bedding

Crushed stone bedding shall be from an approved source. It shall be strong, durable, hard and impervious, having crystalline structure. The broken stone shall be free from thin elongated or laminated pieces.



The crushed stone shall have a maximum gauge of 1.5" and shall be graded down to 3/4". When shifted through a screen made of 1/4" diameter bars spaced 3/4" center to center, it shall yield no more than 10 percent by volume of fine materials.

### 3.4.3. Laying of Sewers

Neither any sewer pipe nor the bedding shall be laid or placed till the alignment of the sewer and its levels and gradients have been carefully checked and tested with the trench excavation and found correct.

Each length of sewer pipe shall be checked for cracks and defects before placing in the line. Defects which in the opinion of the Engineer indicate imperfect placing, shall make the pipe liable to rejection. Each pipe shall be placed carefully to line and grade and in close contact with adjoining pipe. These specifications require rejection of the work if the sewer invert varies as much 1/2 inch from the proper elevation. As shown on Drawings, the bottom of the trench must be shaped to fit the pipe barrel, with holes left for the bells. If excavation has been carried below the correct grade, refilling must be done with satisfactory materials as approved by the Engineer at no extra cost. When laying is not in progress, the open pipe shall be closed with a tapered wooden plug to keep out foreign matter.

## 3.5 TESTING OF SEWER LINES

All sewer built under this contract shall be tested for infiltration or ex-filtration as specified hereinafter. The tests shall be made at times selected or approved by the Engineer. Sections of the completed sewer shall be isolated, and measurements of the infiltration or ex-filtration shall be made by approved method.

### 3.5.1. Infiltration Tests

The sewers which are constructed with the ground water level above the invert level of the pipe shall be tested for infiltration after the sewers have been installed and backfilling has been substantially completed. The tests and measurement shall be performed by the Contractor in the presence of and in a manner approved by the Engineer. The duration of the tests shall be only long enough to establish the true rate of infiltration. The amount of leakage over a 24 hour period will then be calculated from the result of the measured true rate of infiltration.

### 3.5.2. Ex-filtration Tests

The sewers which are constructed with the ground water level below the invert level of the pipe shall be tested for ex-filtration by isolating a section of sewers between manholes by means of approved temporary type of water tight bulk heads. The method of testing for ex-filtration shall be generally as follows:

After isolation of sewer section, it shall be filled with water to a level which is 3' above the crown of the pipe at the higher end of the isolated section under test. The level will not