



GENERAL MANAGER ADMIN & HR
Quaid-e-Azam Thermal Power (Pvt.) Limited
Government of the Punjab

**First Floor, 7 C-1, Gulberg-III, Lahore
042-35750936-8**

Hiring of Contractor

for

**SHIFTING OF BOUNDARY WALL & MAIN
GATE AT BIKKI POWER PLANT**

TENDER DOCUMENTS

VOLUME-1
CONDITIONS OF CONTRACT

OCTOBER – 2022

Project Consultant



MASTER CONSULTING ENGINEERS PVT. LTD.

Architects, Engineers, Town Planners & GIS Experts

119-G, Commercial Area, Phase-I, DHA, Lahore Cantt.

Phone: +092 42 35728412, Fax: +092 42 35896395,

Email: maconsult@hotmail.com, Web: www.masterconsulting.com.pk

**THIS COMPLETE SET OF TENDER DOCUMENTS
INCLUDES;**

VOLUME-1	Conditions of Contract
VOLUME-2	Technical Specifications
VOLUME-3	Bill of Quantities (BOQs)
VOLUME-4	Tender Drawings

Issued to:

These tender/Bid Documents are issued to

M/s _____
for bidding purpose for the project **Shifting of Boundary Wall &
Main Gate at Bikki Power Plant** as per Instructions to bidders,
Conditions of Contract, Technical Specifications, Drawings and
Special Provisions.

Dated : _____

Issued by : _____

INVITATION FOR BIDS



QUAID-E-AZAM THERMAL POWER (PVT) LIMITED



TENDER NOTICE

for

Shifting of Boundary Wall & Main Gate at Bikki Power Plant Sheikhupura

Quaid e Azam Thermal Power Private Limited (QATPL)

(Procurement No. 22-POWER PLANT-RLNG)

National Competitive Bidding

Sealed Tenders are invited from eligible firms licensed by the Pakistan Engineering Council in the appropriate category equals to the value of work. Bidding is open to all eligible Bidders for Shifting of Boundary Wall & Main Gate at Bikki Power Plant, Sheikhupura. Tender (Bidding) Documents can be obtained from the office of QATPL, 1st Floor, 7-C-1, Gulberg III, Lahore during office hours from the date of publication of this Notice till 15th Nov, 2022 (Tuesday) at 02:00 pm, on payment of Rs. 2,000/- (Rupees two thousands 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, 1st Floor, 7-C-1, Gulberg III, Lahore before the closing date and time, i.e. 15th Nov, 2022 (Tuesday) at 02:00 pm. The Technical Bids will be opened on the same date at 02:30 pm in Conference Room, QATPL, 1st 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 ToR's 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 648,000/- in the shape of CDR / Pay Order / Bank Draft / Bank Guarantee in favour of QATPL which is within 5% of the estimated cost i.e., PKR 37 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.
8. A pre-bid meeting is scheduled on 8th Nov 2022 at 11:00 AM in the QATPL, Conference Room, 1st Floor, 7-C-1, Gulberg III, Lahore for the purpose of clarifying issues and attending questions on any matter related to the tender/bid documents and the proposed project, that have been received from the bidders.

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.

IPL-10811

GENERAL MANAGER ADMINISTRATION & HR

Quaid-E-Azam Thermal Power Pvt Limited

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

Phone: 042-35750936-38,

e-mail: gmadminhr@qathermal.com

**GENERAL MANAGER ADMIN & HR,
Quaid-e-Azam Thermal Power (Pvt.) Limited,
First Floor, 7 C-1, Gulberg-III, Lahore
(042-35750936-8).**

**THE WORK IS
“SIFTING OF BOUNDARY WALL & MAIN
GATE AT BIKKI POWER PLANT”**

**BIDDING DOCUMENTS
VOLUME I**

- **Instructions to Bidders**
- **Bidding Data**
- **Form of Bid and Appendices to Bid Forms**
- **Part 1; General Conditions of Contract**
- **Part 2; Particular Conditions of Contract**
- **Part 3; Supplementary Conditions of Contract**
Specifications-Special Provisions

OCTOBER, 2022

INSTRUCTIONS TO BIDDERS

INSTRUCTIONS TO BIDDERS

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 applied for/received a loan/credit from the source (s) indicated in the **Bidding Data** in various currencies towards the cost of the project specified in the Bidding Data and it is intended that part of the proceeds of this loan/credit will be applied to eligible payments under the Contract for which these Bidding Documents are issued.

IB.3 Eligible Bidders

- 3.1 This Invitation for Bids is open to all bidders meeting the following requirements:
- a. Duly licensed by the Pakistan Engineering Council (PEC) in the category relevant to the value of the Works.
 - b. Duly prequalified / enlisted with the Employer.
 - c. Any other as per **Bidding Data Sheet**.

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 – Special Provisions (SP).
 6. Specifications - Technical Provisions.
 7. Form of Bid & Appendices to Bid.
 8. Bill of Quantities (Appendix-D to Bid).
 9. Form of Bid Security.
 10. Form of Contract Agreement.
 11. Forms of Performance Security and Mobilization Advance Guarantee/Bond.
 12. Drawings.

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

IB.8 Clarification of Bidding Documents

- 8.1 Any prospective bidder requiring any clarification (s) in respect of the Bidding Documents may notify the Employer in writing at the Employer's address indicated in the Invitation for Bids. The Employer will respond to any request for clarification which he receives earlier than 28 days prior to the deadline for submission of bids.

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

IB.9 Amendment of Bidding Documents

- 9.1 At any time prior to the deadline for submission of bids, the Employer may, for any reason, whether at his own initiative or in response to a clarification requested by a prospective bidder, modify the Bidding Documents by issuing addendum.
- 9.2 Any addendum thus issued shall be part of the Bidding Documents pursuant to 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 and previously submitted with the application for prequalification, and continue to meet the minimum criteria set out in the prequalification documents which as a minimum, would include the following:
 - (i) Evidence of access to financial resources along with average annual construction turnover;
 - (ii) Financial predictions for the current year and the two following years including the effect of known commitments;
 - (iii) Work commitments since prequalification;
 - (iv) Current litigation information; and
 - (v) Availability of critical equipment.

and

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

Appendix-E to Bid	Proposed Construction Schedule
Appendix-F to Bid	Method of Performing the Work
Appendix-G to Bid	List of Major Equipment
Appendix-K to Bid	Organization Chart for Supervisory Staff
and other pertinent information such as mobilization programme etc.;	

11.2 Bids submitted by a joint venture of two (2) or more 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 partner 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 date 28 days prior to the deadline for submission of bids shall be included in the rates and prices and the total Bid Price submitted by a bidder.

Additional / reduced duties, taxes and levies due to subsequent additions or changes in legislation shall be reimbursed / deducted as per Sub-Clause 70.2 of the General Conditions of Contract Part-I.

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

IB.13 Currencies of Bid and Payment

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

- 13.2 The rates of exchange to be used by the bidder for currency conversion shall be the TT&OD Selling Rates published or authorized by the State Bank of Pakistan prevailing on the date 28 days prior to the deadline for submission of bids.

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

IB.14 Bid Validity

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

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

IB.15 Bid Security

- 15.1 Each bidder shall furnish, as part of his bid, a Bid Security in the amount stipulated in the **Bidding Data** in Pak Rupees or an equivalent amount in a freely convertible currency.
- 15.2 The Bid Security shall be, at the option of the bidder, in the form of Deposit at Call or a Bank Guarantee issued by a Scheduled Bank in Pakistan or from a foreign bank duly counter guaranteed by a Scheduled Bank in Pakistan or an insurance company having at least AA rating from PACRA/JCR in favour of the Employer valid for a period 28 days beyond the Bid Validity date.
- 15.3 Any bid not accompanied by an acceptable Bid Security shall be rejected by the Employer as non-responsive.
- 15.4 The bid securities of unsuccessful bidders will be returned as promptly as possible, but not later than 28 days after the expiration of the period of Bid Validity.
- 15.5 The Bid Security of the successful bidder will be returned when the bidder has furnished the required Performance Security and signed the Contract Agreement.
- 15.6 The Bid Security may be forfeited:
- (a) if the bidder withdraws his bid except as provided in 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 seven (7) days before the proposed pre-bid meeting.
- 17.3 Minutes of the pre-bid meeting, including the text of the questions raised and the replies given, will be transmitted without delay to all purchasers of the Bidding Documents. Any modification of the Bidding Documents listed in 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 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 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 Daywork; 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 28 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 14 days from the date of furnishing of acceptable Performance Security under the Conditions of Contract, the Employer will send the successful bidder the Contract Agreement in the form provided in the Bidding Documents, incorporating all agreements between the parties.
- 33.2 The formal Agreement between the Employer and the successful bidder shall be executed within 14 days of the receipt of the Contract Agreement by the successful bidder from the Employer.

IB.34 General Performance of the Bidders

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

IB.35 Integrity Pact

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

IB.36 Instructions not Part of Contract

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

BIDDING DATA

BIDDING DATA

Instructions to Bidders

Clause Reference

- 1.1 Name and address of the Employer:
The Employer is **Quaid-e-Azam Thermal Power (Pvt.) Limited**.
Address of the Employer is **First Floor, 7 C-1, Gulberg-III, Lahore (042-35750936-8)**
- 1.1 Name of the Project & Summary of the Works:
Name of the Project is **“Shifting of Boundary Wall & Main Gate at Bikki Power Plant”**
- The Employer Quaid-e-Azam Thermal Power (Pvt.) Limited. Intend to hire the services of a contractor for Shifting of Boundary Wall & Main Gate at Bikki Power Plant. The QATPL Power Plant is situated near Bikki, District Sheikhpura. The Employer intends to shift the boundary wall on the other side of its access road along with shifting of Main Gate. The Length of the Wall is approximately 1200 ft and height is 8 ft. For details, please refer to the attached drawings.
- 2.1 Name of the Borrower/Source of Financing/Funding Agency:
The Employer has its own sufficient funds to finance the project.
- 3.1 Eligible Bidders
Para IB.3.1. b is deleted. Pre-qualification with the client is not necessary. However, the firm should meet the following requirements
- (a) The Bidder shall be duly licensed by the Pakistan Engineering Council (PEC) in the C-4 category or above or in case validity of license has expired, the Bidder had applied for renewal of license before submission of its Bid.
 - (b) The firm must be registered with Income Tax and Sales Tax Departments (FBR & PRA) and must be on Active Taxpayer List of the Federal Board of Revenue at the time of submission of its Bid.
 - (d) A firm /Bidder, JV partner or Subcontractor) shall not be eligible to participate in this bidding process while under temporary suspension or debarment/ blacklisting by the Employer, any Government/Semi Government/Public Department in Pakistan (whether notified or not by PPRA on its website) or in the Bidder’s home country.”

- 8.1 Time limit for clarification:
Seven (07) days prior to deadline for submission of bids.
- 10.1 Bid language:
The bidding and controlling Language will be “English Language”

- 11 Documents accompanying the Bid
The text of Sub-Clause IB. 11.1 is substituted by the following:

The Bid shall comprise two envelopes submitted simultaneously, one called the Technical Bid and the other the Price Bid, each containing the documents listed here under, both envelopes enclosed together in one outer single envelope.

TECHNICAL BID

- (a) Duly filled-in Form of Technical Bid
- (b) Original Bid Security
- (c) Written power of attorney, duly notarized, authorizing the signatory of the Bid to act for and on behalf of the Bidder
- (d) Duly filled-in all Appendices to Bid except Appendix-D to Bid (Bill of Quantities), along with all requisite attachments/ supporting satisfactorily authentic documentary evidences
- (e) Proof of purchase of the Bidding Documents directly from the Employer
- (f) Other documents required to be submitted as stated in Eligibility and Qualification Criteria and Bidder's Qualification Forms
- (g) Any other documents required to be submitted with Technical Bid in accordance with these Bidding Documents.

PRICE BID

- (a) Duly filled-in Form of Price Bid
- (b) Duly filled-in Appendix-D to Bid (Bill of Quantities); and
- (c) Any other documents required to be submitted with Price Bid in accordance with these Bidding Documents

Sub-Clause IB.11.2 is replaced with the following;
Joint Venture is Not allowed.

- 13.1 Bidders to quote entirely in **Pak. rupees.**
- 14.1 Period of Bid Validity:
Period of Bid Validity: 90 days

- 15.1 Amount of Bid Security:
As mentioned in the Invitation for Bids.
- 15.2 The Bid security shall be, at the option of bidder, in the form of Deposit at Call or Bank Guarantee issued by a Scheduled Bank in Pakistan or from foreign bank duly counter-guaranteed by a Scheduled Bank in Pakistan in the favour of Employer on the prescribed form annexed to these Bidding Documents and is valid for a period of 28 days beyond the Bid Validity date.

Following Sub-Clauses are added after Sub-Clause IB.15.6:

- 15.7 In case of annulment, Bid Securities and Price Bids, if not yet opened, shall be returned to the Bidders as promptly as possible, but not later than 28 days after the annulment.”

16. Alternate Proposals by Bidder
Alternate proposals shall not be permitted.

- 17.1 Venue, time, and date of the pre-Bid meeting:
As stated in Invitation to bid.

- 18.4 **The text of Sub-Clause IB.18.4 is substituted with the following:**
“The Bidder shall prepare by filling out the forms completely and without alterations one original of the Technical Bid and one original of the Price Bid as described in Sub-Clause 11.1 hereof and clearly mark it “ORIGINAL - TECHNICAL BID” and “ORIGINAL - PRICE BID”. In addition, the Bidder shall submit two (02) copies of each Technical Bid and Price Bid, clearly marked as “COPY NO.1 & 2 - TECHNICAL BID” and “COPY NO.1 & 2 - PRICE BID”. In the event of any discrepancy between the original and the copies, the original shall prevail.

19 Sealing and Marking of Bids

- 19.1 **The text of Sub-Clause IB.19.1 is substituted with the following:**
“The Technical Bid and Price Bid (comprising the relevant documents as stated under Sub-Clause 11.1 hereof) shall be prepared separately. The ORIGINAL and each COPY of Technical Bid shall be sealed in one envelope marked as such. Similarly, the ORIGINAL and each COPY of the Price Bid shall be sealed in another envelope and marked as such. The outer envelope comprising both ‘Technical Bid’ and ‘Price Bid’ shall be addressed/ identified as given in Sub-Clause 19.2 hereof.”

- 19.2(a) Employer’s address for the purpose of Bid submission:
As listed in invitation to bid.

19.2(b) Name and Identification Number of the Contract:

As listed in invitation to bid.

19.2(c) **Para 19.2(c) is substituted with the following:**

“The outer envelope and the inner envelope containing the Technical Bid shall bear a warning not to open before the time and date for the opening of Technical Bids, in accordance with Sub-Clause 23.1 hereof. The envelope containing the Price Bid shall bear a warning not to open until advised by the Employer in accordance with Sub Clause 23.7 hereof.

20.1(a) Deadline for submission of bids:

As listed in invitation to bid.

23 Bid Opening

23.1 At the submission address as listed in invitation to bid. Initially, only the envelop marked “TECHNICAL PROPOSAL (Bid Part-I)” shall be opened. The envelop marked as “FINANCIAL PROPOSAL (Bid Part-II)” shall be retained in the custody of the procuring agency without being opened. The procuring agency shall evaluate the technical proposals in a manner prescribed in advance without reference to the price and reject any proposal which does not conform to the specified requirements.

During the technical evaluation, no amendments in the technical proposal shall be permitted. The technical proposal of the bidders shall be opened publically at a time, date and venue announced and communicated to the bidders in advance.

After the evaluation and approval of the technical proposal the procuring agency shall at a time within the bid validity period, publically open the financial proposals of the technically accepted bids only. The financial proposal of bids found technically nonresponsive shall be returned unopened to the respective bidders and the bid found to be the Highest ranked in cost based (least cost) bid shall be accepted.

Venue, time, and date of Bid opening of Bids Financial Proposal (Bid Part-II) will be communicated to the Technically qualified bidders later.

25 Clarification of Bids

25.1 **Following paragraph is added at the end of Sub-Clause IB.25.1:**

The Employer may, at his discretion, ask any Bidder for confirmation/ submission of missing information to clarify its Bid. However, the Employer does not have an obligation to request any additional information or clarification with respect to missing or deficient information in a Bid. The Employer may reject any Bid as nonresponsive if found materially

incomplete, obscure, irregular or omits any material information required to be submitted in accordance with the Bidding Documents.

Any clarification submitted by a Bidder that is not in response to a request by the Employer shall not be considered.”

- 25.2 If a Bidder does not provide clarifications of its Bid by the date and time set in the Employer’s request for clarification, the Employer may proceed with the evaluation based on the information as already submitted in the Bid.

26 Examination of Bids and Determination of Responsiveness

26.1 **The text of Sub-Clause IB.26.1 is substituted with the following:**

“The Employer will determine whether each Technical/ Price Bid is substantially responsive to the requirements of the Bidding Documents.”

26.2 The text of Sub-Clause IB.26.2 is substituted with the following:

“A substantially responsive Technical Bid is one which (i) meets the eligibility and qualification criteria delineated under Attachment to Bidding Data of the Bidding Documents; (ii) has been properly signed; and (iii) conforms to all the terms, conditions and specifications of the Bidding Documents, without material deviation or reservation.

The Employer shall first examine eligibility and qualification of the Bidders. The Bidders, who will not meet the eligibility and qualification criteria, shall be held nonresponsive and their Technical Bids shall not be further evaluated.

A substantially responsive Price Bid is one which (i) has been properly signed; (ii) is accompanied by the required Bid Security; and (iii) 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.

28 Evaluation and Comparison of Bids

- 28.2 Pursuant to paragraph (c) of Sub-Clause IB.28.2 following evaluation methods for adjustment for any other acceptable variation or deviation will be followed:

Price Adjustment for Completeness in Scope of Work in case of omission in the scope of work of a quoted item, no price adjustment for the omitted item(s) shall be applied provided that the Bidder has mentioned in his Bid that the same is covered in any other item. Otherwise, the adjustments will be applied for comparison purpose only, taking the average price quoted by other substantially responsive Bidders in their original bids for corresponding item. In case of nonavailability of price from other Bidders, the price will be estimated by the Employer. The price adjustment shall not justify any additional payment by the Employer and the price(s) of omitted item(s) shall be deemed covered by other prices of the Bill of Quantities.

29 Award

29.2 **First paragraph of Sub-Clause IB.29.2 is substituted with the following:**

“The Employer, at any stage of the bid evaluation, having credible reasons for or prima facie evidence of any defect in Bidder’s capacities, may require the Bidder to provide information concerning their professional, technical, financial, legal or managerial competence whether already declared substantially responsive.”

32 Performance Security

32.1 Performance Security for an amount equal to 10% of the Contract Price stated in the Letter of Acceptance in the Form of Bank Guarantee on standard form from any Scheduled Bank in Pakistan or from a Bank located outside Pakistan duly counter guaranteed by a Scheduled Bank in Pakistan shall be furnished by the Bidder within a period of 28 days after the receipt of Letter of Acceptance.

TECHNICAL EVALUATION CRITERIA

A. MANDATORY REQUIREMENTS

- i. Firms/Bidders registered with Pakistan Engineering Council with valid license under Category C-4 or above, for the Works mentioned in the Bidding Data Sheet, are eligible to participate in the bidding. Renewal Application receipt for PEC Registration, will also be entertained.
- ii. Bidders with satisfactory past and present performance/experience with any executing agency and those have not been blacklisted earlier by any government agency/ authority / organization.
(Note: Duly signed and attested No Blacklisting / No Litigation Certificate on Stamp Paper worth PKR 100 is to be provided in this effect.)
- iii. Three years Audited accounts statements for the last three years is required to be attached by the bidder in the technical proposal.
- iv. Valid NTN Certificate and appearing on Active Tax Payers list.
- v. Duly registered with Punjab Revenue Authority (PRA)
- vi. The Bids of only those Bidders shall be considered for evaluations, who qualify all Mandatory requirements.

B. QUALIFICATION CRITERIA

Sr. No.	Category	Weightage (Points / Marks)
1	Financial Soundness	30
2	Relevant Past Experience	25
3	Personnel Capabilities	25
4	Equipment Capabilities	20
Total		100

NOTE: Qualification status shall be decided on the basis of qualifying points - Pass /Fail criteria. The applicant firm must secure **at least 50% marks in each category**. Firms/Applicants passing the minimum criteria of **overall 70%** shall be considered Qualified.

Financial proposals of only those bidders shall be opened who get at least 50% points under each of following four categories and at least overall 70% points in Technical Proposal evaluation.

1) FINANCIAL SOUNDNESS

Maximum points 30

Sr. No	Description	Marks Assigned	Criteria for Marks to be Obtained
1	Average Annual Construction Turnover of last three years.	30	Full marks will be awarded if the Average turnover of last three years is equal or more than Rs: 50 million . Financial Statement of Last 3 Years needs to be attached
Total Marks Allocated		30	

2) PAST EXPERIENCE OF CONTRACTOR: Maximum Points 45

Sr. No	Requirement/ Description	Marks Assigned	Explanation
1	Past Relevant Experience: Completed at least 1 Boundary Wall project of length 1500 ft in last 10 Years	10	Letter of Acceptance and Completion Certificate / Performance Certificate needs to be attached
2	05 General Building and Infrastructure Projects (Last 10 Years)	15	Letter of Acceptance and Completion Certificate / Performance Certificate needs to be attached
Total Marks Allocated		25	

3) PERSONNEL CAPABILITIES: Maximum Points 30

Sr. No.	Description	Nos	Marks Assigned	Education & Experience to be attached
1	Site Engineer	1	10	B.Sc. Civil Engineering (Having 5 Year Experience in Building and Infrastructure Works)
2	Quantity Surveyor	1	5	DAE Civil (Having 5 Year relevant Experience)
3	Surveyor	1	5	DAE Civil (Having 5 Year relevant Experience)
4	Surveyor Helper	1	5	DAE Civil (Having 1 Year relevant Experience)
Total Marks Allocated			25	

4) EQUIPMENT / MACHINERY: Maximum Points 10

Sr. No.	Description	Minimum Requirement	Marks Assigned
1	Water Buzzers	01	2
2	Mechanical Compactors	01	2
3	Concrete Vibrators	02	2
4	Concrete Mixer	01	5
5	Wheel Barrow	04	4
6	Tractor Trolly	01	5
Total Marks Allocated		20	

FORM OF BID AND APPENDICES TO BID

BIDDER SUBMISSION FORM

Date: _____
Contract Package No. & Title: _____

To:
Full name of Employer

We, the undersigned, Bid for the referenced Contract and declare that:

- (a) we, including any subcontractors or suppliers for any part of the contract have nationalities in accordance with BD Sub-Clause 11.4(a): *[insert the nationality of the Bidder, including that of all partners in case of a Joint Venture, and the nationality of each already identified subcontractor and supplier of related services, if applicable];*
- (b) we, including any subcontractors or suppliers for any part of the contract do not have any conflict of interest, in accordance with BD Sub-Clause 11.4(b);
- (c) *[insert either "we are not a Government owned entity" or "we are a Government entity, and we meet the requirements of BD Sub-Clause 11.4(c)"];*

Signed: *[insert signature(s) of an authorized representative(s) of the Bidder]*

Name: *[insert full name of person signing the Bid]*

In the Capacity of: *[insert capacity of person signing the Bid]*

Duly authorized to sign the Bid for and on behalf of: Bidder's Name: *[insert full name of bidder]*

Address: *[insert street number/town or city/country address]*

Dated on _____ day of _____, 20____

FORM ELI -1.1

Bidder Information Form

Contract Package No. & Title: _____ Date: _____

Bidder's legal name <i>[insert full legal name]</i>
In case of Joint Venture (JV), legal name of each partner: <i>[insert full legal name of each partner in JV]</i>
Bidder's Actual or Intended country of constitution: <i>[indicate country of Constitution]</i>
Bidder's actual or Intended year of constitution: <i>[indicate year of Constitution]</i>
Bidder's legal address in country of constitution: <i>[insert street/ number/ town or city/ country]</i>
Bidder's authorized representative information Name: <i>[insert full legal name]</i> Address: <i>[insert street/ number/ town or city/ country]</i> Telephone/Fax numbers: <i>[insert telephone/fax numbers, including country and city codes]</i> E-mail address: <i>[indicate e-mail address]</i>
Attached are copies of original documents of <input type="checkbox"/> Articles of Incorporation or Documents of Constitution, and documents of registration of the legal entity named above, in accordance with IB 11.4(a). <input type="checkbox"/> In case of JV, letter of intent to form JV or JV agreement. <input type="checkbox"/> In case of Government owned entity, documents establishing legal and financial autonomy and compliance with commercial law, in accordance with IB 11.4(b).

FORM ELI -1.2
Bidder's Party Information Form

[The following form shall be filled in for the Bidder's parties including partner(s) of a joint venture, subcontractors, suppliers and other parties]

Date: _____

Contract Package No. & Title: _____

JV legal name: <i>[insert full legal name]</i>
Bidder's Party legal name: <i>[insert full legal name of Bidder's Party]</i>
Bidder's Party country of registration: <i>[indicate country of registration]</i>
Bidder Party's year of constitution: <i>[indicate year of constitution]</i>
Bidder Party's legal address in country of constitution: <i>[insert street/ number/ town or city/ country]</i>
Bidder Party's authorized representative information Name: <i>[insert full legal name]</i> Address: <i>[insert street/ number/ town or city/ country]</i> Telephone/Fax numbers: <i>[insert telephone/fax numbers, including country and city codes]</i> E-mail address: <i>[indicate e-mail address]</i>
Attached are copies of original documents of <input type="checkbox"/> Articles of Incorporation or Documents of Constitution, and Registration Documents of the legal entity named above, in accordance with IB 11.4(a). <input type="checkbox"/> In case of a Government owned entity, documents establishing legal and financial autonomy and compliance with commercial law, in accordance with IB 11.4(c).

FORM CON – 1

Historical Contract Non-Performance

[The following table shall be filled in for the Bidder and for each partner of a Joint Venture]

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

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

Joint Venture Party Legal Name: *[insert full name]*

Contract Package No. & Title: *[insert Contract Package No. & title]*

Non-Performing Contracts in accordance with Qualification Criteria and Requirements			
<input type="checkbox"/> Contract non-performance did not occur during the last <i>[5]</i> years specified in Qualification Criteria and Requirements, Sub-Factor 2.1.			
<input type="checkbox"/> Contract(s) not performed during the last <i>[5]</i> years specified in Qualification Criteria and Requirements, requirement 2.1			
Year	Non performed portion of contract	Contract Identification	Total Contract Amount (current value, Pak Rs.)
<i>[insert year]</i>	<i>[insert amount and percentage]</i>	Contract Identification: <i>[indicate complete contract name/ number, and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Reason(s) for non-performance: <i>[indicate main reason(s)]</i>	<i>[insert amount]</i>
Pending Litigation, in accordance with Qualification Criteria and Requirements			
<input type="checkbox"/> No pending litigation in accordance with Qualification Criteria and Requirements, Sub-Factor 2.1.			
<input type="checkbox"/> Pending litigation in accordance with Qualification Criteria and Requirements, Sub-Factor 2.2 as indicated below.			

Year	Outcome as Percentage of Total Assets	Contract Identification	Total Contract Amount (current value, Pak Rs.)
<i>[insert year]</i>	<i>[insert percentage]</i>	Contract Identification: <i>[indicate complete contract name, number, and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Matter in dispute: <i>[indicate main issues in dispute]</i>	<i>[insert amount]</i>

FORM FIN – 1

Financial Situation

[The following table shall be filled in for the Bidder and for each partner of a Joint Venture]

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

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

Joint Venture Party Legal Name: *[insert full name]*

Contract Package No. & Title: *[insert Contract Package No. & title]*

1. Financial Data

Financial information	Historic information for previous 3 (Three) years, (Pak Rs in Million)		
	2020	2021	2022
Total Assets (TA)			
Total Liabilities (TL)			
Net Worth (NW)			
Current Assets (CA)			
Current Liabilities (CL)			
Total Revenue (TR)			
Profits Before Taxes (PBT)			
Cash Flow (CF)			

Note: Financial Documents

The Bidder and its parties shall provide copies of the complete set of annual accounts for the last three (3) years pursuant to Qualifications Criteria and Requirements, Sub-factor 3.1. The financial statements shall:

- (a) reflect the financial situation of the Applicant or in case of JV member, and not an affiliated entity (such as parent company or group member).
 - (b) be audited by a certified accountant.
 - (c) be complete, including all notes to the financial statements.
 - (d) correspond to accounting periods already completed and audited (no statements for partial periods shall be requested or accepted).
 - (e) be in English Language & Pak Rupees or US Dollar currency along with currency conversion rate. If financial statements of any bidder, especially foreign company/JV, firm etc. are not in requisite language and/or currency, then duly translated complete financial statements (along with annexed notes) signed and stamp by independent auditor and auditor's report thereon shall be provided.
- ☐ Attached are copies of balance sheets, including all related notes, and income statements for the last three (3) years required above; and complying with the requirements

FORM FIN – 2
Average Annual Construction Turnover

[The following table shall be filled in for the Bidder and for each partner of a Joint Venture]

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

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

Joint Venture Party Legal Name: *[insert full name]*

Contract Package No. & Title: *[insert Contract Package No. & title]*

Annual turnover data (construction only)	
Year	Amount and Currency
<i>[indicate year]</i>	<i>[insert amount and indicate currency]</i>
2017	
2018	
2019	
Average Annual Construction Turnover *	

- * Average annual construction turnover calculated as total certified payments received for work in progress or completed, divided by the number of years specified in Qualification Criteria and Requirements, Sub-Factor 3.2.

EXPERIENCE FORM

General Construction Experience

[The following table shall be filled in for the Bidder and for each partner of a Joint Venture]

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

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

Joint Venture Party Legal Name: *[insert full name]*

Contract Package No. & Title: *[insert Contract Package No. & title]*

[Identify contracts that demonstrate continuous construction work over the past [10] years pursuant to Qualification Criteria and Requirements, Sub-Factor 4.1. List contracts chronologically, according to their commencement (starting) dates.]

Starting Month / Year	Ending Month / Year	Contract Identification	Role of Applicant
<i>[indicate month/ year]</i>	<i>[indicate month/ year]</i>	Contract name: <i>[insert full name]</i> Brief Description of the Works performed by the Bidder: <i>[describe works performed briefly]</i> Amount of contract: <i>[insert amount in Pak Rs]</i> Name of Employer: <i>[indicate full name]</i> Address: <i>[indicate street/number/town or city/country]</i>	<i>(insert "Contractor" or "Subcontractor" or "Contract Manager")</i>
		Contract name: <i>[insert full name]</i> Brief Description of the Works performed by the Bidder: <i>[describe works performed briefly]</i> Amount of contract: <i>[insert amount in Pak Rs]</i> Name of Employer: <i>[indicate full name]</i> Address: <i>[indicate street/number/town or city/country]</i>	<i>(insert "Contractor" or "Subcontractor" or "Contract Manager")</i>
		Contract name: <i>[insert full name]</i> Brief Description of the Works performed by the Bidder: <i>[describe works performed briefly]</i> Amount of contract: <i>[insert amount in Pak Rs]</i> Name of Employer: <i>[indicate full name]</i> Address: <i>[indicate street/number/town or city/country]</i>	<i>(insert "Contractor" or "Subcontractor" or "Contract Manager")</i>

EXPERIENCE FORM

Similar Construction Experience

[The following table shall be filled in for the Bidder and for each partner of a Joint Venture]

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

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

Joint Venture Party Legal Name: *[insert full name]*

Contract Package No. & Title: *[insert Contract Package No. & title]*

[Identify contracts that demonstrate continuous construction work over the past [10] years pursuant to Qualification Criteria and Requirements, Sub-Factor 4.1. List contracts chronologically, according to their commencement (starting) dates.]

Similar Contract No. <i>[insert number] of [insert number of similar contracts required]</i>	Information		
Contract Identification	<i>[insert contract name and number, if applicable]</i>		
Award date	<i>[insert day, month, year]</i>		
Completion date	<i>[insert day, month, year]</i>		
Role in Contract <i>[check the appropriate box]</i>	Contractor <input type="checkbox"/>	Management Contractor <input type="checkbox"/>	Subcontractor <input type="checkbox"/>
Total Contract Amount	<i>[insert total contract amount in local currency]</i>		
If partner in a JV, or subcontractor, specify participation in total contract amount	<i>[insert a percentage amount]</i>	<i>[insert total contract amount in local currency]</i>	
Employer's Name:	<i>[insert full name]</i>		
Address:	<i>[indicate street / number / town or city / country]</i>		
Telephone/fax number	<i>[insert telephone/fax numbers, including country and city area codes]</i>		
E-mail:	<i>[insert e-mail address, if available]</i>		
Description of the similarity in accordance with Sub-Factor 4.2(a) of Criteria:			
1. Amount	<i>[insert amount in words and in</i>		
2. Physical size	<i>[insert physical size of activities]</i>		
3. Complexity	<i>[insert description of complexity]</i>		
4. Methods/Technology	<i>[insert specific aspects of the methods/technology involved in the contract]</i>		
5. Other Characteristics	<i>[insert other characteristics as described in Scope of this Contract]</i>		

PROPOSED PERSONNEL FORM

Proposed Personnel

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

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

Joint Venture Party Legal Name: *[insert full name]*

Contract Package No. & Title: *[insert Contract Package No. & title]*

Bidders should provide the names of suitably qualified personnel to meet the specified requirements stated in qualification Criteria. The data on their experience should be supplied using the Form below for each candidate.

1.	Title of position*
	Name
2.	Title of position*
	Name
3.	Title of position*
	Name
4.	Title of position*
	Name
5.	Title of position*
	Name

PROPOSED PERSONNEL FORM Cont...

Proposed Personnel

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

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

Joint Venture Party Legal Name: *[insert full name]*

Contract Package No. & Title: *[insert Contract Package No. & title]*

Position		
Personnel information	Name	Date of birth
	Professional qualifications	
Present employment	Name of employer	
	Address of employer	
	Telephone	Contact (manager / personnel officer)
	Fax	E-mail
	Job title	Years with present employer

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

From	To	Company / Project / Position / Relevant technical and management experience

FORM OF BID

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

To:

Gentleman,

1. Having examined the Bidding Documents including Instructions to Bidders, Bidding Data, 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	10% of Contract Price stated in the Letter of Acceptance.
3	Time for Furnishing Programme	14.1	Within 7 days from the date of receipt of Letter of Acceptance.
4	Minimum amount of Third-Party Insurance	23.2	Rs. One Hundred Thousand (Rs. 100,000/-) per occurrence with number of occurrences unlimited.
5	Time for Commencement	41.1	Within 14 days from the date of receipt of Engineer's Notice to Commence which shall be issued within fourteen (14) days after signing of Contract Agreement.
6	Time for Completion	43.1, 48.2	180 days from the date of receipt of Engineer's Notice to Commence.
7	a) 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.
	b) Amount of Bonus	47.3	Not Applicable
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	Limit of Retention Money	60.2	5 % of Contract Price stated in the Letter of Acceptance.
11	Minimum amount of Interim Payment Certificates (Running Bills)	60.2	Rupees Five Million (Rs. 5.00 million)
12	Time of Payment from delivery of Engineer's Interim Payment Certificate to the Employer.	60.10	30 days in case of local currency or 42 days in case of foreign funded projects.
13	Mobilization Advance * (Interest Free)	60.12	10 % of Contract Price stated in the Letter of Acceptance.

FOREIGN CURRENCY REQUIREMENTS

1. The Bidder may indicate here in below his requirements of foreign currency (if any), with reference to various inputs to the Works.
2. Foreign Currency Requirement as percentage of the Bid Price excluding Provisional Sums ____%.
3. Table of Exchange Rates

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

PRICE ADJUSTMENT UNDER CLAUSE 70 OF CONDITIONS OF CONTRACT

The source of indices and the weightages or coefficients for use in the adjustment formula under Clause 70 shall be as follows:

(To be filled by the Employer)

Cost Element	Description	Weightages	Applicable index
1	2	3	4
(i)	Fixed Portion	0.350	
(ii)	Local Labour		Government of Pakistan (GP) Federal Bureau of Statistics (FBS) Monthly Statistical Bulletin.
(iii)	Cement – in bags		
(iv)	Reinforcing Steel		
(v)	High Speed Diesel (HSD)		
(vi)	Bricks		
(vii)	Bitumen		
(viii)			
	Total	1.000	

Notes:

- 1) Indices for “(ii)” to “(vii)” are taken from the Government of Pakistan Federal Bureau of Statistics, Monthly Statistical Bulletin. The base cost indices or prices shall be those applying 28 days prior to the latest day for submission of bids. Current indices or prices shall be those applying 28 days prior to the last day of the billing period.
- 2) Any fluctuation in the indices or prices of materials other than those given above shall not be subject to adjustment of the Contract Price.
- 3) Fixed portion shown here is for typical road project, Employer to determine the weightage of Fixed Portion considering only those cost elements having cost impact of seven (7) percent or more on his specific project.

(Employers using this price adjustment provisions may add or delete any elements as deemed appropriate to the project.)

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 summarized in the Bill of Quantities. References to the relevant sections of the Bidding Documents shall be made before entering prices against each item in the priced Bill of Quantities.
7. Provisional sums included and so designated in the Bill of Quantities shall be expended in whole or in part at the direction and discretion of the Engineer in accordance with Sub-Clause 58.2 of Part I, General Conditions of Contract.

BILL OF QUANTITIES

B. Work Items

Item	Description	Unit	Quantity	Rate		Amount Rupees
				Rupees in figures	Rupees in words	
1	2	3	4	5		6
	<div>Refer to Volume – 3 Bill of Quantities</div>					
101						
102						
103						
104						
105						
106						
Total (in words & Figure): _____						

Daywork Schedule
Summary Bill of Quantities

- Bidders shall price the Bill of Quantities in Pakistani Rupees only.

BILL OF QUANTITIES

C. Daywork Schedule

General

1. Reference is made to Sub-Clause 52.4 of the General Conditions of Contract Part-I. Work shall not be executed on a day work basis except by written order of the Engineer. Bidders shall enter basic rates for Daywork items in the Schedules, which rates shall apply to any quantity of Daywork ordered by the Engineer. Nominal quantities have been indicated against each item of Daywork, and the extended total for Daywork shall be carried forward to the Bid Price.

Daywork Labour

2. In calculating payments due to the Contractor for the execution of Daywork, the actual time of classes of labour directly doing the Daywork ordered by the Engineer and for which they are competent to perform will be measured excluding meal breaks and rest periods. The time of gangers (charge hands) actually doing work with the gang will also be measured but not the time of foreman or other supervisory personnel.
3. The Contractor shall be entitled to payment in respect of the total time that labour is employed on Daywork, calculated at the basic rates entered by him in the Schedule of Daywork Rates for labour together with an additional percentage, payment on basic rates representing the Contractor's profit, overheads, etc., as described below:
 - a) the basic rates for labour shall cover all direct costs to the Contractor, including (but not limited to) the amount of wages paid to such labour, transportation time, overtime, subsistence allowances and any sums paid to or on behalf of such labour for social benefits in accordance with Pakistan law. The basic rates will be payable in local currency only; and
 - b) the additional percentage payment to be quoted by the Bidder and applied to costs incurred under (a) above shall be deemed to cover the Contractor's profit, overheads, superintendence, liabilities and insurances and allowances to labour timekeeping and clerical and office work; the use of consumable stores, water, lighting and power; the use and repair of staging's, scaffolding, workshops and stores, portable power tools, manual plant and tools; supervision by the Contractor's staff, foremen and other supervisory personnel; and charges incidental to the foregoing.

SCHEDULE OF DAYWORK RATES

I. Labour

Item No.	Description	Unit	Nominal Quantity	Rate (Rs) in Figure	Rate (Rs) in Words	Extended Amount (Rs.)
1	2	3	4	5	6	7
D101	Ganger	Hr	500			
D102	Labourer	Hr	5,000			
D103	Brick layer	Hr	500			
D104	Mason	Hr	500			
D105	Carpenter	Hr	500			
D106	Steel work Erector	Hr	500			
	-----etc-----	Hr	500			
D113	Driver for vehicle up to 10 tons	Hr	1,000			
D114	Operator for excavator, dragline, shovel or crane	Hr	500			
D115	Operator for tractor, (tracked) with dozer blade or ripper	Hr	500			
D122	<p style="text-align: right;">Sub Total</p> <p>Allow _____ percent of subtotal for Contractor's overhead, profit, etc, in accordance with Paragraph 3(b) of Daywork Schedule _____</p> <p>Total for Daywork: Labour: _____</p> <p>(Carried forward to Daywork Summary)</p>					

Daywork Material

4. The Contractor shall be entitled to payment in respect of materials used for Daywork (except for materials for which the cost is included in the percentage addition to labour costs as detailed heretofore), at the basic rates entered by him in the Schedule of Daywork Rates for materials together with an additional percentage payment on the basic rates to cover overhead charges and profit, as follows:
 - a) the basic rates for materials shall be calculated on the basis of the invoiced price, freight, insurance, handling expenses, damage, losses, etc., and shall provide for delivery to store for stockpiling at the site. The basic rates shall be stated in local currency but payment will be made in the currency or currencies expended upon presentation of supporting documentation;
 - b) the additional percentage payment shall be quoted by the Bidder and applied to the equivalent local currency payments made under Sub-Para(a) above; and
 - c) the cost of hauling materials used on work ordered to be carried out as Daywork from the store or stockpile on the site to the place where it is to be used will be paid in accordance with the terms for Labour and Constructional Plant in this Schedule.

SCHEDULE OF DAYWORK RATES

II. Materials

Item No.	Description	Unit	Nominal Quantity	Rate (Rs) in Figure	Rate (Rs) in Words)	Extended Amount (Rs.)
1	2	3	4	5	6	7
D201	Cement, ordinary Portland or equivalent in bags	M.Ton	200			
D202	Mild Steel reinforcing bar upto 16mm diameter to BS 4449 or equivalent	M.Ton	100			
D203	Fine aggregate for concrete as specified in Clause _____	Cu.M	1,000			
D204	-----etc-----					
D222	Gelignite (Noble Special Gelatine 60 % or equivalent) including caps, fuse, wire and requisite accessories	M.Ton	10			
D223	<p style="text-align: right;">Sub Total</p> <p>Allow _____ percent of subtotal for Contractor's overhead, profit, etc., in accordance with Paragraph 4(b) of Daywork Schedule _____</p> <p>Total for Daywork: Materials _____</p> <p>(Carried forward to Daywork Summary)</p>					

Daywork Constructional Plant

5. The Contractor shall be entitled to payments in respect of constructional plant already on Site and employed on Daywork at the basic rental rates entered by him in the Schedule of Daywork Rates for constructional plant. The said rates shall be deemed to include complete allowance for depreciation, interest, indemnity and insurance, repairs, maintenance, supplies, fuel, lubricants, and other consumables, and all overhead, profit and administrative costs related to the use of such equipment. The cost of drivers, operators and assistants will be paid for separately as described under the section on Daywork Labour.
6. In calculating the payment due to the Contractor for constructional plant employed on Daywork, only the actual number of working hours will be eligible for payment, except that where applicable and agreed with the Engineer, the travelling time from the part of the Site where the constructional plant was located when ordered by the Engineer to be employed on Daywork and the time for return journey thereto shall be included for payment.
7. The basic rental rates for constructional plant employed on Daywork shall be stated in Pakistani Rupees.

SCHEDULE OF DAYWORK RATES

III. Constructional Plant

Item No.	Description	Unit	Nominal Quantity	Rate (Rs.) in Figure	Rate Rs.) in Words	Extended Amount (Rs.)
1	2	3	4		5	6
D301	Excavator, face shovel or dragline: 1. Up-to and including 1 Cu.M. 2. Over 1 Cu.M to 2 Cu. M. 3. Over 2 Cu. M	Hr Hr Hr	500 400 100			
D302	Tractor (tracked) including bull or angle dozer: 1. Up-to and including 150 HP 2. Over 150 to 200 HP 3. Over 200 to 250 HP	Hr Hr Hr	500 400 200			
D303	Tractor with ripper: 1. Up-to and including 200 HP 2. Over 200 to 250 HP	Hr Hr	400 200			
D304	-----etc-----					
	Total for Daywork: Constructional Plant _____ (Carried forward to Daywork Summary)					

DAYWORK

Summary (Daywork)

		Amount (Rs.)
(I)	Total for Daywork: Labour	_____
(II)	Total for Daywork: Materials	_____
(III)	Total for Daywork: Constructional Plant	_____
Total for Daywork (Carried forward to Summary Page of Bill of Quantities)		_____

PROPOSED CONSTRUCTION SCHEDULE

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

Description	Time for Completion
a) Whole Works	180 One Hundred Eighty days

METHOD OF PERFORMING THE WORK

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

1. Organization Chart indicating head office and field office personnel involved in management and supervision, engineering, equipment maintenance and purchasing.
2. Mobilization in Pakistan, the type of facilities including personnel accommodation, office accommodation, provision for maintenance and for storage, communications, security and other services to be used.
3. The method of executing the Works, the procedures for installation of equipment and machinery and transportation of equipment and materials to the site.]

LIST OF MAJOR EQUIPMENT – RELATED ITEMS

[The Bidder will provide on Sheet 2 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.]

Owned Purchased or Leased	Descriptio n 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 listed in the data sheet.

LIST OF SUBCONTRACTORS

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

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

Part of Works (Give Details)	Subcontractor (With Complete Address)
1	2

ESTIMATED PROGRESS PAYMENTS

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

Quarter/ Year/ Period	Amounts (1,000 Rs.)
1	2
<i>1st Quarter</i>	
<i>2nd Quarter</i>	
<i>3rd Quarter</i>	
<i>4th Quarter</i>	
<i>5th Quarter</i>	
<i>6th Quarter</i>	
<i>7th Quarter</i>	
<i>8th Quarter</i>	
<i>9th Quarter</i>	
Bid Price	

ORGANIZATION CHART
FOR THE
SUPERVISORY STAFF AND LABOUR

To be included by the bidder.

List the Name of staff, position assigned, CNIC No, Pb (where applicable) and degree of responsibility assigned.

(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: _____ Name of Seller/Supplier: _____

Signature: _____ Signature: _____
[Seal] [Seal]

FORMS

**BID SECURITY PERFORMANCE SECURITY
CONTRACT AGREEMENT MOBILIZATION
ADVANCE GUARANTEE/ BOND**

BID SECURITY
(Bank Guarantee)

Security Executed on _____
(Date)

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

Name of Principal (Bidder) with Address _____

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

Bid Reference No. _____

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

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

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

- (1) that the Bid Security shall remain in force up to and including the date 28 days after the deadline for validity of bids as stated in the Instructions to Bidders or as it may be extended by the Employer, notice of which extension(s) to the Surety is hereby waived;
- (2) that the Bid Security of unsuccessful Bidders will be returned by the Employer after expiry of its validity or upon signing of the Contract Agreement; and
- (3) that in the event of failure of the successful Bidder to execute the proposed Contract Agreement for such work and furnish the required Performance Security, the entire said sum be paid immediately to the

said Employer pursuant to Clause 15.6 of the Instruction to Bidders for the successful Bidder's failure to perform.

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

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

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

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

WITNESS:

1. _____

Corporate Secretary (Seal)

2. _____

Name, Title & Address

SURETY (Bank)

Signature: _____

Name: _____

Title: _____

Corporate Guarantor (Seal)

FORM OF PERFORMANCE SECURITY (Bank Guarantee)

Guarantee No. _____
 Executed on _____
 Expiry date _____

[Letter by the Guarantor to the Employer]

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

Name of Principal (Contractor) with address: _____

Penal Sum of Security (express in words and figures) _____

Letter of Acceptance No. _____ Dated _____

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

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

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

Conditions of Contract are fulfilled.

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

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

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

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

WITNESS:

1. _____

Corporate Secretary (Seal)

2. _____

Name, Title & Address

SURETY (Bank)

Signature: _____

Name: _____

Title: _____

Corporate Guarantor (Seal)

FORM OF CONTRACT AGREEMENT

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

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

NOW this Agreement witnesseth as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.
2. The following documents after incorporating addenda, 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 Particular Conditions of Contract – Part II;
 - (f) The General Conditions – Part I;
 - (g) The priced Bill of Quantities (Appendix-D to Bid);
 - (h) The completed Appendices to Bid (B, C, E to L);
 - (i) The Drawings;
 - (j) The Specifications.
 - (k) _____ (any other)
3. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy defects therein in conformity and in all respects with the provisions of the Contract.

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

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

Signature of the Contactor

Signature of Employer

(Seal)

(Seal)

Signed, Sealed and Delivered in the presence of:

Witness:

Witness:

(Name, Title and Address)

(Name, Title and Address)

MOBILIZATION ADVANCE GUARANTEE/BOND

Guarantee No. _____ Date _____

WHEREAS _____ (hereinafter called the 'Employer') has entered into a Contract for _____

(Particulars of Contract)

with _____ (hereinafter called the "Contractor").

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

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

AND WHEREAS, _____
(Scheduled Bank in Pakistan or Insurance Company
acceptable to the Employer)

(Hereinafter called the "Guarantor") at the request of the Contractor and in consideration of the Employer agreeing to make the above advance to the Contractor, has agreed to furnish the said Guarantee.

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

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

This Guarantee shall remain in force until the advance is fully adjusted against payments from the Interim Payment Certificates of the Contractor or until _____ whichever is earlier.

(Date)

The Guarantor's liability under this Guarantee shall not in any case exceed the sum of Rupees _____ (Rs _____).

This Guarantee shall remain valid up to the aforesaid date and shall be null and void

after the aforesaid date or earlier if the advance made to the Contractor is fully adjusted against payments from Interim Payment Certificates of the Contractor provided that the Guarantor agrees that the aforesaid period of validity shall be deemed to be extended if on the above-mentioned date, the advance payment is not fully adjusted.

WITNESS:

1. _____

Corporate Secretary (Seal)

2. _____

Name, Title & Address

SURETY (Bank)

Signature: _____

Name: _____

Title: _____

Corporate Guarantor (Seal)

PART II

GENERAL CONDITIONS OF CONTRACT

[Notes on the Conditions of Contract]

The Conditions of Contract comprise two parts:

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

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

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

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

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

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

FEDERATION INTERNATIONALE DES INGENIEURS-CONSEILS

Conditions of Contract for Works of Civil Engineering Construction Part I General Conditions

Fourth Edition 1987
Reprinted 1988 with editorial amendments
Reprinted in 1992 with further amendments

CONTENTS

PART I: GENERAL CONDITIONS

DEFINITIONS AND INTERPRETATION

- 1.1 Definitions
- 1.2 Headings and Marginal Notes
- 1.3 Interpretation
- 1.4 Singular and Plural
- 1.5 Notices, Consents, Approvals, Certificates and Determinations

ENGINEER AND ENGINEER'S REPRESENTATIVE

- 2.1 Engineer's Duties and Authority
- 2.2 Engineer's Representative
- 2.3 Engineer's Authority to Delegate
- 2.4 Appointment of Assistants
- 2.5 Instructions in Writing
- 2.6 Engineer to Act Impartially

ENGINEER AND ENGINEER'S REPRESENTATIVE

- 2.1 Engineer's Duties and Authority
- 2.2 Engineer's Representative
- 2.3 Engineer's Authority to Delegate
- 2.4 Appointment of Assistants
- 2.5 Instructions in Writing
- 2.6 Engineer to Act Impartially

ASSIGNMENT AND SUBCONTRACTING

- 3.1 Assignment of Contract
- 4.1 Subcontracting
- 4.2 Assignment of Subcontractors' Obligations

CONTRACT DOCUMENTS

- 5.1 Language/s and Law
- 5.2 Priority of Contract Documents
- 6.1 Custody and Supply of Drawings and Documents
- 6.2 One Copy of Drawings to be Kept on Site
- 6.3 Disruption of Progress
- 6.4 Delays and Cost of Delay of Drawings
- 6.5 Failure by Contractor to Submit Drawings
- 7.1 Supplementary Drawings and Instructions
- 7.2 Permanent Works Designed by Contractor
- 7.3 Responsibility Unaffected by Approval

GENERAL OBLIGATIONS

- 8.1 Contractor's General Responsibilities
- 8.2 Site Operations and Methods of Construction
- 9.1 Contract Agreement
- 10.1 Performance Security
- 10.2 Period of Validity of Performance Security
- 10.3 Claims under Performance Security
- 11.1 Inspection of Site
- 12.1 Sufficiency of Tender
- 12.2 Not Foreseeable Physical Obstructions or Conditions
- 13.1 Work to be in Accordance with Contract

- 14.1 Program to be Submitted
- 14.2 Revised Program
- 14.3 Cash Flow Estimate to be Submitted
- 14.4 Contractor not Relieved of Duties or Responsibilities
- 15.1 Contractor's Superintendence
- 16.1 Contractor's Employees
- 16.2 Engineer at Liberty to Object
- 17.1 Setting-out
- 18.1 Boreholes and Exploratory Excavation
- 19.1 Safety, Security and Protection of the Environment
- 19.2 Employer's Responsibilities
- 20.1 Care of Works
- 20.2 Responsibility to Rectify Loss or Damage
- 20.3 Loss or Damage Due to Employer's Risks
- 20.4 Employer's Risks
- 21.1 Insurance of Works and Contractor's Equipment
- 21.2 Scope of Cover
- 21.3 Responsibility for Amounts not Recovered
- 21.4 Exclusions
- 22.1 Damage to Persons and Property
- 22.2 Exceptions
- 22.3 Indemnity by Employer
- 23.1 Third Party Insurance (including Employer's Property)
- 23.2 Minimum Amount of Insurance
- 23.3 Cross Liabilities
- 24.1 Accident or Injury to Workmen
- 24.2 Insurance Against Accident to Workmen
- 25.1 Evidence and Terms of Insurances
- 25.2 Adequacy of Insurances
- 25.3 Remedy on Contractor's Failure to Insure
- 25.4 Compliance with Policy Conditions
- 26.1 Compliance with Statutes, Regulations
- 27.1 Fossils
- 28.1 Patent Rights
- 28.2 Royalties
- 29.1 Interference With Traffic and Adjoining Properties
- 30.1 Avoidance of Damage to Roads
- 30.2 Transport of Contractor's Equipment or Temporary Works
- 30.3 Transport of Materials or Plant
- 30.4 Waterborne Traffic
- 31.1 Opportunities for Other Contractors
- 31.2 Facilities for Other Contractors
- 32.1 Contractor to Keep Site Clear
- 33.1 Clearance of Site on Completion

LABOUR

- 34.1 Engagement of Staff and Labour
- 35.1 Returns of Labour and Contractor's Equipment

MATERIALS, PLANT AND WORKMANSHIP

- 36.1 Quality of Materials, Plant and Workmanship
- 36.2 Cost of Samples
- 36.3 Cost of Tests
- 36.4 Cost of Tests not Provided for

- 36.5 Engineer's Determination where Tests not Provided for
- 37.1 Inspection of Operations
- 37.2 Inspection and Testing
- 37.3 Dates for Inspection and Testing
- 37.4 Rejection
- 37.5 Independent Inspection
- 38.1 Examination of Work before Covering up
- 38.2 Uncovering and Making Openings
- 39.1 Removal of Improper Work, Materials or Plant
- 39.2 Default of Contractor in Compliance

SUSPENSION

- 40.1 Suspension of Work
- 40.2 Engineer's Determination following Suspension
- 40.3 Suspension lasting more than 84 Days

COMMENCEMENT AND DELAYS

- 41.1 Commencement of Works
- 42.1 Possession of Site and Access Thereto
- 42.2 Failure to Give Possession
- 42.3 Rights of Way and Facilities
- 43.1 Time for Completion
- 44.1 Extension of Time for Completion
- 44.2 Contractor to Provide Notification and Detailed Particulars
- 44.3 Interim Determination of Extension
- 45.1 Restriction on Working Hours
- 46.1 Rate of Progress
- 47.1 Liquidated Damages for Delay
- 47.2 Reduction of Liquidated Damages
- 48.1 Taking-Over Certificate
- 48.2 Taking-Over of Sections or Parts
- 48.3 Substantial Completion of Parts
- 48.4 Surfaces Requiring Reinstatement

DEFECTS LIABILITY

- 49.1 Defects Liability Period
- 49.2 Completion of Outstanding Work and Remedying Defects
- 49.3 Cost of Remedying Defects
- 49.4 Contractor's Failure to Carry Out Instructions
- 50.1 Contractor to Search

ALTERATIONS, ADDITIONS AND OMISSIONS

- 51.1 Variations
- 51.2 Instructions for Variations
- 52.1 Valuation of Variations
- 52.2 Power of Engineer to Fix Rates
- 52.3 Variations Exceeding 15 percent
- 52.4 Day work

PROCEDURE FOR CLAIMS

- 53.1 Notice of Claims
- 53.2 Contemporary Records
- 53.3 Substantiation of Claims
- 53.4 Failure to Comply

53.5 Payment of Claims

CONTRACTOR'S EQUIPMENT, TEMPORARY WORKS AND MATERIALS

- 54.1 Contractor's Equipment, Temporary Works and Materials; Exclusive Use for the Works.
- 54.2 Employer not Liable for Damage
- 54.3 Customs Clearance
- 54.4 Re-export of Contractor's Equipment
- 54.5 Conditions of Hire of Contractor's Equipment
- 54.6 Costs for the Purpose of Clause 63
- 54.7 Incorporation of Clause in Subcontracts
- 54.8 Approval of Materials not Implied

MEASUREMENT

- 55.1 Quantities
- 56.1 Works to be Measured
- 57.1 Method of Measurement
- 57.2 Breakdown of Lump Sum Items

PROVISIONAL SUMS

- 58.1 Definition of "Provisional Sum"
- 58.2 Use of Provisional Sums
- 58.3 Production of Vouchers

NOMINATED SUBCONTRACTORS

- 59.1 Definition of "Nominated Subcontractors"
- 59.2 Nominated Subcontractors; Objection to Nomination
- 59.3 Design Requirements to be Expressly Stated
- 59.4 Payments to Nominated Subcontractors
- 59.5 Certification of Payments to Nominated Subcontractors

CERTIFICATES AND PAYMENT

- 60.1 Monthly Statements
- 60.2 Monthly Payments
- 60.3 Payment of Retention Money
- 60.4 Correction of Certificates
- 60.5 Statement at Completion
- 60.6 Final Statement
- 60.7 Discharge
- 60.8 Final Payment Certificate
- 60.9 Cessation of Employer's Liability
- 60.10 Time for Payment
- 61.1 Approval only by Defects Liability Certificate
- 62.1 Defects Liability Certificate
- 62.2 Unfulfilled Obligations

REMEDIES

- 63.1 Default of Contractor
- 63.2 Valuation at Date of Termination
- 63.3 Payment after Termination
- 63.4 Assignment of Benefit of Agreement
- 64.1 Urgent Remedial Work

SPECIAL RISKS

- 65.1 No Liability for Special Risks

- 65.2 Special Risks
- 65.3 Damage to Works by Special Risks
- 65.4 Projectile, Missile
- 65.5 Increased Costs arising from Special Risks
- 65.6 Outbreak of War
- 65.7 Removal of Contractor's Equipment on Termination
- 65.8 Payment if Contract Terminated

RELEASE FROM PERFORMANCE

- 66.1 Payment in Event of Release from Performance

SETTLEMENT OF DISPUTES

- 67.1 Engineer's Decision
- 67.2 Amicable Settlement
- 67.3 Arbitration
- 67.4 Failure to Comply with Engineer's Decision

NOTICES

- 68.1 Notice to Contractor
- 68.2 Notice to Employer and Engineer
- 68.3 Change of Address

DEFAULT OF EMPLOYER

- 69.1 Default of Employer
- 69.2 Removal of Contractor's Equipment
- 69.3 Payment on Termination
- 69.4 Contractor's Entitlement to Suspend Work
- 69.5 Resumption of Work

CHANGES IN COST AND LEGISLATION

- 70.1 Increase or Decrease of Cost
- 70.2 Subsequent Legislation

CURRENCY AND RATES OF EXCHANGE

- 71.1 Currency Restrictions
- 72.1 Rates of Exchange
- 72.2 Currency Proportions
- 72.3 Currencies of Payment for Provisional Sums

PART-1 GENERAL CONDITIONS

Definitions and Interpretation

1.1 Definitions

In the Contract (as hereinafter defined) the following words and expressions shall have the meanings hereby assigned to them, except where the context otherwise requires:

- (a)
 - (i) "Employer" means the person named as such in **Part II** of these Conditions and the legal successors in title to such person, but not (except with the consent of the Contractor) any assignee of such person.
 - (ii) "Contractor" means the person whose tender has been accepted by the Employer and the legal successors in title to such person, but not (except with the consent of the Employer) any assignee of such person.
 - (iii) "Subcontractor" means any person named in the Contract as a Subcontractor for a part of the Works or any person to whom a part of the Works has been subcontracted with the consent of the Engineer and the legal successors in title to such person, but not any assignee of any such person.
 - (iv) "Engineer" means the person appointed by the Employer to act as Engineer for the purposes of the Contract and named as such in **Part II** of these Conditions.
 - (v) "Engineer's Representative" means a person appointed from time to time by the Engineer under Sub-Clause 2.2.
- (b)
 - (i) "Contract" means these Conditions (Parts I and II), the Specification, the Drawings, the Bill of Quantities, the Tender, the Letter of Acceptance, the Contract Agreement (if completed) and such further documents as may be expressly incorporated in the Letter of Acceptance or Contract Agreement (if completed).
 - (ii) "Specification" means the specification of the Works included in the Contract and any modification thereof or addition thereto made under Clause 51 or submitted by the Contractor and approved by the Engineer.
 - (iii) "Drawings" means all drawings, calculations and technical information of a like nature provided by the Engineer to the Contractor under the Contract and all drawings, calculations, samples, patterns, models, operation and maintenance manuals and other technical information of a like nature submitted by the Contractor and approved by the Engineer.
 - (iv) "Bill of Quantities" means the priced and completed bill of quantities forming part of the Tender.
 - (v) "Tender" means the Contractor's priced offer to the Employer for the execution and completion of the Works and the remedying of any defects therein in accordance with the provisions of the Contract, as accepted by the Letter of Acceptance.
 - (vi) "Letter of Acceptance" means the formal acceptance by the Employer of the Tender.
 - (vii) "Contract Agreement" means the contract agreement (if any) referred to in Sub-Clause 9.1.

- (viii) "Appendix to Tender" means the appendix comprised in the form of Tender annexed to these Conditions.
- (c)
 - (i) "Commencement Date" means the date upon which the Contractor receives the notice to commence issued by the Engineer pursuant to Clause 41.
 - (ii) "Time for Completion" means the time for completing the execution of and passing the Tests on Completion of the Works or any Section or part thereof as stated in the Contract (or as extended under Clause 44) calculated from the Commencement Date.
- (d)
 - (i) "Tests on Completion" means the tests specified in the Contract or otherwise agreed by the Engineer and the Contractor which are to be made by the Contractor before the Works of any Section or part thereof are taken over by the Employer.
 - (ii) "Taking-Over Certificate" means a certificate issued pursuant to Clause 48.
- (e)
 - (i) "Contract Price" means the sum stated in the Letter of Acceptance as payable to the Contractor for the execution and completion of the Works and the remedying of any defects therein in accordance with the provisions of the Contract.
 - (ii) "Retention Money" means the aggregate of all monies retained by the Employer pursuant to Sub-Clause 60.2(a).
 - (iii) "Interim Payment Certificate" means any certificate of payment issued by the Engineer other than the Final Payment Certificate.
 - (iv) "Final Payment Certificate" means the certificate of payment issued by the Engineer pursuant to Sub-Clause 60.8.
- (f)
 - (i) "Works" means the Permanent Works and the Temporary Works or either of them as appropriate.
 - (ii) "Permanent Works" means the permanent works to be executed (including Plant) in accordance with the Contract.
 - (iii) "Temporary Works" means all temporary works of every kind (other than Contractor's Equipment) required in or about the execution and completion of the Works and the remedying of any defects therein.
 - (iv) "Plant" means machinery, apparatus and the like intended to form or forming part of the Permanent Works.
 - (v) "Contractor's Equipment" means all appliances and things of whatsoever nature (other than Temporary Works) required for the execution and completion of the Works and the remedying of any defects therein, but does not include Plant, materials or other things intended to form or forming part of the Permanent Works.
 - (vi) "Section" means a part of the Works specifically identified in the Contract as a Section.
 - (vii) "Site" means the places provided by the Employer where the Works are to be executed and any other places as may be specifically designated in the Contract as forming part of the Site.
- (g)
 - (i) "cost" means all expenditure properly incurred or to be incurred, whether, on or off the Site, including overhead and other charges properly allocable thereto but does not include any allowance for profit.
 - (ii) "Day" means calendar day.
 - (iii) "Foreign currency" means a currency of a country other than that in which the Works are to be located.

- (iv) "Writing" means any hand-written, type-written, or printed communication, including telex, cable and facsimile transmission.

Headings and Marginal Notes

- 1.2 The headings and marginal notes in these Conditions shall not be deemed part thereof or be taken into consideration in the interpretation or construction thereof or of the Contract.

Interpretation

- 1.3 Words importing persons or parties shall include firms and corporations and any organization having legal capacity.

Singular and Plural

- 1.4 Words importing the singular only also include the plural and vice versa where the context requires.

Notices, Consents, Approvals, Certificates and Determinations

- 1.5 Wherever in the Contract provision is made for the giving or issue of any notice, consent, approval, certificate or determination by any person, unless otherwise specified such notice, consent, approval, certificate or determination shall be in writing and the words "notify", "certify" or "determine" shall be construed accordingly. Any such consent, approval, certificate or determination shall not unreasonably be withheld or delayed.

ENGINEER AND ENGINEER'S REPRESENTATIVE

Engineer's Duties and Authority

- 2.1
- (a) The Engineer shall carry out the duties specified in the Contract.
 - (b) The Engineer may exercise the authority specified in or necessarily to be implied from the Contract, provided, however, that if the Engineer is required, under the terms of his appointment by the Employer, to obtain the specific approval of the Employer before exercising any such authority, particulars of such requirements shall be set out in **Part II** of these Conditions. Provided further that any requisite approval shall be deemed to have been given by the Employer for any such authority exercised by the Engineer.
 - (c) Except as expressly stated in the Contract, the Engineer shall have no authority to relieve the Contractor of any of his obligations under the Contract.

Engineer's Representative

- 2.2 The Engineer's Representative shall be appointed by and be responsible to the Engineer and shall carry out such duties and exercise such authority as may be delegated to him by the Engineer under Sub-Clause 2.3.

Engineer's Authority to Delegate

- 2.3 The Engineer may from time-to-time delegate to the Engineer's Representative any of the duties and authorities vested in the Engineer and he may at any time revoke such delegation. Any such delegation or revocation shall be in writing and shall not

take effect until a copy thereof has been delivered to the Employer and the Contractor. Any communication given by the Engineer's Representative to the Contractor in accordance with such delegation shall have the same effect as though it had been given by the Engineer. Provided that:

- (a) Any failure of the Engineer's Representative to disapprove any work, materials or Plant shall not prejudice the authority of the Engineer to disapprove such work, materials or Plant and to give instructions for the rectification thereof; and
- (b) If the Contractor questions any communication of the Engineer's Representative he may refer the matter to the Engineer who shall confirm, reverse or vary the contents of such communication.

Appointment of Assistants

- 2.4 The Engineer or the Engineer's Representative may appoint any number of persons to assist the Engineer's Representative in the carrying out of his duties under Sub-Clause 2.2. He shall notify to the Contractor the names, duties and scope of authority of such persons. Such assistants shall have no authority to issue any instructions to the Contractor save in so far as such instructions may be necessary to enable them to carry out their duties and to secure their acceptance of materials, Plant or workmanship as being in accordance with the Contract, and any instructions given by any of them for those purposes shall be deemed to have been given by the Engineer's Representative.

Instructions in Writing

- 2.5 Instructions given by the Engineer shall be in writing, provided that if for any reason the Engineer considers it necessary to give any such instruction orally, the Contractor shall comply with such instruction. Confirmation in writing of such oral instruction given by the Engineer, whether before or after the carrying out of the instruction, shall be deemed to be an instruction within the meaning of this Sub-Clause. Provided further that if the Contractor, within 7 days, confirms in writing to the Engineer any oral instruction of the Engineer and such confirmation is not contradicted in writing within 7 days by the Engineer, it shall be deemed to be an instruction of the Engineer.

The provisions of this Sub-Clause shall equally apply to instructions given by the Engineer's Representative and any assistants of the Engineer or the Engineer's Representative appointed pursuant to Sub-Clause 2.4.

Engineer to Act Impartially

- 2.6 Wherever, under the Contract, the Engineer is required to exercise his discretion by:
- (a) Giving his decision, opinion or consent,
 - (b) Expressing his satisfaction or approval,
 - (c) Determining value, or
 - (d) Otherwise taking action which may affect the rights and obligations of the Employer or the Contractor he shall exercise such discretion impartially within

the terms of the Contract and having regard to all the circumstances. Any such decision, opinion, consent expression of satisfaction, or approval, determination of value or action may be opened up, reviewed or revised as provided in Clause 67.

ASSIGNMENT AND SUBCONTRACTING

Assignment of Contract

- 3.1 The Contractor shall not, without the prior consent of the Employer (which consent, notwithstanding the provisions of Sub-Clause 1.5, shall be at the sole discretion of the Employer), assign the Contract or any part thereof, or any benefit or interest therein or there under, otherwise than by:
- (a) a charge in favour of the Contractor's bankers of any monies due or to become due under the Contract, or
 - (b) Assignment to the Contractor's insurers (in cases where the insurers have discharged the Contractor's loss or liability) of the Contractor's right to obtain relief against any other party liable.

Subcontracting

- 4.1 The Contractor shall not subcontract the whole of the Works. Except where otherwise provided by the Contract, the Contractor shall not subcontract any part of the Works without the prior consent of the Engineer. Any such consent shall not relieve the Contractor from any liability or obligation under the Contract and he shall be responsible for the acts, defaults and neglects of any Subcontractor, his agents, servants or workmen as fully as if they were the acts, defaults or neglects of the Contractor, his agents' servants or workmen. Provided that the Contractor shall not be required to obtain such consent for:
- (a) The provision of labour,
 - (b) The purchase of materials which are in accordance with the standards specified in the Contract,
 - (c) The subcontracting of any part of the Works for which the Subcontractor is named in the Contract.

Assignment of Subcontractors' Obligations

- 4.2 In the event of a Subcontractor having undertaken towards the Contractor in respect of the work executed, or the goods, materials, Plant or services supplied by such Subcontractor, any continuing obligation extending for a period exceeding that of the Defects Liability Period under the Contract, the Contractor shall at any time, after the expiration of such Period, assign to the Employer, at the Employer's request and cost, the benefit of such obligation for the unexpired duration thereof.

CONTRACT DOCUMENTS

Language/s and Law

- 5.1 There is stated in **Part II** of these Conditions:

- (a) the language or languages in which the Contract documents shall be drawn up, and
- (b) the country or state the law of which shall apply to the Contract and according to which the Contract shall be construed. If the said documents are written in more than one language, the language according to which the Contract shall be construed and interpreted is also stated in **Part II** of these Conditions, being therein designated the "Ruling Language".

Priority of Contract Documents

- 5.2 The several documents forming the Contract are to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies the same shall be explained and adjusted by the Engineer who shall thereupon issue to the Contractor instructions thereon and in such event, unless otherwise provided in the Contract, the priority of the documents forming the Contract shall be as follows:
- (1) The Contract Agreement (if completed);
 - (2) The Letter of Acceptance;
 - (3) The Tender;
 - (4) Part II of these Conditions;
 - (5) Part I of these Conditions; and
 - (6) Any other document forming part of the Contract.

Custody and Supply of Drawings and Documents

- 6.1 The Drawings shall remain in the sole custody of the Engineer, but two copies thereof shall be provided to the Contractor free of charge. The Contractor shall make at his own cost any further copies required by him. Unless it is strictly necessary for the purposes of the Contract, the Drawings, Specification and other documents provided by the Employer or the Engineer shall not, without the consent of the Engineer, be used or communicated to a third party by the Contractor. Upon issue of the Defects Liability Certificate, the Contractor shall return to the Engineer all Drawings, Specification and other documents provided under the Contract. The Contractor shall supply to the Engineer four copies of all Drawings, specification and other documents submitted by the Contractor and approved by the Engineer in accordance with Clause 7, together with a reproducible copy of any material which cannot be reproduced to an equal standard by photocopying. In addition, the Contractor shall supply such further copies of such Drawings, Specification and other documents as the Engineer may request in writing for the use of the Employer, who shall pay the cost thereof.

One Copy of Drawings to be Kept on Site

- 6.2 One copy of the Drawings, provided to or supplied by the Contractor as aforesaid, shall be kept by the Contractor on the Site and the same shall at all reasonable times be available for inspection and use by the Engineer and by any other person Authorized by the Engineer in writing.

Disruption of Progress

- 6.3 The Contractor shall give notice to the Engineer, with a copy to the Employer, whenever planning or execution of the Works is likely to be delayed or disrupted unless any further drawing or instruction is issued by the Engineer within a reasonable time. The notice shall include details of the drawing or instruction required and of why and by when it is required and of any delay or disruption likely to be suffered if it is late.

Delay and Cost of Delay of Drawings

- 6.4 If, by reason of any failure or inability of the Engineer to issue, within a time reasonable in all the circumstances, any drawing or instruction for which notice has been given by the Contractor in accordance with Sub-Clause 6.3, the Contractor suffers delay and/or incurs costs then the Engineer shall, after due consultation with the Employer and the Contractor, determine:
- (a) any extension of time to which the Contractor is entitled under Clause 44, and
 - (b) the amount of such costs, which shall be added to the Contract Price, and shall notify the Contractor accordingly, with a copy to the Employer.

Failure by Contractor to Submit Drawings

- 6.5 If the failure or inability of the Engineer to issue any drawings or instructions is caused in whole or in part by the failure of the Contractor to submit Drawings, Specification or other documents which he is required to submit under the Contract, the Engineer shall take such failure by the Contractor into account when making his determination pursuant to Sub-Clause 6.4.

Supplementary Drawings and Instructions

- 7.1 The Engineer shall have authority to issue to the Contractor, from time to time, such supplementary Drawings and instructions as shall be necessary for the purpose of the proper and adequate execution and completion of the Works and the remedying of any defects therein. The Contractor shall carry out and be bound by the same.

Permanent Works Designed by Contractor

- 7.2 Where the Contract expressly provides that part of the Permanent Works shall be designed by the Contractor, he shall submit to the Engineer, for approval:
- (a) such drawings, specifications, calculations and other information as shall be necessary to satisfy the Engineer as to the suitability and adequacy of that design, and
 - (b) operation and maintenance manuals together with drawings of the Permanent Works as completed, in sufficient detail to enable the Employer to operate, maintain, dismantle, reassemble and adjust the Permanent Works incorporating that design. The Works shall not be considered to be completed for the purposes of taking over in accordance with Clause 48 until such operation and maintenance manuals together with drawings on completion have been submitted to and approved by the Engineer.

Responsibility Unaffected by Approval

- 7.1 Approval by the Engineer, in accordance with Sub-Clause 7.2, shall not relieve the Contractor of any of his responsibilities under the Contract.

GENERAL OBLIGATIONS**Contractor's General Responsibilities**

- 8.1 The Contractor shall, with due care and diligence, design (to the extent provided for by the Contract), execute and complete the Works and remedy any defects therein in accordance with the provisions of the Contract. The Contractor shall provide all superintendence, labour, material, Plant, Contractor's Equipment and all other things, whether of a temporary or permanent nature, required in and for such design, execution, completion and remedying of any defects, so far as the necessity for providing the same is specified in or is reasonably to be inferred from the Contract.

Site Operations and Methods of Construction

- 8.2 The Contractor shall take full responsibility for the adequacy, stability and safety of all Site operations and methods of construction. Provided that the Contractor shall not be responsible (except as stated hereunder or as may be otherwise agreed) for the design or specification of Permanent Works, or for the design or specification of any Temporary Works not prepared by the Contractor. Where the Contract expressly provides that part of the Permanent Works shall be designed by the Contractor, he shall be fully responsible for that part of such Works, notwithstanding any approval by the Engineer.

Contract Agreement

- 9.1 The Contractor shall, if called upon so to do, enter into and execute the Contract Agreement, to be prepared and completed at the cost of the Employer, in the form annexed to these Conditions with such modification as may be necessary.

Performance Security

- 10.1 If the Contract requires the Contractor to obtain security for his proper performance of the Contract, he shall obtain and provide to the Employer, such security within 28 days after the receipt of the Letter of Acceptance, in the sum stated in the Appendix to Tender. When providing such security to the Employer, the Contractor shall notify the Engineer of so doing. Such security shall be in the form annexed to these Conditions or in such other form as may be agreed between the Employer and the Contractor. The institution providing such security shall be subject to the approval of the Employer. The cost of complying with the requirements of this Clause shall be borne by the Contractor, unless the Contract otherwise provides.

Period of Validity of Performance Security

- 10.2 The performance security shall be valid until the Contractor has executed and completed the Works and remedied any defects therein in accordance with the Contract. No claim shall be made against such security after the issue of the Defects Liability Certificate in accordance with Sub-Clause 62.1 and such security shall be

returned to the Contractor within 14 days of the issue of the said Defects Liability Certificate.

Claims under Performance Security

- 10.3 Prior to making a claim under the performance security the Employer shall, in every case, notify the Contractor stating the nature of the default in respect of which the claim is to be made.

Inspection of Site

- 11.1 The Employer shall have made available to the Contractor, before the submission by the Contractor of the Tender, such data on hydrological and subsurface conditions as have been obtained by or on behalf of the Employer from investigations undertaken relevant to the Works but the Contractor shall be responsible for his own interpretation thereof. The Contractor shall be deemed to have inspected and examined the Site and its surroundings and information available in connection therewith and to have satisfied himself (so far as is practicable, having regard to considerations of cost and time) before submitting his Tender, as to:
- (a) the form and nature thereof, including the sub-surface conditions,
 - (b) the hydrological and climatic conditions,
 - (c) the extent and nature of work and materials necessary for the execution and completion of the Works and the remedying of any defects therein, and
 - (d) the means of access to the Site and the accommodation he may require, and, in general, shall be deemed to have obtained all necessary information, subject as above mentioned, as to risks, contingencies and all other circumstances which may influence or affect his Tender. The Contractor shall be deemed to have based his Tender on the data made available by the Employer and on his own inspection and examination, all as aforementioned.

Sufficiency of Tender

- 12.1 The Contractor shall be deemed to have satisfied himself as to the correctness and sufficiency of the Tender and of the rates and prices stated in the Bill of Quantities, all of which shall, except insofar as it is otherwise provided in the Contract, cover all his obligations under the Contract (including those in respect of the supply of goods, materials, Plant or services or of contingencies for which there is a Provisional Sum) and all matters and things necessary for the proper execution and completion of the Works and the remedying of any defects therein.

Not Foreseeable Physical Obstructions or Conditions

- 12.2 If, however, during the execution of the Works the Contractor encounters physical obstructions or physical conditions, other than climatic conditions on the Site, which obstructions or conditions were, in his opinion, not foreseeable by an experienced contractor, the Contractor shall forthwith give notice thereof to the Engineer, with a copy to the Employer. On receipt of such notice, the Engineer shall if in his opinion such obstructions or conditions could not have been reasonably foreseen by an experienced contractor, after due consultation with the Employer and the Contractor, determine:

- (a) any extension of time to which the Contractor is entitled under Clause 44, and
- (b) the amount of any costs which may have been incurred by the Contractor by reason of such obstructions or conditions having been encountered, which shall be added to the Contract Price, and shall notify the Contractor accordingly, with a copy to the Employer. Such determination shall take account of any instruction which the Engineer may issue to the Contractor in connection therewith, and any proper and reasonable measures acceptable to the Engineer which the Contractor may take in the absence of specific instructions from the Engineer.

Work to be in Accordance with Contract

- 13.1 Unless it is legally or physically impossible, the Contractor shall execute and complete the Works and remedy any defects therein in strict accordance with the Contract to the satisfaction of the Engineer. The Contractor shall comply with and adhere strictly to the Engineer's instructions on any matter, whether mentioned in the Contract or not, touching or concerning the Works. The Contractor shall take instructions only from the Engineer (or his delegate).

Program to be Submitted

- 14.1 The Contractor shall, within the time stated in **Part II** of these Conditions after the date of the Letter of Acceptance, submit to the Engineer for his consent a program, in such form and detail as the Engineer shall reasonably prescribe, for the execution of the Works. The Contractor shall, whenever required by the Engineer, also provide in writing for his information a general description of the arrangements and methods which the Contractor proposes to adopt for the execution of the Works.

Revised Program

- 14.2 If at any time it should appear to the Engineer that the actual progress of the Works does not conform to the program to which consent has been given under Sub-Clause 14.1, the Contractor shall produce, at the request of the Engineer, a revised program showing the modifications to such program necessary to ensure completion of the Works within the Time for Completion.

Cash Flow Estimate to be Submitted

- 14.3 The Contractor shall, within the time stated in **Part II** of these Conditions after the date of the Letter of Acceptance, provide to the Engineer for his information a detailed cash flow estimate, in quarterly periods, of all payments to which the Contractor will be entitled under the Contract and the Contractor shall subsequently supply revised cash flow estimates at quarterly intervals, if required to do so by the Engineer.

Contractor not Relieved of Duties or Responsibilities

- 14.4 The submission to and consent by the Engineer of such programs or the provision of such general descriptions or cash flow estimates shall not relieve the Contractor of any of his duties or responsibilities under the Contract.

Contractor's Superintendence

- 15.1 The Contractor shall provide all necessary superintendence during the execution of the Works and as long thereafter as the Engineer may consider necessary for the proper fulfilling of the Contractor's obligations under the Contract. The Contractor, or a competent and Authorized representative approved of by the Engineer, which approval may at any time be withdrawn, shall give his whole time to the superintendence of the Works. Such Authorized representative shall receive, on behalf of the Contractor, instructions from the Engineer. If approval of the representative is withdrawn by the Engineer, the Contractor shall, as soon as is practicable, having regard to the requirement of replacing him as hereinafter mentioned, after receiving notice of such withdrawal, remove the representative from the Works and shall not thereafter employ him again on the Works in any capacity and shall replace him by another representative approved by the Engineer.

Contractor's Employees

- 16.1 The Contractor shall provide on the Site in connection with the execution and completion of the Works and the remedying of any defects therein:
- (a) only such technical assistants as are skilled and experienced in their respective callings and such foremen and leading hands as are competent to give proper superintendence of the Works, and
 - (b) such skilled, semi-skilled and unskilled labour as is necessary for the proper and timely fulfilling of the Contractor's obligations under the Contract.

Engineer at Liberty to Object

- 16.2 The Engineer shall be at liberty to object to and require the Contractor to remove forthwith from the Works any person provided by the Contractor who, in the opinion of the Engineer, misconducts himself, or is incompetent or negligent in the proper performance of his duties, or whose presence on Site is otherwise considered by the Engineer to be undesirable, and such person shall not be again allowed upon the Works without the consent of the Engineer. Any person so removed from the Works shall be replaced as soon as possible.

Setting-out

- 17.1 The Contractor shall be responsible for:
- (a) the accurate setting-out of the Works in relation to original points, lines and levels of reference given by the Engineer in writing,
 - (b) the correctness, subject as above mentioned of the position, levels dimensions and alignment of all parts of the Works, and
 - (c) the provision of all necessary instruments, appliances and labour in connection with the foregoing responsibilities. If, at any time during the execution of the Works, any error appears in the position, levels, dimensions or alignment of any part of the Works, the Contractor, on being required so to do by the Engineer, shall, at his own cost, rectify such error to the satisfaction of the Engineer, unless such error is based on incorrect data supplied in writing by the Engineer, in which case the Engineer shall determine an addition to the Contract Price in accordance with Clause 52 and shall notify

the Contractor accordingly, with a copy to the Employer. The checking of any setting-out or of any line or level by the Engineer shall not in any way relieve the Contractor of his responsibility for the accuracy thereof and the Contractor shall carefully protect and preserve all bench-marks, sight rails, pegs and other things used in setting-out the Works.

Boreholes and Exploratory Excavation

- 18.1 If, at any time during the execution of the Works, the Engineer requires the Contractor to make boreholes or to carry out exploratory excavation, such requirement shall be the subject of an instruction in accordance with Clause 51, unless an item or a Provisional Sum in respect of such work is included in the Bill of Quantities.

Safety, Security and Protection of the Environment

- 19.1 The Contractor shall, throughout the execution and completion of the Works and the remedying of any defects therein:
- (a) have full regard for the safety of all persons entitled to be upon the Site and keep the Site (so far as the same is under his control) and the Works (so far as the same are not completed or occupied by the Employer) in an orderly state appropriate to the avoidance of danger to such persons,
 - (b) provide and maintain at his own cost all lights, guards, fencing, warning signs and watching, when and where necessary or required by the Engineer or by any duly constituted authority, for the protection of the Works or for the safety and convenience of the public or others, and
 - (c) take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation.

Employer's Responsibilities

- 19.2 If under Clause 31 the Employer shall carry out work on the Site with his own workmen he shall, in respect of such work:
- (a) have full regard to the safety of all persons entitled to be upon the Site, and
 - (b) keep the Site in an orderly state appropriate to the avoidance of danger to such persons. If under Clause 31 the Employer shall employ other contractors on the Site, he shall require them to have the same regard for safety and avoidance of danger.

Care of Works

- 20.1 The Contractor shall take full responsibility for the care of the Works and materials and Plant for incorporation therein from the Commencement Date until the date of issue of the Taking-Over Certificate for the whole of the Works, when the responsibility for the said care shall pass to the Employer. Provided that:
- (a) if the Engineer issues a Taking-Over Certificate for any Section or part of the Permanent Works the Contractor shall cease to be liable for the care of that Section or part from the date of issue of the Taking-Over Certificate, when the

responsibility for the care of that Section or part shall pass to the Employer, and

- (b) The Contractor shall take full responsibility for the care of any outstanding Works and materials and Plant for incorporation therein which he undertakes to finish during the Defects Liability Period until such outstanding Works have been completed pursuant to Clause 49.

Responsibility to Rectify Loss or Damage

- 20.2 If any loss or damage happens to the Works, or any part thereof, or materials or Plant for incorporation therein, during the period for which the Contractor is responsible for the care thereof, from any cause whatsoever, other than the risks defined in Sub-Clause 20.4, the Contractor shall, at his own cost, rectify such loss or damage so that the Permanent Works conform in every respect with the provisions of the Contract to the satisfaction of the Engineer. The Contractor shall also be liable for any loss or damage to the Works occasioned by him in the course of any operations carried out by him for the purpose of complying with his obligations under Clauses 49 and 50.

Loss or Damage Due to Employer's Risks

- 20.3 In the event of any such loss or damage happening from any of the risks defined in Sub-Clause 20.4, or in combination with other risks, the Contractor shall, if and to the extent required by the Engineer, rectify the loss or damage and the Engineer shall determine an addition to the Contract Price in accordance with Clause 52 and shall notify the Contractor accordingly, with a copy to the Employer. In the case of a combination or risks causing loss or damage any such determination shall take into account the proportional responsibility of the Contractor and the Employer.

Employer's Risks

- 20.4 The Employer's risks are:
- (a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies,
 - (b) rebellion, revolution, insurrection, or military or usurped power, or civil war,
 - (c) ionizing radiations, or contamination by radio-activity 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,
 - (d) pressure waves caused by aircraft or other aerial devices traveling at sonic or supersonic speeds,
 - (e) riot, commotion or disorder, unless solely restricted to employees of the Contractor or of his Subcontractor and arising from the conduct of the Works,
 - (f) 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,
 - (g) 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

- (h) any operation of the forces of nature against which an experienced contractor could not reasonably have been expected to take precautions.

Insurance of Works and Contractor's Equipment

- 21.1 The Contractor shall, without limiting his or the Employer's obligations and responsibilities under Clause 20, insure:
- (a) the Works, together with materials and Plant for incorporation therein, to the full replacement cost (the term "cost" in this context shall include profit),
 - (b) an additional sum of 15 per cent of such replacement cost, or as may be specified in **Part II** of these Conditions, to cover any additional costs of and incidental to the rectification of loss or damage including professional fees and the cost of demolishing and removing any part of the Works and of removing debris of whatsoever nature, and
 - (c) the Contractor's Equipment and other things brought onto the Site by the Contractor, for a sum sufficient to provide for their replacement at the Site.

Scope of Cover

- 21.2 The insurance in paragraphs (a) and (b) of Sub-Clause 21.1 shall be in the joint names of the Contractor and the Employer and shall cover:
- (a) the Employer and the Contractor against all loss or damage from whatsoever cause arising, other than as provided in Sub-Clause 21.4, from the start of work at the Site until the date of issue of the relevant Taking- Over Certificate in respect of the Works or any Section or part thereof as the case may be, and
 - (b) the Contractor for his liability:
 - (i) during the Defects Liability Period for loss or damage arising from a cause occurring prior to the commencement of the Defects Liability Periods, and
 - (ii) for loss or damage occasioned by the Contractor in the course of any operations carried out by him for the purpose of complying with his obligations under Clauses 49 and 50.

Responsibility for Amounts not Recovered

- 21.3 Any amounts not insured or not recovered from the insurers shall be borne by the Employer or the Contractor in accordance with their responsibilities under Clause 20.

Exclusions

- 21.4 There shall be no obligation for the insurances in Sub-Clause 21.1 to include loss or damage caused by:
- (a) war, hostilities (where war be declared or not), invasion, act of foreign enemies,
 - (b) Rebellion, revolution, insurrection, or military or usurped power, or civil war,
 - (c) ionizing, radiations, or contamination by radio-activity 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, or
 - (d) Pressure waves caused by aircraft or other aerial devices traveling at sonic or supersonic speeds.

Damage to Persons and Property

- 22.1 The Contractor shall, except if and so far as the Contract provides otherwise, indemnify the Employer against all losses and claims in respect of:
- (a) Death of or injury to any person, or
 - (b) loss of or damage to any property (other than the Works), which may arise out of or in consequence of the execution and completion of the Works and the remedying of any defects therein, and against all claims, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto, subject to the exceptions defined in Sub-Clause 22.2.

Exceptions

- 22.2 The "exceptions" referred to in Sub-Clause 22.1 are:
- (a) The permanent use or occupation of land by the Works, or any part thereof,
 - (b) The right of the Employer to execute the Works, or any part thereof, on, over, under, is or through any land,
 - (c) Damage to property which is the unavoidable result of the execution and completion of the Works, or the remedying of any defects therein, in accordance with the Contract, and.
 - (d) death of or injury to persons or loss of or damage to property resulting from any act or neglect of the Employer, his agents servants or other contractors, not being employed by the Contractor, or in respect of any claims, proceedings, damages, costs, charges and expenses in respect thereof or in relation thereto or, where the injury or damage was contributed to by the Contractor, his servants or agents, such part of the said injury or damage as may be just and equitable having regard to the extent of the responsibility of the Employer, his servants or agents or other contractors for the injury or damage.

Indemnity by Employer

- 22.3 The Employer shall indemnify the Contractor against all claims, proceedings, damages, costs, charges and expenses in respect of the matters referred to in the exceptions defined in Sub-Clause 22.2.

Third Party Insurance (including Employer's Property)

- 23.1. The Contractor shall, without limiting his or the Employer's obligation and responsibilities under Clause 22, insure, in the joint names of the Contractor and the Employer, against liabilities for death of or injury to any person (other than as provided in Clause 24) or loss of or damage to any property (other than the Works) arising out of the performance of the Contract, other than the exceptions defined in paragraphs (a), (b) and (c) of Sub-Clause 22.2.

Minimum Amount of Insurance

- 23.2 Such insurance shall be for at least the amount stated in the Appendix to Tender.

Cross Liabilities

- 23.3 The insurance policy shall include a cross liability clause such that the insurance shall apply to the Contractor and to the Employer as separate insured's.

Accident or Injury to Workmen

- 24.1 The Employer shall not be liable for or in respect of any damages or compensation payable to any workman or other person in the employment of the Contractor or any Subcontractor, other than death or injury resulting from any act or default of the Employer, his agents or servants. The Contractor shall indemnify and keep indemnified the Employer against all such damages and compensation, other than those for which the Employer is liable as aforesaid, and against all claims, proceedings, damages, costs, charges, and expenses whatsoever in respect thereof or in relation thereto.

Insurance Against Accident to Workmen

- 24.2 The Contractor shall insure against such liability and shall continue such insurance during the whole of the time that any persons are employed by him on the Works. Provided that, in respect of any persons employed by any Subcontractor, the Contractor's obligations to insure as aforesaid under the Sub- Clause shall be satisfied if the Subcontractor shall have insured against the liability in respect of such persons in such manner that the Employer is indemnified under the policy, but the Contractor shall require such Subcontractor to produce to the Employer, when required, such policy of insurance and the receipt for the payment of the current premium.

Evidence and Terms of Insurances

- 25.1 The Contractor shall provide evidence to the Employer prior to the start of work at the Site that the insurances required under the Contract have been effected and shall, within 84 days of the Commencement Date, provide the insurance policies to the Employer. When providing such evidence and such policies to the Employer, the Contractor shall notify the Engineer of so doing. Such insurance policies shall be consistent with the general terms agreed prior to the issue of the Letter of Acceptance. The Contractor shall effect all insurances for which he is responsible with insurers and in terms approved by the Employer.

Adequacy of Insurances

- 25.2 The Contractor shall notify the insurers of changes in the nature, extent or program for the execution of the Works and ensure the adequacy of the insurances at all times in accordance with the terms of the Contract and shall, when required, produce to the Employer the insurance policies in force and the receipts for payment of the current premiums.

Remedy on Contractor's Failure to Insure

- 25.3 If the Contractor fails to effect and keep in force any of the insurances required under the Contract, or fails to provide the policies to the Employer within the period required by Sub-Clause 25.1, then and in any such case the Employer may effect and keep

in force any such insurances and pay any premium as may be necessary for that purpose and from time to time deduct the amount so paid from any monies due or to become due to the Contractor, or recover the same as a debt due from the Contractor.

Compliance with Policy Conditions

- 25.4 In the event that the Contractor or the Employer fails to comply with conditions imposed by the insurance policies effected pursuant to the Contract, each shall indemnify the other against all losses and claims arising from such failure.

Compliance with Statutes, Regulations

- 26.1 The Contractor shall conform in all respects, including by the giving of all notices and the paying of all fees, with the provisions of:
- (a) any National or State Statute, Ordinance, or other Law, or any regulation, or bye-law of any local or other duly constituted authority in relation to the execution and completion of the Works and the remedying of any defects therein, and
 - (b) the rules and regulations of all public bodies and companies whose property or rights are affected or may be affected in any way by the Works, and the Contractor shall keep the Employer indemnified against all penalties and liability of every kind for breach of any such provisions. Provided always that the Employer shall be responsible for obtaining any planning, zoning or other similar permission required for the Works to proceed and shall indemnify the Contractor in accordance with Sub-Clause 22.3.

Fossil

- 27.1 All fossils, coins, articles of value or antiquity and structures and other remains or things of geological or archaeological interest discovered on the Site shall, as between the Employer and the Contractor, be deemed to be the absolute property of the Employer. The Contractor shall take reasonable precautions to prevent his workmen or any other persons from removing or damaging any such article or thing and shall, immediately upon discovery thereof and before removal, acquaint the Engineer of such discovery and carry out the Engineer's instructions for dealing with the same. If, by reason of such instructions, the Contractor suffers delay and/or incurs costs then the Engineer shall, after due consultation with the Employer and the Contractor, determine:
- (a) any extension of time to which the Contractor is entitled under Clause 44, and
 - (b) the amount of such costs, which shall be added to the Contract Price, and shall notify the Contractor accordingly, with a copy to the Employer.

Patent Rights

- 28.1 The Contractor shall save harmless and indemnify the Employer from and against all claims and proceedings for or on account of infringement of any patent rights, design trademark or name or other protected rights in respect of any Contractor's Equipment, materials or Plant used for or in connection with or for incorporation in the Works and from and against all damages, costs, charges and expenses

whatsoever in respect thereof or in relation thereto, except where such infringement results from compliance with the design or Specification provided by the Engineer.

Royalties

- 28.2 Except where otherwise stated, the Contractor shall pay all tonnage and other royalties, rent and other payments or compensation, if any, for getting stone, sand, gravel, clay or other materials required for the Works.

Interference with Traffic and Adjoining Properties

- 29.1 All operations necessary for the execution and completion of the Works and the remedying of any defects therein shall, so far as compliance with the requirements of the Contract permits, be carried on so as not to interfere unnecessarily or improperly with:
- (a) the convenience of the public, or
 - (b) the access to, use and occupation of public or private roads and footpaths to or of properties whether in the possession of the Employer or of any other person. The Contractor shall save harmless and indemnify the Employer in respect of all claims, proceedings, damages, costs, charges and expenses whatsoever arising out of, or in relation to, any such matters insofar as the Contractor is responsible therefore.

Avoidance of Damage to Roads

- 30.1 The Contractor shall use every reasonable means to prevent any of the roads or bridges communicating with or on the routes to the Site from being damaged or injured by any traffic of the Contractor or any of his Subcontractors and, in particular, shall select routes, choose and use vehicles and restrict and distribute loads so that any such extraordinary traffic as will inevitably arise from the moving of materials, Plant, Contractor's Equipment or Temporary Works from and to the Site shall be limited, as far as reasonably possible, and so that no unnecessary damage or injury may be occasioned to such roads and bridges.

Transport of Contractor's Equipment or Temporary Works

- 30.2 Save insofar as the Contract otherwise provides, the Contractor shall be responsible for and shall pay the cost of strengthening any bridges or altering or improving any road communicating with or on the routes to the Site to facilitate the movement of Contractor's Equipment or Temporary Works and the Contractor shall indemnify and keep indemnified the Employer against all claims for damage to any such road or bridge caused by such movement, including such claims as may be made directly against the Employer, and shall negotiate and pay all claims arising solely out of such damage.

Transport of Materials or Plant

- 30.3 If, notwithstanding Sub-Clause 30.1, any damage occurs to any bridge or road communicating with or on the routes to the Site arising from the transport of materials or Plant, the Contractor shall notify the Engineer with a copy to the Employer, as soon as he becomes aware of such damage or as soon as he receives any claim

from the authority entitled to make such claim. Where under any law or regulation the hauler of such materials or Plant is required to indemnify the road authority against damage the Employer shall not be liable for any costs, charges or expenses in respect thereof or in relation thereto. In other cases the Employer shall negotiate the settlement of and pay all sums due in respect of such claim and shall indemnify the Contractor in respect thereof and in respect of all claims, proceedings damages, costs, charges and expenses in relation thereto. Provided that if and so far as any such claim or part thereof is, in the opinion of the Engineer, due to any failure on the part of the Contractor to observe and perform his obligations under Sub-Clause 30.1, then the amount determined by the Engineer, after due consultation with the Employer and the Contractor, to be due to such failure shall be recoverable from the Contractor by the Employer and may be deducted by the Employer from any monies due or to become due to the Contractor and the Engineer shall notify the Contractor accordingly, with a copy to the Employer. Provided also that the Employer shall notify the Contractor whenever a settlement is to be negotiated and, where any amount may be due from the Contractor, the Employer shall consult with the Contractor before such settlement is agreed.

Waterborne Traffic

- 30.4 Where the nature of the Works is such as to require the use by the Contractor of waterborne transport the foregoing provisions of this Clause shall be construed as though "road" included a lock, dock, sea wall or other structure related to a waterway and "vehicle" included craft, and shall have effect accordingly.

Opportunities for Other Contractors

- 31.1 The Contractor shall, in accordance with the requirements of the Engineer, afford all reasonable opportunities for carrying out their work to:
- (a) any other contractors employed by the Employer and their workmen,
 - (b) the workmen of the Employer, and
 - (c) the workmen of any duly constituted authorities who may be employed in the execution on or near the Site of any work not included in the Contract or of any contract which the Employer may enter into in connection with or ancillary to the Works.

Facilities for Other Contractors

- 31.2 If, however, pursuant to Sub-Clause 31.1 the Contractor shall, on the written request of the Engineer:
- (a) make available to any other contractor, or to the Employer or any such authority, any roads or ways for the maintenance of which the Contractor is responsible,
 - (b) permit the use, by any such, of Temporary Works or Contractor's Equipment on the Site, or
 - (c) provide any other service of whatsoever nature for any such, the Engineer shall determine an addition to the Contract Price in accordance with Clause 52 and shall notify the Contractor accordingly, with a copy to the Employer.

Contractor to Keep Site Clear

- 32.1 During the execution of the Works the Contractor shall keep the Site reasonably free from all unnecessary obstruction and shall store or dispose of any Contractor's Equipment and surplus materials and clear away and remove from the Site any wreckage, rubbish or Temporary Works no longer required.

Clearance of Site on Completion

- 33.1 Upon the issue of any Taking-Over Certificate the Contractor shall clear away and remove from that part of the Site to which such Taking-Over Certificate relates all Contractor's Equipment, surplus materials, rubbish and Temporary Works of every kind, and leave such part of the Site and Works clean and in a workmanlike condition to the satisfaction of the Engineer. Provided that the Contractor shall be entitled to retain on Site, until the end of the Defects Liability Period, such materials, Contractor's Equipment and Temporary Works as are required by him for the purpose of fulfilling his obligations during the Defects Liability Period.

LABOUR**Engagement of Staffs and Labour**

- 34.1 The Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all staff and labour, local or other, and for their payment, housing, feeding and transport.

Returns of Labour and Contractor's Equipment

- 35.1 The Contractor shall, if required by the Engineer, deliver to the Engineer a return in detail, in such form and at such intervals as the Engineer may prescribe, showing the staff and the numbers of the several classes of labour from time to time employed by the Contractor on the Site and such information respecting Contractor's Equipment as the Engineer may require.

MATERIALS, PLANT AND WORKMANSHIP**Quality of Materials, Plant and Workmanship**

- 36.1 All materials, Plant and workmanship shall be:
- (a) of the respective kinds described in the Contract and in accordance with the Engineer's instructions, and.
 - (b) subjected from time to time to such tests as the Engineer may require at the place of manufacture, fabrication or preparation, or on the Site or at such other place or places as may be specified in the Contract, or at all or any of such places. The Contractor shall provide such assistance, labour, electricity, fuels, stores, apparatus and instruments as are normally required for examining, measuring and testing any materials or Plant and shall supply samples of materials, before incorporation in the Works, for testing as may be selected and required by the Engineer.

Cost of Samples

- 36.2 All samples shall be supplied by the Contractor at his own cost if the supply thereof is clearly intended by or provided for in the Contract.

Cost of Tests

- 36.3 The cost of making any test shall be borne by the Contractor if such test is:
- (a) clearly intended by or provided for in the Contract, or
 - (b) particularized in the Contract (in cases only for a test under load or of a test to ascertain whether the design of any finished or partially finished work is appropriate for the purposes which it was intended to fulfill) in sufficient detail to enable the Contractor to price or allow for the same in his Tender.

Cost of Tests not provided for

- 36.4 If any test required by the Engineer which is?
- (a) Not intended by or provided for,
 - (b) (In the cases above mentioned) not so particularized, or
 - (c) (through so intended or provided for) required by the Engineer to be carried out at any place other than the Site or the place of manufacture, fabrication or preparation of the materials or Plant tested, shows the materials, Plant or workmanship not to be in accordance with the provisions of the Contract to the satisfaction of the Engineer, then the cost of such test shall be borne by the Contractor, but in any other case Sub-Clause 36.5 shall apply.

Engineer's Determination where Tests not Provided for

- 36.5 Where, pursuant to Sub-Clause 36.4, this Sub-Clause applies the Engineer shall, after due consultation with the Employer and the Contractor, determine:
- (a) any extension of time of which the Contractor is entitled under Clause 44, and
 - (b) the amount of such costs, which shall be added to the Contract Price, and shall notify the Contractor accordingly, with a copy to the Employer.

Inspection of Operations

- 37.1 The Engineer, and any person Authorized by him, shall at all reasonable times have access to the Site and to all workshops and places where materials or Plant are being manufactured, fabricated or prepared for the Works and the Contractor shall afford every facility for and every assistance in obtaining the right to such access.

Inspection and Testing

- 37.2 The Engineer shall be entitled, during manufacture, fabrication or preparation to inspect and test the materials and Plant to be supplied under the Contract. If materials or Plant are being manufactured, fabricated or prepared in workshops or places other than those of the Contractor, the Contractor shall obtain permission for the Engineer to carry out such inspection and testing in those workshops or places. Such inspection or testing shall not release the Contractor from any obligation under the Contract.

Dates for Inspection and Testing

- 37.3 The Contractor shall agree with the Engineer on the time and place for the inspection or testing of any materials or Plant as provided in the Contract. The Engineer shall give the Contractor not less than 24 hours notice of his intention to carry out the inspection or to attend the tests. If the Engineer, or his duly Authorized representative, does not attend on the date agreed, the Contractor may, unless otherwise instructed by the Engineer, proceed with the tests, which shall be deemed to have been made in the presence of the Engineer. The Contractor shall forthwith forward to the Engineer duly certified copies of the tests readings. If the Engineer has not attended the tests, he shall accept the said readings as accurate.

Rejection

- 37.4 If, at the time and place agreed in accordance with Sub-Clause 37.3, the materials or Plant are not ready for inspection or testing or if, as a result of the inspection or testing referred to in this Clause, the Engineer determines that the materials or Plant are defective or otherwise not in accordance with the Contract, he may reject the materials or Plant and shall notify the Contractor thereof immediately. The notice shall state the Engineer's objections with reasons. The Contractor shall then promptly make good the defect or ensure that rejected materials or Plant comply with the Contract. If the Engineer so requests, the tests of rejected materials or Plant shall be made or repeated under the same terms and conditions. All costs incurred by the Employer by the repetition of the test shall after due consultation with the Employer and the Contractor, be determined by the Engineer and shall be recoverable from the Contractor by the Employer and may be deducted from any monies due or to become due to the Contractor and the Engineer shall notify the Contractor accordingly, with a copy to the Employer.

Independent Inspection

- 37.5 The Engineer may delegate inspection and testing of materials or Plant to an independent inspector. Any such delegation shall be effected in accordance with Sub-Clause 2.4 and for this purpose such independent inspector shall be considered as an assistant of the Engineer. Notice of such appointment (not being less than 14 days) shall be given by the Engineer to the Contractor.

Examination of Work before Covering up

- 38.1 No part of the works shall be covered up or put out of view without the approval of the Engineer and the Contractor shall afford full opportunity for the Engineer to examine and measure any such part of the Works which is about to be covered up or put out of view and to examine foundations before any part of the Works is placed thereon. The Contractor shall give notice to the Engineer whenever any such part of the Works or foundations is or are ready or about to be ready for examination and the Engineer shall, without unreasonable delay, unless he considers it unnecessary and advises the Contractor accordingly, attend for the purpose of examining and measuring such part of the Works or of examining such foundations.

Uncovering and Making Openings

- 38.2 The Contractor shall uncover any part of the Works or make openings in or through the same as the Engineer may from time to time instruct and shall reinstate and make good such part. If any such part has been covered up or put out of view after compliance with the requirement of Sub-Clause 38.1 and is found to be executed in accordance with the Contract, the Engineer shall, after due consultation with the Employer and the Contractor, determine the amount the Contractor's costs in respect of such of uncovering, making openings in or through, reinstating and making good the same, which shall be added to the Contract Price, and shall notify the Contractor accordingly, with a copy to the Employer. In any other case all costs shall be borne by the Contractor.

Removal of Improper Work, Materials or Plant

- 39.1 The Engineer shall have authority to issue instructions from time to time, for:
- (a) the removal from the Site, within such time or times as may be specified in the instruction, of any materials or Plant which, in the opinion of the Engineer, are not in accordance with the Contract,
 - (b) the substitution of proper and suitable materials or Plant, and
 - (c) the removal and proper re-execution, notwithstanding any previous test thereof or interim payment therefore, of any work which, in respect of
 - (i) materials, Plant or workmanship, or
 - (ii) design by the Contractor or for which he is responsible, is not, in the opinion of the Engineer, in accordance with the Contract.

Default of Contractor in Compliance

- 39.2 In case of default on the part of Contractor in carrying out such instruction within the time specified therein or, if none, within a reasonable time, the Employer shall be entitled to employ and pay other persons to carry out the same and all costs consequent thereon or incidental thereto shall, after due consultation with the Employer and the Contractor, be determined by the Engineer and shall be recoverable from the Contractor by the Employer, and may be deducted by the Employer from any monies due or to become due to the Contractor and the Engineer shall notify the Contractor accordingly, with a copy to the Employer.

SUSPENSION

Suspension of Work

- 40.1 The Contractor shall, on the instructions of the Engineer, suspend the progress of the Works or any part thereof for such time and in such manner as the Engineer may consider necessary and shall, during such suspension, properly protect and secure the Works or such part thereof so far as is necessary in the opinion of the Engineer. Unless such suspension is:
- (a) Otherwise provided for in the Contract,
 - (b) Necessary by reason of some default of or breach of contract by the Contractor or for which he is responsible,
 - (c) Necessary by reason of climatic conditions of the Site, or

- (d) Necessary for the proper execution of the Works or for the safety of the Works or any part thereof (save to the extent that such necessity arises from any act or default by the Engineer or the Employer or from any of the risks defined in Sub-Clause 20.4), Sub-Clause 40.2 shall apply.

Engineer's Determination following Suspension

- 40.2 Where, pursuant to Sub-Clause 40.1, this Sub-Clause applies the Engineer shall, after due consultation with the Employer and the Contractor, determine:
- (a) any extension of time to which the Contractor is entitled under Clause 44, and
 - (b) the amount, which shall be added to the Contract Price, in respect of the cost incurred by the Contractor by reason of such suspension, and shall notify the Contractor accordingly, with a copy to the Employer.

Suspension lasting more than 84 Days

- 40.3 If the progress of the Works or any part thereof is suspended on the written instructions of the Engineer and if permission to resume work is not given by the Engineer within a period for 84 days from the date of suspension then, unless such suspension is within paragraph (a), (b), (c) or (d) of Sub-Clause 40.1, the Contractor may give notice to the Engineer requiring permission, within 28 days from the receipt thereof, to proceed with the Works or that part thereof in regard to which progress is suspended. If, within the said time, such permission is not granted, the Contractor may, but is not bound to, elect to treat the suspension, where it affects part only of the Works, as an omission of such part under Clause 51 by giving a further notice to the Engineer to that effect, or, where it affects the whole of the Works, treat the suspension as an event of default by the Employer and terminates his employment under the Contract in accordance with the provisions of Sub-Clause 69.1, whereupon the provisions of Sub-Clause 69.2 and 69.3 shall apply.

COMMENCEMENT AND DELAYS

Commencement of Works

- 41.1 The Contractor shall commence the Works as soon as is reasonably possible after the receipt by him of notice to this effect from the Engineer, which notice shall be issued within the time stated in the Appendix to Tender after the date of the Letter of Acceptance. Thereafter, the Contractor shall proceed with the Works with due expedition and without delay.

Possession of Site and Access Thereto

- 42.1 Save insofar as the Contract may prescribe:
- (a) the extent of portions of the Site of which the Contractor is to be given possession from time to time,
 - (b) the order in which such portions shall be made available to the Contractor, and, subject to any requirement in the Contract as to the order in which the Works shall be executed, the Employer will, with the Engineer's notice to commence the Works, give to the Contractor possession of.
 - (c) so much of the Site, and

- (d) such access as, in accordance with the Contract, is to be provided by the Employer as may be required to enable the Contractor to commence and proceed with the execution of the Works in accordance with the program referred to in Clause 14, if any, and otherwise in accordance with such reasonable proposals as the Contractor shall, by notice to the Engineer with a copy to the Employer, make. The Employer will, from time to time as the Works proceed, give to the Contractor possession of such further portions of the Site as may be required to enable the Contractor to proceed with the execution of the Works with due dispatch in accordance with such program or proposals, as the case may be.

Failure to Give Possession

- 42.2 If the Contractor suffers delay and/or incurs costs from failure on the part of the Employer to give possession in accordance with the terms of Sub-Clause 42.1, the Engineer shall, after due consultation with the Employer and the Contractor, determine:
 - (a) any extension of time to which the Contractor is entitled under Clause 44, and
 - (b) the amount of such costs, which shall be added to the Contract Price, and shall notify the Contractor accordingly, with a copy to the Employer.

Rights of Way and Facilities

- 42.3 The Contractor shall bear all costs and charges for special or temporary way leaves required by him in connection with access to the Site. The Contractor shall also provide at his own cost any additional facilities outside the Site required by him for the purposes of the Works.

Time for Completion

- 43.1 The whole of the Works and, if applicable, any Section required to be completed within a particular time as stated in the Appendix to Tender, shall be completed, in accordance with the provisions of Clause 48, within the time stated in the Appendix to Tender for the whole of the Works or the Section (as the case may be), calculated from the Commencement Date, or such extended time as may be allowed under Clause 44.

Extension of Time for Completion

- 44.1 In the event of:
 - (a) The amount or nature of extra or additional work,
 - (b) Any cause of delay referred to in these Conditions,
 - (c) Exceptionally adverse climatic conditions,
 - (d) Any delay, impediment or prevention by the Employer, or
 - (e) other special circumstances which may occur, other than through a default of or breach of contract by the Contractor or for which he is responsible, being such as fairly to entitle the Contractor to an extension of the Time for Completion of the Works, or any Section or part thereof, the Engineer shall, after due consultation with the Employer and the Contractor, determine the

amount of such extension and shall notify the Contractor accordingly, with a copy to the Employer.

Contractor to Provide Notification and Detailed Particulars

- 44.2 Provided that the Engineer is not bound to make any determination unless the Contractor has
- (a) within 28 days after such event has first arisen notified the Engineer with a copy to the Employer, and
 - (b) within 28 days or such other reasonable time as may be agreed by the Engineer, after such notification submitted to the Engineer detailed particulars of any extension of time to which he may consider himself entitled in order that such submission may be investigated at the time.

Interim Determination of Extension

- 44.3 Provided also that where an event has a continuing effect such that it is not practicable for the Contractor to submit detailed particulars within the period of 28 days referred to in Sub-Clause 44.2(b), he shall nevertheless be entitled to an extension of time provided that he has submitted to the Engineer interim particulars at intervals of not more than 28 days and final particulars within 28 days of the end of the effects resulting from the event. On receipt of such interim particulars, the Engineer shall, without undue delay, make an interim determination of extension of time and, on receipt of the final particulars, the Engineer shall review all the circumstances and shall determine an overall extension of time in regard to the event. In both such cases the Engineer shall make his determination after due consultation with the Employer and the Contractor and shall notify the Contractor of the determination, with a copy to the Employer. No final review shall result in a decrease of any extension of time already determined by the Engineer.

Restriction on Working Hours

- 45.1 Subject to any provision to the contrary contained in the Contract, none of the Works shall, save as hereinafter provided, be carried on during the night or on locally recognized days of rest without the consent of the Engineer, except when work is unavoidable or absolutely necessary for the saving of life or property or for the safety of the Works, in which case the Contractor shall immediately advise the Engineer. Provided that the provisions of this Clause shall not be applicable in the case of any work which it is customary to carry out by multiple shifts.

Rate of Progress

- 46.1 If for any reason, which does not entitle the Contractor to an extension of time, the rate of progress of the Works or any Section is at any time, in the opinion of the Engineer, too slow to comply with the Time for Completion, the Engineer shall so notify the Contractor who shall thereupon take such steps as are necessary, subject to the consent of the Engineer, to expedite progress so as to comply with the Time for Completion. The Contractor shall not be entitled to any additional payment for taking such steps. If, as a result of any notice given by the Engineer under this Clause, the Contractor considers that it is necessary to do any work at night or on

locally recognized days of rest, he shall be entitled to seek the consent of the Engineer so to do. Provided that if any steps, taken by the Contractor in meeting his obligations under this Clause, involve the Employer in additional supervision costs, such cost shall, after due consultation with the Employer and the Contractor, be determined by the Engineer and shall be recoverable from the Contractor by the Employer, and may be deducted by the Employer from any monies due or to become due to the Contractor and the Engineer shall notify the Contractor accordingly, with a copy to the Employer.

Liquidated Damages for Delay

- 47.1 If the Contractor fails to comply with the Time for Completion in accordance with Clause 48, for the whole of the Works or, if applicable, any Section within the relevant time prescribed by Clause 43, then the Contractor shall pay to the Employer the relevant sum stated in the Appendix to Tender as liquidated damages for such default and not as a penalty (which sum shall be the only monies due from the Contractor for such default) for every day or part of a day which shall elapse between the relevant Time for Completion and the date stated in a Taking-Over Certificate of the whole of the Works or the relevant Section, subject to the applicable limit stated in the Appendix to Tender. The Employer may, without prejudice to any other method of recovery, deduct the amount of such damages from any monies due or to become due to the Contractor. The payment or deduction of such damages shall not relieve the Contractor from his obligation to complete the Works, or from any other of his obligations and liabilities under the Contract.

Reduction of Liquidated Damages

- 47.2 If, before the Time for Completion of the whole of the Works or, if applicable, any Section, a Taking-Over Certificate has been issued for any part of the Works or of a Section, the liquidated damages for delay in completion of the remainder of the Works or of that Section shall, for any period of delay after the date stated in such Taking-Over Certificate, and in the absence of Alternative provisions in the Contract, be reduced in the proportion which the value of the part so certified bears to the value of the whole of the Works or Section, as applicable. The provisions of this Sub-Clause shall only apply to the rate of liquidated damages and shall not affect the limit thereof.

Taking-Over Certificate

- 48.1 When the whole of the Works have been substantially completed and have satisfactorily passed any Tests on Completion prescribed by the Contract, the Contractor may give a notice to that effect to the Engineer with a copy to the Employer, accompanied by a written undertaking to finish with due expedition any outstanding work during the Defects Liability Period. Such notice and undertaking shall be deemed to be a request by the Contractor for the Engineer to issue a Taking-Over Certificate in respect of the Works. The Engineer shall within 21 days of the date of delivery of such notice, either issue to the Contractor, with a copy to the Employer, a Taking-Over Certificate, stating the date on which, in his opinion, the Works were substantially completed in accordance with the Contract, or give instructions in writing to the Contractor specifying all the work which, in the Engineer's

opinion, is required to be done by the Contractor before the issue of such Certificate. The Engineer shall also notify the Contractor of any defects in the Works affecting substantial completion that may appear after such instructions and before completion of the Works specified therein. The Contractor shall be entitled to receive such Taking-Over Certificate within 21 days of completion, to the satisfaction of the Engineer, of the Works so specified and remedying any defects so notified.

Taking Over of Sections or Parts

48.2 Similarly, in accordance with the procedure set out in Sub-Clause 48.1, the Contractor may request and the Engineer shall issue a Taking-Over Certificate in respect of:

- (a) any Section in respect of which a separate Time for Completion is provided in the Appendix to Tender,
- (b) any substantial part of the Permanent Works which has been both completed to the satisfaction of the Engineer and, otherwise than as provided for in the Contract, occupied or used by the Employer, or
- (c) any part of the Permanent Works which the Employer has elected to occupy or use prior to completion (where such prior occupation or use is not provided for in the Contract or has not been agreed by the Contractor as a temporary measure).

Substantial Completion of Parts

48.3 If any part of the Permanent Works has been substantially completed and has satisfactorily passed any Tests on Completion prescribed by the Contractor, the Engineer may issue a Taking-Over Certificate in respect of that part of the Permanent Works before completion of the whole of the Works and, upon the issue of such Certificate, the Contractor shall be deemed to have undertaken to complete with due expedition any outstanding work in that part of the Permanent Works during the Defects Liability Period.

Surfaces Requiring Reinstatement

48.4 Provided that a Taking-Over Certificate given in respect of any Section or part of the Permanent Works before completion of the whole of the Works shall not be deemed to certify completion of any ground or surfaces requiring reinstatement, unless such Taking-Over Certificate shall expressly so state.

DEFECTS LIABILITY

Defects Liability Period

49.1 In these Conditions the expression "Defects Liability Period" shall mean the defects liability period named in the Appendix to Tender, calculated from:

- (a) the date of completion of the Works certified by the Engineer in accordance with Clause 48, or
- (b) in the event of more than one certificate having issued by the Engineer under Clause 48, the respective dates so certified, and in relation to the Defects Liability Period the expression "the Works" shall be construed accordingly.

Completion of Outstanding Work and Remedying Defects

- 49.2 To the intent that the Works shall, at or as soon as practicable after the expiration of the Defects Liability Period, be delivered to the Employer in the condition required by the Contract, fair wear and tear excepted, to the satisfaction of the Engineer, the Contractor shall:
- (a) complete the work, if any, outstanding on the date stated in the Taking-Over Certificate as soon as practicable after such date, and
 - (b) execute all such work of amendment, reconstruction, and remedying defects, shrinkages or other faults as the Engineer may, during the Defects Liability Period or within 14 days after its expiration, as a result of an inspection made by or on behalf of the Engineer prior to its expiration, instruct the Contractor to execute.

Cost of Remedying Defects

- 49.3 All work referred to in Sub-Clause 49.2(b) shall be executed by the Contractor at his own cost if the necessity thereof is, in the opinion of the Engineer, due to:
- (a) the use of materials, Plant or workmanship not in accordance with the Contract,
 - (b) where the Contractor is responsible for the design of part of the Permanent Works, any fault in such design, or
 - (c) the neglect or failure on the part of the Contractor to comply with any obligation, expressed or implied, on the Contractor's part under the Contract.
- If, in the opinion of the Engineer, such necessity is due to any other cause, he shall determine an addition to the Contract Price in accordance with Clause 52 and shall notify the Contractor accordingly, with a copy to the Employer.

Contractor's Failure to Carry Out Instructions

- 49.4 In case of default on the part of the Contractor in carrying out such instruction within a reasonable time, the Employer shall be entitled to employ and pay other persons to carry out the same and if such work is work which, in the opinion of the Engineer, the Contractor was liable to do at his own cost under the Contract, then all cost consequent thereon or incidental thereto shall, after due consultation with the Employer and the Contractor, be determined by the Engineer and shall be recoverable from the Contractor by the Employer, and may be deducted by the Employer from any monies due or to become due to the Contractor and the Engineer shall notify the Contractor accordingly, with a copy to the Employer.

Contractor to Search

- 50.1 If any defect, shrinkage or other fault in the Works appears at any time prior to the end of the Defects Liability Period, the Engineer may instruct the Contractor, with a copy to the Employer, to search under the directions of the Engineer for the cause thereof. Unless such defect, shrinkage or other fault is one for which the Contractor is liable under the Contract, the Engineer shall, after due consultation with the Employer and the Contractor, determine the amount in respect of the costs of such search incurred by the Contractor, which shall be added to the Contract Price and shall notify the Contractor accordingly, with a copy to the Employer. If such defect,

shrinkage or other fault is one for which the Contractor is liable, the cost of the work carried out in searching as aforesaid shall be borne by the Contractor and he shall in such case remedy such defect, shrinkage or other fault at his own cost in accordance with the provisions of Clause 49.

ALTERATIONS, ADDITIONS AND OMISSIONS

Variations

- 51.1 The Engineer shall make any variation of the form, quality or quantity of the Works or any part thereof that may, in his opinion, be necessary and for that purpose, or if for any other reason it shall, in his opinion, be appropriate, he shall have the authority to instruct the Contractor to do and the Contractor shall do any of the following:
- (a) increase or decrease the quantity of any work included in the Contract,
 - (b) omit any such work (but not if the omitted work is to be carried out by the Employer or by another contractor),
 - (c) change the character or quality or kind of any such work,
 - (d) change the levels, lines, position and dimensions of any part of the Works,
 - (e) execute additional work of any kind necessary for the completion of the Works, or
 - (f) change any specified sequence or timing of construction of any part of the Works. No such variation shall in any way vitiate or invalidate the Contract, but the effect, if any, of all such variations shall be valued in accordance with Clause 52. Provided that where the issue of an instruction to vary the Works is necessitated by some default of or breach of contract by the Contractor or for which he is responsible, any additional cost attributable to such default shall be borne by the Contractor.

Instructions for Variations

- 51.2 The Contractor shall not make any such variation without an instruction of the Engineer. Provided that no instruction shall be required for increase or decrease in the quantity of any work where such increase or decrease is not the result of an instruction given under this Clause, but is the result of the quantities exceeding or being less than those stated in the Bill of Quantities.

Valuation of Variations

- 52.1 All variations referred to in Clause 51 and any additions to the Contract Price which are required to be determined in accordance with Clause 52 (for the purposes of this Clause referred to as "varied work"), shall be valued at the rates and prices set out in the Contract if, in the opinion of the Engineer, the same shall be applicable. If the Contract does not contain any rates or prices applicable to the varied work, the rates and prices in the Contract shall be used as the basis for valuation so far as may be reasonable, failing which, after due consultation by the Engineer with the Employer and the Contractor, suitable rates or prices shall be agreed upon between the Engineer and the Contractor. In the event of disagreement the Engineer shall fix such rates or prices as are, in his opinion, appropriate and shall notify the Contractor accordingly, with a copy to the Employer. Until such time as rates or prices are

agreed or fixed, the Engineer shall determine provisional rates or prices to enable on-account payments to be included in certificates issued in accordance with Clause 60.

Power of Engineer to Fix Rates

- 52.2 Provided that if the nature or amount of any varied work relative to the nature or amount of the whole of the Works or to any part thereof, is such that, in the opinion of the Engineer, the rate or price contained in the Contract for any item of the Works is, by reason of such varied work, rendered inappropriate or inapplicable, then, after due consultation by the Engineer with the Employer and the Contractor, a suitable rate or price shall be agreed upon between the Engineer and the Contractor. In the event of disagreement the Engineer shall fix such other rate or price as is, in his opinion, appropriate and shall notify the Contractor accordingly, with a copy to the Employer. Until such time as rates or prices are agreed or fixed, the Engineer shall determine provisional rates or prices to enable on-account payments to be included in certificates issued in accordance with Clause 60. Provided also that no varied work instructed to be done by the Engineer pursuant to Clause 51 shall be valued under Sub-Clause 52.1 or under this Sub- Clause unless, within 14 days of the date of such instruction and, other than in the case of omitted work, before the commencement of the varied work, notice shall have been given either:

- (a) by the Contractor to the Engineer of his intention to claim extra payment or a varied rate or price, or
- (b) by the Engineer to the Contractor of his intention to vary a rate or price.

Variations Exceeding 15 per cent

- 52.3 If, on the issue of the Taking-Over Certificate for the whole of the Works, it is found that as a result of:
- (a) all varied work valued under Sub-Clauses 52.1 and 52.2, and
 - (b) all adjustments upon measurement of the estimated quantities set out in the Bill of Quantities, excluding Provisional Sums, day works and adjustment of price made under Clause 70. but not from any other cause, there have been additions to or deductions from the Contract Price which taken together are in excess of 15 per cent of the "Effective Contract Price" (which for the purposes of this Sub-Clause shall mean the Contract Price, excluding Provisional Sums and allowance for day works, if any) then and in such event (subject to any action already taken under any other Sub-Clause of this Clause), after due consultation by the Engineer with the Employer and the Contractor, there shall be added to or deducted from the Contract Price such further sums as may be agreed between the Contractor and the Engineer or, failing agreement, determined by the Engineer having regard to the Contractor's Site and general overhead costs of the Contract. The Engineer shall notify the Contractor of any determination made under this Sub-Clause, with a copy to the Employer. Such sum shall be based only on the amount by which such additions or deductions shall be in excess of 15 per cent of the Effective Contract Price.

Day work

- 52.4 The Engineer may, if in his opinion it is necessary or desirable, issue an instruction that any varied work shall be executed on a day work basis. The Contractor shall then be paid for such varied work under the terms set out in the day work schedule included in the Contract and at the rates and prices affixed thereto by him in the Tender. The Contractor shall furnish to the Engineer such receipts or other vouchers as may be necessary to provide the amounts paid and, before ordering material, shall submit to the Engineer quotations for the same for his approval. In respect of such of the Works executed on a day work basis, the Contractor shall during the continuance of such work, deliver each day to the Engineer an exact list in duplicate of the names, occupation and time of all workmen employed on such work and a statement, also in duplicate, showing the description and quantity of all materials and Contractor's Equipment used thereon or therefore other than Contractor's Equipment which is included in the percentage addition in accordance with such day work schedule. One copy of each list and statement will, if correct, or when agreed, be signed by the Engineer and returned to the Contractor. At the end of each month the Contractor shall deliver to the Engineer a priced statement of the labour, materials and Contractor's Equipment, except as aforesaid, used and the Contractor shall not be entitled to any payment unless such lists and statements have been fully and punctually rendered. Provided always that if the Engineer considers that for any reason the sending of such lists or statements by the Contractor, in accordance with the foregoing provision, was impracticable he shall nevertheless be entitled to authorize payment for such work, either as day work, on being satisfied as to the time employed and the labour, materials and Contractor's Equipment used on such work, or at such value therefore as shall, in his opinion, be fair and reasonable.

PROCEDURE FOR CLAIMS**53.1 Notice of Claims**

Notwithstanding any other provision of the Contract, if the Contractor intends to claim any additional payment pursuant to any Clause of these Conditions or otherwise, he shall give notice of his intention to the Engineer with a copy to the Employer, within 28 days after the event giving rise to the claim has first arisen

Contemporary Records

- 53.2 Upon the happening of the event referred to in Sub-Clause 53.1, the Contractor shall keep such contemporary records as may reasonably be necessary to support any claim he may subsequently wish to make. Without necessarily admitting the Employer's liability, the Engineer shall, on receipt of a notice under Sub-Clause 53.1, inspect such contemporary records and may instruct the Contractor to keep any further contemporary records as are reasonable and may be material to the claim of which notice has been given. The Contractor shall permit the Engineer to inspect all records kept pursuant to this Sub-Clause and shall supply him with copies thereof as and when the Engineer so instructs.

Substantiation of Claims

- 53.3 Within 28 days, or such other reasonable time as may be agreed by the Engineer, of giving notice under Sub-Clause 53.1, the Contractor shall send to the Engineer an account giving detailed particulars of the amount claimed and the grounds upon which the claim is based. Where the event giving rise to the claim has a continuing effect, such account shall be considered to be an interim account and the Contractor shall, at such intervals as the Engineer may reasonably require, send further interim accounts giving the accumulated amount of the claim and any further grounds upon which it is based. In cases where interim accounts are sent to the Engineer, the Contractor shall send a final account within 28 days of the end of the effects resulting from the event. The Contractor shall, if required by the Engineer so to do, copy to the Employer all accounts sent to the Engineer pursuant to this Sub-Clause. (116)

Failure to Comply

- 53.4 If the Contractor fails to comply with any of the provisions of this Clause in respect of any claim which he seeks to make, his entitlement to payment in respect thereof shall not exceed such amount as the Engineer or any arbitrator or arbitrators appointed pursuant to Sub-Clause 67.3 assessing the claim considers to be verified by contemporary records (whether or not such records were brought to the Engineer's notice as required under Sub-Clause 53.2 and 53.3).

Payment of Claims

- 53.5.1 The Contractor shall be entitled to have included in any interim payment certified by the Engineer pursuant to Clause 60 such amount in respect of any claim as the Engineer, after due consultation with the Employer and the Contractor, may consider due to the Contractor provided that the Contractor has supplied sufficient particulars to enable the Engineer to determine the amount due. If such particulars are insufficient to substantiate the whole of the claim, the Contractor shall be entitled to payment in respect of such part of the claim as such particulars may substantiate to the satisfaction of the Engineer. The Engineer shall notify the Contractor of any determination made under this Sub-Clause, with a copy to the Employer.

CONTRACTOR'S EQUIPMENT, TEMPORARY WORKS AND MATERIALS

Contractor's Equipment, Temporary Works and Materials; Exclusive Use for the Works

- 54.1 All Contractor's Equipment, Temporary Works and materials provided by the Contractor shall, when brought on to the Site, be deemed to be exclusively intended for the execution of the Works and the Contractor shall not remove the same or any part thereof, except for the purpose of moving it from one part of the Site to another, without the consent of the Engineer. Provided that consent shall not be required for vehicles engaged in transporting any staff, labour, Contractor's Equipment, Temporary Works, Plant or materials to or from the Site.

Employer not Liable for Damage

- 54.2 The Employer shall not at any time be liable, save as mentioned in Clauses 20 and 65, for the loss of or damage to any of the said Contractor's Equipment, Temporary Works or materials.

Customs Clearance

- 54.3 The Employer will use his best endeavors in assisting the Contractor, where required, in obtaining clearance through the Customs of Contractor's Equipment, materials and other things required for the Works.

Re-export of Contractor's Equipment

- 54.4 In respect of any Contractor's Equipment which the Contractor has imported for the purposes of the Works, the Employer will use his best endeavors to assist the Contractor, where required, in procuring any necessary Government consent to the re-export of such Contractor's Equipment by the Contractor upon the removal thereof pursuant to the terms of Contract.

Conditions of Hire of Contractor's Equipment

- 54.5 With a view to securing, in the event of termination under Clause 63, the continued availability, for the purpose of executing the Works, of any hired Contractor's Equipment, the Contractor shall not bring on to the Site any hired Contractor's Equipment unless there is an agreement for hire thereof (which agreement shall be deemed not to include an agreement for hire purchase) which contains a provision that the owner thereof will, on request in writing made by the Employer within 7 days after the date on which any termination has become effective, and on the Employer undertaking to pay all hire charges in respect thereof from such date, hire such Contractor's Equipment to the Employer on the same terms in all respect as the same was hired to the Contractor save that the Employer shall be entitled to permit the use thereof by any other contractor employed by him for the purpose of execution and completing the Works and remedying any defects therein, under the terms of the said Clause 63.

Costs for the Purpose of Clause 63

- 54.6 In the event of the Employer entering into any agreement for the hire of Contractor's Equipment pursuant to Sub-Clause 54.5, all sums properly paid by the Employer under the provision of any such agreement and all costs incurred by him (including stamp duties) in entering into such agreement shall be deemed, for the purpose of Clause 63, to be part of the cost of executing and completing the Works and the remedying of any defects therein.

Incorporation of Clause in Subcontracts

- 54.7 The Contractor shall, where entering into any subcontract for the execution of any part of the Works, incorporate in such subcontract (by reference or otherwise) the provisions of this Clause in relation to Contractor's Equipment, Temporary Works or materials brought on to the Site by the Subcontractor.

Approval of Materials not Implied

- 54.8 The operation of this Clause shall not be deemed to imply any approval by the Engineer of the materials or other matters referred to therein nor shall it (118) prevent the rejection of any such materials at any time by the Engineer.

MEASUREMENT**Quantities**

- 55.1 The quantities set out in the Bill of Quantities are the estimated quantities for the Works, and they are not to be taken as the actual and correct quantities of the Works to be executed by the Contractor in fulfillment of his obligations under the Contract.

Works to be Measured

- 56.1 The Engineer shall, except as otherwise stated, ascertain and determine by measurement the value of the Works in accordance with the Contract and the Contractor shall be paid that value in accordance with Clause 60. The Engineer shall, when he requires any part of the Works to be measured, give reasonable notice to the Contractor's Authorized agent, who shall:
- (a) forthwith attend or send a qualified representative to assist the Engineer in making such measurement, and
 - (b) supply all particulars required by the Engineer. Should the Contractor not attend, or neglect or omit to send such representative, then the measurement made by the Engineer or approved by him shall be taken to be the correct measurement of such part of the Works. For the purpose of measuring such Permanent Works as are to be measured by records and drawings, the Engineer shall prepare records and drawings as the work proceeds and the Contractor, as and when called upon to do so in writing, shall, within 14 days, attend to examine and agree such records and drawings with the Engineer and shall sign the same when so agreed. If the Contractor does not attend to examine and agree such records and drawings, they shall be taken to be correct. If, after examination of such records and drawings, the Contractor does not agree the same or does not sign the same as agreed, they shall nevertheless be taken to be correct, unless the Contractor, within 14 days of such examination, lodges with the Engineer notice of the respects in which such records and drawings are claimed by him to be incorrect. On receipt of such notice, the Engineer shall review the records and drawings and either confirm or vary them.

Method of Measurement

- 57.1 The Works shall be measured net, notwithstanding any general or local custom, except where otherwise provided for in the Contract.

Breakdown of Lump Sum Items

- 57.2 For the purposes of statements submitted in accordance with Sub-Clause 60.1, the Contractor shall submit to the Engineer, within 28 days after the receipt of the Letter

of Acceptance, a breakdown for each of the lump sum items contained in the Tender. Such breakdowns shall be subject to the approval of the Engineer.

PROVISIONAL SUMS

Definition of "Provisional Sum"

- 58.1 "Provisional Sum" means a sum included in the Contract and so designated in the Bill of Quantities for the execution of any part of the Works or for the supply of goods, materials, Plant or services, or for contingencies, which sum may be used, in whole or in part, or not at all, on the instructions of the Engineer. The Contractor shall be entitled to only such amounts in respect of the work, supply or contingencies to which such Provisional Sums relate as the Engineer shall determine in accordance with this Clause. The Engineer shall notify the Contractor of any determination made under this Sub-Clause, with a copy to the Employer.

Use of Provisional Sums

- 58.2 In respect of every Provisional Sum the Engineer shall have authority to issue instructions for the execution of work or for the supply of goods, material, Plant or services by:
- (a) the Contractor, in which case the Contractor shall be entitled to an amount equal to the value thereof determined in accordance with Clause 52, and
 - (b) a nominated Subcontractor, as hereinafter defined, in which case the sum to be paid to the Contractor therefore shall be determined and paid in accordance with Sub-Clause 59.4.

58.3 Production of Vouchers

The Contractor shall produce to the Engineer all quotations, invoices, vouchers and accounts or receipts in connection with expenditure in respect of Provisional Sums, except where work is valued in accordance with rates or prices set out in the Tender.

NOMINATED SUBCONTRACTORS

Definition of "Nominated Subcontractors"

- 59.1 All specialists, merchants, tradesmen and others executing any work or supplying any goods, materials, Plant or services for which Provisional Sums are included in the Contract, who may have been or be nominated or selected or approved by the Employer or the Engineer, and all persons to whom by virtue of the provisions of the Contract the Contractor is required to subcontract shall, in the execution of such work or the supply of such goods, materials, Plant or services, be deemed to be subcontractors to the Contractor and are referred to in this Contract as "nominated Subcontractors".

Nominated Subcontractors; Objection to Nomination

- 59.2 The Contractor shall not be required by the Employer or the Engineer, or be deemed to be under any obligation, to employ any nominated Subcontractor against whom

the Contractor may raise reasonable objection, or who declines to enter into subcontract with the Contractor containing provisions:

- (a) that in respect of the work, goods, materials, Plant or services the subject of the subcontract, the nominated Subcontractor will undertake towards the Contractor such obligations and liabilities as will enable the Contractor to discharge his own obligations and liabilities towards the Employer under the terms of the Contract and will save harmless and indemnify the Contractor from and against the same and from all claims, proceedings, damages, costs, charges and expenses whatsoever arising out of or in connection therewith, or arising out of or in connection with any failure to perform such obligations or to fulfill such liabilities, and
- (b) that the nominated Subcontractor will save harmless and indemnify the Contractor from and against any negligence by the nominated Subcontractor, his agents, workmen and servants and from and against any misuse by him or them of any Temporary Works provided by the Contractor for the purposes of the Contract and from all claims as aforesaid.

Design Requirements to be Expressly Stated

- 59.3 If in connection with any Provisional Sum the services to be provided include any matter of design or specification of any part of the Permanent Works or of any Plant to be incorporated therein, such requirement shall be expressly stated in the Contract and shall be included in any nominated Subcontract. The nominated Subcontract shall specify that the nominated Subcontractor providing such services will save harmless and indemnify the Contractor from and against the same and from all claims, proceedings, damages, costs, charges and expenses whatsoever arising out of or in connection with any failure to perform such obligations or to fulfill such liabilities.

Payments to Nominated Subcontractors

- 59.4 For all work executed or goods, materials, Plant or services supplied by any nominated Subcontractor, the Contractor shall be entitled to:
- (a) The actual price paid or due to be paid by the Contractor, on the instructions of the Engineer, and in accordance with the subcontract;
 - (b) in respect of labour supplied by the Contractor, the sum, if any, entered in the Bill of Quantities or, if instructed by the Engineer pursuant to paragraph (a) of Sub-Clause 58.2, as may be determined in accordance with Clause 52; and
 - (c) in respect of all other charges and profit, a sum being a percentage rate of the actual price paid or due to be paid calculated, where provision has been made in the Bill of Quantities for a rate to be set against the relevant Provisional Sum, at the rate inserted by the Contractor against that item or, where no such provision has been made, at the rate inserted by the Contractor in the Appendix to Tender and repeated where provision for such is made in a special item provided in the Bill of Quantities for such purpose.

Certification of Payments to Nominated Subcontractors

- 59.5 Before issuing, under Clause 60 any certificate, which includes any payment in respect of work done or goods, materials, Plant or services supplied by any nominated Subcontractor, the Engineer shall be entitled to demand from the Contractor reasonable proof that all payments, less retentions, included in previous certificates in respect of the work or goods, materials, Plant or services of such nominated Subcontractor have been paid or discharged by the Contractor. If the Contractor fails to supply such proof then, unless the Contractor:
- (a) satisfies the Engineer in writing that he has reasonable cause for withholding or refusing to make such payment, and
 - (b) produces to the Engineer reasonable proof that he has so informed such nominated Subcontractor in writing, the Employer shall be entitled to pay to such nominated Subcontractor direct, upon the certificate of the Engineer, all payments, less retention, provided for in the nominated Subcontract, which the Contractor has failed to make to such nominated Subcontractor and to deduct by way of set-off the amount so paid by the Employer from any sums due or to become due from the Employer to the Contractor. Provided that, where the Engineer has certified and the Employer has paid direct as aforesaid, the Engineer shall in issuing any further certificate in favour of the Contractor, deduct from the amount thereof the amount so paid, direct as aforesaid, but shall not withhold or delay the issue of the certificate itself when due to be issued under the terms of the Contract.

CERTIFICATES AND PAYMENT

Monthly Statements

- 60.1 The Contractor shall submit to the Engineer after the end of each month six copies, each signed by the Contractor's representative approved by the Engineer in accordance with the Sub-Clause 15.1, of a statement, in such form as the Engineer may from time to time prescribe, showing the amounts to which the Contractor considers himself to be entitled up to the end of the month in respect of:
- (a) the value of the Permanent Works executed,
 - (b) any other items in the Bill of Quantities including those for Contractor's Equipment, Temporary Works, day works and the like,
 - (c) the percentage of the invoice value of listed materials, all as stated in the Appendix to Tender, and Plant delivered by the Contractor on the Site for incorporation in the Permanent Works but not incorporated in such Works,
 - (d) adjustments under Clause 70, and
 - (e) any other sum to which the Contractor may be entitled under the Contract or otherwise.

Monthly Payments

- 60.2 The Engineer shall, within 28 days of receiving such statement, certify to the Employer the amount of payment to the Contractor which he considers due and payable in respect thereof, subject:

- (a) firstly, to the retention of the account calculated by applying the Percentage of Retention stated in the Appendix to Tender, to the amount to which the Contractor is entitled under paragraph (a), (b), (c) and (e) of Sub-Clause 60.1 until the amount so retained reaches the Limit of Retention Money stated in the Appendix to Tender, and
- (b) secondly, to the deduction, other than pursuant to Clause 47, of any sums which may have become due and payable by the Contractor to the Employer. Provided that the Engineer shall not be bound to certify any payment under this Sub-Clause if the net amount thereof, after all retentions and deductions, would be less than the Minimum Amount of Interim Payment Certificates stated in the Appendix to Tender. Notwithstanding the terms of this Clause or any other Clause of the Contract no amount will be certified by the Engineer for payment until the performance security, if required under the Contract, has been provided by the Contractor and approved by the Employer.

Payment of Retention Money

- 60.3 (a) Upon the issue of the Taking-Over Certificate with respect to the whole of the Works, one half of the Retention Money, or upon the issue of a Taking-Over Certificate with respect to a Section or part of the Permanent Works only such proportion thereof as the Engineer determines having regard to the relative value of such Section or part of the Permanent Works, shall be certified by the Engineer for payment to the Contractor.
- (b) Upon the expiration of the Defects Liability Period for the Works the other half of the Retention Money shall be certified by the Engineer for payment to the Contractor. Provided that, in the event of different Defects Liability Periods having become applicable to different Sections or part of the Permanent Works pursuant to Clause 48, the expression "expiration of the Defects Liability Period" shall, for the purposes of this Sub-Clause, be deemed to mean the expiration of the latest of such periods. Provided also that if at such time, there shall remain to be executed by the Contractor any work instructed, pursuant to Clause 49 and 50, in respect of the Works, the Engineer shall be entitled to withhold certification until completion of such work of so much of the balance of the Retention Money as shall, in the opinion of the Engineer, represent the cost of the work remaining to be executed.

Correction of Certificates

- 60.4 The Engineer may by any Interim Payment Certificate make any correction or modification in any previous certificate which shall have been issued by him and shall have authority, if any work is not being carried out to his satisfaction, to omit or reduce the value of such work in any Interim Payment Certificate.

Statement at Completion

- 60.5 Not later than 84 days after the issue of the Taking-Over Certificate in respect of the whole of the Works, the Contractor shall submit to the Engineer a Statement at Completion with supporting documents showing in detail, in the form approved by the Engineer:

- (a) the final value of all work done in accordance with the Contract up to the date stated in such Taking-Over Certificate,
- (b) any further sums which the Contractor considers to be due, and
- (c) an estimate of amounts which the Contractor considers will become due to him under the Contract. The estimated amounts shall be shown separately in such Statement at Completion. The Engineer shall verify payment in accordance with Sub- Clause 60.2.

Final Statement

60.6 Not later than 56 days after the issue of the Defects Liability Certificate pursuant to Sub-Clause 62.1, the Contractor shall submit to the Engineer for consideration a draft final statement with supporting documents showing in detail, in the form approved by the Engineer:

- (a) the value of all work done in accordance with the Contract, and
- (b) any further sums which the Contractor considers to be due to him under the Contract. If the Engineer disagrees with or cannot verify any part of the draft final statement, the Contractor shall submit such further information as the Engineer may reasonably require and shall make such changes in the draft as may be agreed between them. The Contractor shall then prepare and submit to the Engineer the final statement as agreed (for the purposes of these Conditions referred to as the "Final Statement"). If, following discussions between the Engineer and the Contractor and any changes to the draft final statement which may be agreed between them, it becomes evident that a dispute exists, the Engineer shall deliver to the Employer an Interim Payment Certificate for those parts of the draft final statement, if any, which are not in dispute. The dispute may then be settled in accordance with Clause 67.

Discharge

60.7 Upon submission of the Final Statement, the Contractor shall give to the Employer, with a copy to the Engineer, a written discharge confirming that the total of the Final Statement represents full and final settlement of all monies due to the Contractor arising out of or in respect of the Contract. Provided that such discharge shall become effective only after payment due under the Final Payment Certificate issued pursuant to Sub-Clause 60.8 has been made and the performance security referred to in Sub-Clause 10.1, if any, has been returned to the Contractor.

Final Payment Certificate

60.8 Within 28 days after receipt of the Final Statement, and the written discharge, the Engineer shall issue to the Employer (with a copy to the Contractor) a Final Payment Certificate stating:

- (a) the amount which, in the opinion of the Engineer, is finally due under the Contract or otherwise, and
- (b) after giving credit to the Employer for all amounts previously paid by the Employer and for all sums to which the Employer is entitled other than under Clause 47, the balance, if any, due from the Employer to the Contractor or from the Contractor to the Employer as the case may be.

Cessation of Employer's Liability

- 60.9 The Employer shall not be liable to the Contractor for any matter or thing arising out of or in connection with the Contract or execution of the Works, unless the Contractor shall have included a claim in respect thereof in his Final Statement and (except in respect of matters or things arising after the issue of the Taking-Over Certificate in respect of the whole of the Works) in the Statement at Completion referred to in Sub-Clause 60.5.

Time for Payment

- 60.10 The amount due to the Contractor under any Interim Payment Certificate issued by the Engineer pursuant to this Clause, or to any other term of the Contract, shall, subject to Clause 47, be paid by the Employer to the Contractor within 28 days after such Interim Payment Certificate has been delivered to the Employer, or, in the case of the Final Payment Certificate referred to in Sub-Clause 60.8, within 56 days, after such Final Payment Certificate has been delivered to the Employer. In the event of the failure of the Employer to make payment within the times stated, the Employer shall pay to the Contractor interest at the rate stated in the Appendix to Tender upon all sums unpaid from the date by which the same should have been paid. The provisions of this Sub-Clause are without prejudice to the Contractor's entitlement under Clause 69 or otherwise.

Approval only by Defects Liability Certificate

- 61.1 Only the Defects Liability Certificate, referred to in Clause 62, shall be deemed to constitute approval of the Works.

Defects Liability Certificate

- 62.1 The Contract shall not be considered as completed until a Defects Liability Certificate shall have been signed by the Engineer and delivered to the Employer, with a copy to the Contractor, stating the date on which the Contractor shall have completed his obligations to execute and complete the Works and remedy any defects therein to the Engineer's satisfaction. The Defects Liability Certificate shall be given by the Engineer within 28 days after the expiration of the Defects Liability Period, or, if different defects liability periods shall become applicable to different Sections or parts of the Permanent Works, the expiration of the latest such period, or as soon thereafter as any works instructed, pursuant to Clause 49 and 50, have been completed to the satisfaction of the Engineer. Provided that the issue of the Defects Liability Certificate shall not be a condition precedent to payment to the Contractor of the second portion of the Retention Money in accordance with the conditions set out in Sub-Clause 60.3.

Unfulfilled Obligations

- 62.2 Notwithstanding the issue of the Defects Liability Certificate the Contractor and the Employer shall remain liable for the fulfillment of any obligation incurred under the provisions of the Contract prior to the issue of the Defects Liability Certificate which remains unperformed at the time of such Defects Liability Certificate is issued and,

for the purposes of determining the nature and extent of any such obligation, the Contract shall be deemed to remain in force between the parties to the Contract.

REMEDIES

Default of Contractor

63.1 If the Contractor is deemed by law unable to pay his debts as they fall due, or enters into voluntary or involuntary bankruptcy, liquidation or dissolution (other than a voluntary liquidation for the purposes of amalgamation or reconstruction), or becomes insolvent, or makes an arrangement with, or assignment in favour of, his creditors, or agrees to carry out the Contract under a committee of inspection of his creditors, or if a receiver, administrator, trustee or liquidator is appointed over any substantial part of his assets, or if, under any law or regulation relating to reorganization, arrangement or readjustment of debts, proceedings are commenced against the Contractor or resolutions passed in connection with dissolution or liquidation or if any steps are taken to enforce any security interest over a substantial part of the assets of the Contractor, or if any act is done or event occurs with respect to the Contractor or his assets which, under any applicable law has a substantially similar effect to any of the foregoing acts or events, or if the Contractor has contravened Sub-Clause 3.1, or has an execution levied on his goods, or Contract, if the Engineer certifies to the Employer, with a copy to the Contractor, that, in his opinion, the Contractor:

- (a) has repudiated the Contract, or
- (b) without reasonable excuse has failed
 - (i) to commence the Works in accordance with Sub-Clause 41.1,
 - (ii) to proceed with the Works, or any Section thereof, within 28 days after receiving notice pursuant to Sub-Clause 46.1,
- (c) has failed to comply with a notice issued pursuant to Sub-Clause 37.4 or an instruction issued pursuant to Sub-Clause 39.1 within 28 days after having received it
- (d) Despite previous warning from the Engineer, in writing, is otherwise persistently or flagrantly neglecting to comply with any of his obligations under the Contract, or
- (e) has contravened Sub-Clause 4.1, then the Employer may, after giving 14 days' notice to the Contractor, enter upon the Site and the Works and terminate the employment of the Contractor without thereby releasing the Contractor from any of his obligations or liabilities under the Contract, or affecting the rights and authorities conferred on the Employer or the Engineer by the Contract, and may himself complete the Works or may employ any other contractor to complete the Works. The Employer or such other contractor may use for such completion so much of the Contractor's Equipment, Temporary Works and materials as he or they may think proper.

Valuation at Date of Termination

63.2 The Engineer shall, as soon as may be practicable after any such entry and termination by the Employer, fix and determine ex parte, or by or after reference to

the parties or after such investigation or enquiries as he may think fit to make or institute, and shall certify:

- (a) what amount (if any) had, at the time of such entry and termination, been reasonably earned by or would reasonably accrue to the Contractor in respect of work then actually done by him under the Contract, and
- (b) the value of any of the said unused or partially used materials, any Contractor's Equipment and any Temporary Works.

Payment after Termination

- 63.3 If the Employer terminates the Contractor's employment under this Clause, he shall not be liable to pay to the Contractor any further amount (including damages) in respect of the Contract until the expiration of the Defects Liability Period and thereafter until the costs of execution, completion and remedying of any defects, damages for delay in completion (if any) and all other expenses incurred by the Employer have been ascertained and the amount thereof certified by the Engineer. The Contractor shall then be entitled to receive only such sum (if any) as the Engineer may certify would have been payable to him upon due completion by him after deducting the said amount. If such amount exceeds the sum which would have been payable to the Contractor on due completion by him, then the Contractor shall, upon demand, pay to the Employer the amount of such excess and it shall be deemed a debt due by the Contractor to the Employer and shall be recoverable accordingly.

Assignment of Benefit of Agreement

- 63.4 Unless prohibited by law, the Contractor shall, if so instructed by the Engineer within 14 days of such entry and termination referred to in Sub-Clause 63.1, assign to the Employer the benefit of any agreement for the supply of any goods or materials or services and/or for the execution of any work for the purposes of the Contract, which the Contractor may have entered into.

Urgent Remedial Work

- 64.1 If, by reason of any accident, or failure, or other event occurring to, in, or in connection with the Works, or any part thereof, either during the execution of the Works, or during the Defects Liability Period, any remedial or other work is, in the opinion of the Engineer, urgently necessary for the safety of the Works and the Contractor is unable or unwilling at once to do such work, the Employer shall be entitled to employ and pay other persons to carry out such work as the Engineer may consider necessary. If the work or repair so done by the Employer is work which, in the opinion of the Engineer, the Contractor was liable to do at his own cost under the Contract, then all costs consequent thereon or incidental thereto shall, after due consultation with the Employer and the Contractor, be determined by the Engineer and shall be recoverable from the Contractor by the Employer, and may be deducted by the Employer from any monies due or to become due to the Contractor and the Engineer shall notify the Contractor accordingly, with a copy to the Employer. Provided that the Engineer shall, as soon after the occurrence of any such emergency as may be reasonably practicable, notify the Contractor thereof.

SPECIAL RISKS

No Liability for Special Risks

- 65.1 The Contractor shall be under no liability whatsoever in consequence of any of the special risks referred to in Sub-Clause 65.2, whether by way of indemnity or otherwise, for or in respect of:
- (a) Destruction of or damage to the Works, save to work condemned under the provisions of Clause 39 prior to the occurrence of any of the said special risks,
 - (b) Destruction of or damage to property, whether of the Employer or third parties, or
 - (c) Injury or loss of life.

Special Risks

- 65.2 The Special Risks are:
- (a) The risks defined under paragraphs (a), (c), (d) and (e) of Sub-Clause 20.4, and
 - (b) The risks defined under paragraph (b) of Sub-Clause 20.4 insofar as these relate to the country in which the Works are to be executed.

Damage to Works by Special Risks

- 65.3 If the Works or any materials or Plant on or near or in transit to the Site, or any of the Contractor's Equipment, sustain destruction or damage by reason of any of the said special risks, the Contractor shall be entitled to payment in accordance with the Contract for any Permanent Works duly executed and for any materials or Plant so destroyed or damaged and, so far as may be required by the Engineer or as may be necessary for the completion of the Works, to payment for:
- (a) Rectifying any such destruction or damage to the Works, and
 - (b) replacing or rectifying such materials or Contractor's Equipment, and the Engineer shall determine an addition to the Contract Price in accordance with Clause 52 (which shall in the case of the cost of replacement of Contractor's Equipment include the fair market value thereof as determined by the Engineer) and shall notify the Contractor accordingly, with a copy to the Employer.

Projectile, Missile

- 65.4 Destruction, damage, injury or loss of life caused by the explosion or impact, whenever and wherever occurring, of any mine, bomb, shell, grenade, or other projectile, missile, munitions, or explosive of war, shall be deemed to be a consequence of the said special risks.

Increased Costs arising from Special Risks

- 65.5 Save to the extent that the Contractor is entitled to payment under any other provision of the Contract, the Employer shall repay to the Contractor any costs of the execution of the Work (other than such as may be attributable to the cost of reconstructing work condemned under the provisions of Clause 39 prior to the occurrence of any special risk) which are howsoever attributable to or consequent on or the result of or in any

way whatsoever connected with the said special risks, subject however to the provisions in this Clause hereinafter contained in regard to outbreak of war, but the Contractor shall, as soon as any such cost comes to his knowledge, forthwith notify the Engineer thereof. The Engineer shall, after due consultation with the Employer and the Contractor, determine the amount of the Contractor's costs in respect thereof which shall be added to the Contract Price and shall notify the Contractor accordingly, with a copy to the Employer.

Outbreak of War

- 65.6 If, during the currency of the Contract, there is an outbreak of war, whether war is declared or not, in any part of the world which, whether financially or otherwise, materially affects the execution of the Works, the Contractor shall, unless and until the Contract is terminated under the provisions of this Clause, continue to use his best Endeavour to complete the execution of the Works. Provided that the Employer shall be entitled, at any time after such outbreak of war, to terminate the Contract by giving notice to the Contractor and, upon such notice being given, the Contract shall, except as to the rights of the parties under this clause and Clause 67, terminate, but without prejudice to the rights of either party in respect of any antecedent breach thereof.

Removal of Contractor's Equipment on Termination

- 65.7 If the Contract is terminated under the provisions of Sub-Clause 65.6, the Contractor shall, with all reasonable dispatch, remove from the Site all Contractor's Equipment and shall give similar facilities to his Subcontractors to do so.

Payment if Contract Terminated

- 65.8 If the Contract is terminated as aforesaid, the Contractor shall be paid by the Employer, insofar as such amounts or items have not already been covered by payments on account made to the Contractor, for all work executed prior to the date of termination at the rates and prices provided in the Contract and in addition:
- (a) the amounts payable in respect of any preliminary items referred to in the Bill of Quantities, so far as the work or service comprised therein has been carried out or performed, and a proper portion of any such items which have been partially carried out or performed;
 - (b) the cost of materials, Plant or goods reasonably ordered for the Works which have been delivered to the Contractor or of which the Contractor is legally liable to accept delivery, such materials, Plant or goods becoming the property of the Employer upon such payments being made by him;
 - (c) a sum being the amount of any expenditure reasonably incurred by the Contractor in the expectation of completing the whole of the Works insofar as such expenditure has not been covered by any other payments referred to in this Sub-Clause;
 - (d) any additional sum payable under the provisions of Sub-Clauses 65.3 and 65.5;
 - (e) such proportion of the cost as may be reasonable, taking into account payments made or to be made for work executed, of removal of Contractor's

Equipment under Sub-Clause 65.7 and, if required by the Contractor, return thereof to the Contractor's main plant yard in his country of registration or to other destination, at no greater cost; and

- (f) the reasonable cost of repatriation of all the Contractor's staff and workmen employed on or in connection with the Works at the time of such termination. Provided that against any payment due from the Employer under this Sub-Clause, the Employer shall be entitled to be credited with any outstanding balances due from the Contractor for advances in respect of Contractor's Equipment, materials and Plant and any other sums which, at the date of termination, were recoverable by the Employer from the Contractor under the terms of Contract. Any sums payable under this Sub-Clause shall, after due consultation with the Employer and the Contractor, be determined by the Engineer who shall notify the Contractor accordingly, with a copy to the Employer.

RELEASE FROM PERFORMANCE

Payment in Event of Release from Performance

- 66.1 If any circumstance outside the control of both parties arises after the issue of the Letter of Acceptance which renders it impossible or unlawful for either party to fulfill his or their contractual obligations, or under the law governing the Contract the parties are released from further performance, then the parties shall be discharged from the Contract, except as to their rights under this Clause and Clause 67 and without prejudice to the rights of either party in respect of any antecedent breach of the Contract, and the sum payable by the Employer to the Contractor in respect of the work executed shall be the same as that which would have been payable under Clause 65 if the Contract had been terminated under the provisions of Clause 65.

SETTLEMENT OF DISPUTES

Engineer's Decision

- 67.1 If a dispute of any kind whatsoever arises between the Employer and the Contractor in connection with, or arising out of, the Contract or the execution of the Works, whether during the execution of the Works or after their completion and whether before or after repudiation or other termination of the Contract, including any dispute as to any opinion, instruction, determination, certificate or valuation of the Engineer, the matter in dispute shall, in the first place, be referred in writing to the Engineer, with a copy to the other party. Such reference shall state that it is made pursuant to this Clause. No later than the eighty-fourth day after the day on which he received such reference the Engineer shall give notice of his decision to the Employer and the Contractor. Such decision shall state that it is made pursuant to this Clause. Unless the Contract has already been repudiated or terminated, the Contractor shall, in every case, continue to proceed with the Works with all due diligence and the Contractor and the Employer shall give effect forthwith to every such decision of the Engineer unless and until the same shall be revised, as hereinafter provided, in an amicable settlement or an arbitral award. If either the Employer or the Contractor be

dissatisfied with any decision of the Engineer, or if the Engineer fails to give notice of his decision on or before the eighty-fourth day on which he received the reference, then either the Employer or the Contractor may, on or before the seventieth day after the day on which he received notice of such decision, or on or before the seventieth day after the day on which the said period of 84 days expired, as the case may be, give notice to the other party, with a copy for information to the Engineer, of his intention to commence arbitration, as hereinafter provided, as to the matter in dispute. Such notice shall establish the entitlement of the party giving the same to commence arbitration, as hereinafter provided, as to such dispute and, subject to Sub-Clause 67.4, no arbitration in respect thereof may be commenced unless such notice is given. If the Engineer has given notice of his decision as to a matter in dispute to the Employer and the Contractor and no notice of intention to commence arbitration as to such dispute has been given by either the Employer or the Contractor on or before the seventieth day after the day on which the parties received notice as to such decision from the Engineer, the said decision shall become final and binding upon the Employer and the Contractor.

Amicable Settlement

- 67.2 Where notice of intention to commence arbitration as to a dispute has been given in accordance with Sub-Clause 67.1, the parties shall attempt to settle such dispute amicably before the commencement of arbitration. Provided that, unless the parties otherwise agree, arbitration may be commenced on or after the fifty-sixth day after the day on which notice of intention to commence arbitration of such dispute was given, even if no attempt at amicable settlement thereof has been made.

Arbitration

- 67.3 Any dispute in respect of which:
- (a) the decision, if any, of the Engineer has not become final and binding pursuant to Sub-Clause 67.1, and
 - (b) amicable settlement has not been reached within the period stated in Sub-Clause 67.2, shall be finally settled, unless otherwise specified in the Contract, under the Rules of Conciliation and Arbitration of the International Chamber of Commerce by one or more arbitrators appointed under such Rules. The said arbitrator/s shall have full power to open up, review and revise any decision, opinion, instruction, determination, certificate or valuation of the Engineer related to the dispute. Neither party shall be limited in the proceedings before such arbitrator/s to the evidence or arguments put before the Engineer for the purpose of obtaining his said decision pursuant to Sub-Clause 67.1. No such decision shall disqualify the Engineer from being called as a witness and giving evidence before the arbitrator/s on any matter whatsoever relevant to the dispute.

Arbitration may be commenced prior to or after completion of the Works, provided that the obligations of the Employer, the Engineer and the Contractor shall not be altered by reason of the arbitration being conducted during the progress of the Works.

Failure to Comply with Engineer's Decision

- 67.4 Where neither the Employer nor the Contractor has given notice of intention to commence arbitration of a dispute within the period stated in Sub-Clause 67.1 and the related decision has become final and binding, either party may, if the other party fails to comply with such decision, and without prejudice to any other rights it may have, refer the failure to arbitration in accordance with Sub-Clause 67.3. The provisions of Sub-Clause 67.1 and 67.2 shall not apply to any such reference.

NOTICES

Notice to Contractor

- 68.1 All certificates, notices or instructions to be given to the Contractor by the Employer or the Engineer under the terms of the Contract shall be sent by post, email, cable, telex or facsimile transmission to or left at the Contractor's principal place of business or such other address as the Contractor shall nominate for that purpose.

Notice to Employer and Engineer

- 68.2 Any notice to be given to the Employer or to the Engineer under the terms of the Contract shall be sent by post, cable, telex or facsimile transmission to or left at the respective addresses nominated for that purpose in Part II of these Conditions.

Change of Address

- 68.3 Either party may change a nominated address to another address in the country where the Works are being executed by prior notice to the other party, with a copy to the Engineer, and the Engineer may do so by prior notice to both parties.

DEFAULT OF EMPLOYER

Default of Employer

- 69.1 In the event of the Employer:
- (a) failing to pay to the Contractor the amount due under any certificate of the Engineer within 28 days after the expiry of the time stated in Sub-Clause 60.10 within which payment is to be made, subject to any deduction that the Employer is entitled to make under the Contract,
 - (b) interfering with or obstructing or refusing any required approval to the issue of any such certificate,
 - (c) becoming bankrupt or, being a company, going into liquidation, other than for the purpose of a scheme of reconstruction or amalgamation, or
 - (d) giving notice to the Contractor that for economic reasons it is impossible for him to continue to meet his contractual obligations, the Contractor shall be entitled to terminate his employment under the Contract by giving notice to the Employer, with a copy to the Engineer. Such termination shall take effect 14 days after the giving of the notice.

Removal of Contractor's Equipment

- 69.2 Upon the expiry of the 14 days' notice referred to in Sub-Clause 69.1, the Contractor shall, notwithstanding the provisions of Sub-Clause 54.1, with all reasonable dispatch, remove from the Site all Contractor's Equipment brought by him thereon.

Payment on Termination

- 69.3 In the event of such termination the Employer shall be under the same obligations to the Contractor in regard to payment as if the Contract had been terminated under the provisions of Clause 65, but, in addition to the payments specified in Sub-Clause 65.8, the Employer shall pay to the Contractor the amount of any loss or damage to the Contractor arising out of or in connection with or by consequence of such termination.

Contractor's Entitlement to Suspend Work

- 69.4 Without prejudice to the Contractor's entitlement to interest under Sub-Clause 60.10 and to terminate under Sub-Clause 69.1, the Contractor may, if the Employer fails to pay the Contractor the amount due under any certificate of the Engineer within 28 days after the expiry of the time stated in Sub-Clause 60.10 within which payment is to be made, subject to any deduction that the Employer is entitled to make under the Contract, after giving 28 days' prior notice to the Employer, with a copy to the Engineer, suspend work or reduce the rate of work. If the Contractor suspends work or reduces the rate of work in accordance with the provisions of this Sub-Clause and thereby suffers delay or incurs costs the Engineer shall, after due consultation with the Employer and the Contractor, determine:
- (a) any extension of time to which the Contractor is entitled under Clause 44, and
 - (b) the amount of such costs, which shall be added to the Contract Price, and shall notify the Contractor accordingly, with a copy to the Employer.

Resumption of Work

- 69.5 Where the Contractor suspends work or reduces the rate of work, having given notice in accordance with Sub-Clause 69.4, and the Employer subsequently pays the amount due, including interest pursuant to Sub-Clause 60.10, the Contractor's entitlement under Sub-Clause 69.1 shall, if notice of termination has not been given, lapse and the Contractor shall resume normal working as soon as is reasonably possible.

CHANGES IN COST AND LEGISLATION

Increase or Decrease of Cost

- 70.1 There shall be added to or deducted from the Contract Price such sums in respect of rise or fall in the cost of labour and/or materials or any other matters affecting the cost of the execution of the Works as may be determined in accordance with part II of these Conditions.

Subsequent Legislation

- 70.2 If, after the date 28 days prior to the latest date for submission of tenders for the Contract there occur in the country in which the Works are being or are to be executed changes to any National or State Statute, Ordinance, Decree or other Law or any regulation or bye-law of any local or other duly constituted authority, or the introduction of any such State Statute, Ordinance, Decree, Law, regulation or bye-law which causes additional or reduced cost to the Contractor, other than under Sub-Clause 70.1, in the execution of the Contract, such additional or reduced cost shall, after due consultation with the Employer and the Contractor, be determined by the Engineer and shall be added to or deducted from the Contract Price and the Engineer shall notify the Contractor accordingly, with a copy to the Employer.

CURRENCY AND RATES OF EXCHANGE

Currency Restrictions

- 71.1 If, after the date 28 days prior to the latest date for submission of tenders for the Contract, the Government or authorized agency of the Government of the country in which the Works are being or are to be executed imposes currency restrictions and/or transfer of currency restrictions in relation to the currency or currencies in which the Contract Price is to be paid, the Employer shall reimburse any loss or damage to the Contractor arising there from, without prejudice to the right of the Contractor to exercise any other rights or remedies to which he is entitled in such event.

Rates of Exchange

- 72.1 Where the Contract provides for payment in whole or in part to be made to the Contractor in foreign currency or currencies, such payment shall not be subject to variations in the rate or rates of exchange between such specified foreign currency or currencies and the currency of the country in which the Works are to be executed.

Currency Proportions

- 72.2 Where the Employer has required the Tender to be expressed in a single currency but with payment to be made in more than one currency and the Contractor has stated the proportions or amounts of other currency or currencies in which he requires payment to be made, the rate or rates of exchange applicable for calculating the payment of such proportions or amounts shall, unless otherwise stated in Part II of these Conditions, be those prevailing, as determined by the Central Bank of the country in which the Works are to be executed, on the date 28 days prior to the latest date for the submission of tenders for the Contract, as has been notified to the Contractor by the Employer prior to the submission of tenders or as provided for in the Tender.

Currencies of Payment for Provisional Sums

- 72.3 Where the Contract provides for payment in more than one currency, the proportions or amounts to be paid in foreign currencies in respect of Provisional Sums shall be determined in accordance with the principles set forth in Sub-Clauses 72.1 and 72.2

as and when these sums are utilized in whole or in part in accordance with the provisions of Clauses 58 and 59.

REFERENCE TO PART II

As stated in the Foreword at the beginning of this document, the FIDIC Conditions comprise both Part I and Part II. Certain clauses, namely Sub-Clauses 1.1. paragraph (a) (i) and (iv), 5.1 (part), 14.1.143, 68.2 and 70.1 must include additional wording in Part II for the Conditions to be complete. Other Clauses may require additional wording to supplement Part I or to cover particular circumstances or the type of work (dredging is an example).

Part II Conditions of Particular Application with guidelines for the preparation of Part II are printed in a separately bound document.

PART I GENERAL CONDITIONS**INDEX****Clause Reference**

Access to Site	42.1
Access to Works, Engineer	37.1
Access, Contractor to Satisfy Himself	11.1
Accident or Injury to Workmen - Insurance Against	24.2
Accident or Injury to Workmen - Liability for	24.1
Address, Change of	68.3
Adequacy of Insurance	25.2
Adjustment of Contract Price if Variations Exceed 15 percent of Tender Sum	52.3
Agreement	9.1
Alterations, Additions and Omissions	51&52
Ambiguities in Contract Documents	5.2
Amicable Settlement of Disputes	67.2
Appointment of Assistants to Engineer	2.4`
Approval by the Engineer	7.3
Approval of Materials not Implied	54.8
Approval Only by Defects Liability Certificate	61.1
Arbitration	67.3
Assignment of Contract	3.1
Avoidance of Damage to Roads	30.1
Bills of Quantities – Estimated Only	55.1
Boreholes and Exploratory Excavation	18.1
Breakdown of Lump Sum items	57.2
Care of works	20.1
Cash Flow Estimate to be Submitted	14.3
Certificate, Final	60.8
Certificate and Payment, Monthly Statements	60.1
Certificates, Correction of	60.4
Certificate, Taking-Over	48.1
Certification of Completion of Works	48.1
Certification of Completion of Sections or Parts	48.2
Cessation of Employer's Liability	60.9
Change of Address, Notice of	68.3
Claims, Contemporary Records	53.2
Claims, Notice of	53.1
Claims, Payment of	53.5
Claims, Substantiation of	53.3
Claims Under Performance Security	10.3
Clearance of Site on Completion	33.1
Commencement of Works	41.1
Completion of Works, Time for	43.1
Completion of Works, Time for, Extension of	44.1
Completion, Statement at	60.5
Compliance with Insurance Policy Conditions	25.4
Compliance with Statutes and Regulations	26.1
Contemporary Records for Claims	53.2
Contract Agreement	9.1
Contract Not Relieved of Duties or Responsibilities	14.4
Contractor's Employees	16.1
Contractor's Employees, Engineer at Liberty to Object	16.2
Contractor's Entitlement to Suspend Work for Employer's Default	69.4

INDEX	Clause Reference
Contractor's Equipment, Conditions of Hire	54.5
Contractor's Equipment, Employer not Liable for Damage	54.2
Contractor's Equipment, Insurance of	21.1
Contractor's Equipment, Reference in Subcontracts	54.7
Contractor's Equipment, Temporary Works and Material; Exclusive Use for the Works	54.1
Contractor's Equipment, Transport of	30.2
Contractor's Failure to Carry Out Instructions	49.4
Contractor's Failure to Insure, Remedy	25.3
Contractor's General Responsibilities	8.1
Contractor's Superintendence	15.1
Contractor to Keep Site Clear	32.1
Contractor to Search	50.1
Correction of Certificates	60.4
Cost of Remedying Defects	49.3
Cost of Samples	36.2
Cost of Tests	35.3
Cost of Tests not provided for	36.4
Covering up Work, Examination Before	38.1
Cross Liabilities	23.3
Currencies of Payment for Provisional Sums	72.3
Currencies, Rates of Exchange	72.1
Currency Restrictions	71.1
Custody and Supply of Drawings and Documents	6.1
Customs Clearance	54.3
Damage to Persons and Property	22.1
Damage to Roads, Avoidance of	30.1
Damage to Works, Special Risks	65.3
Damages, Liquidated	47.1
Dates for Inspection and Testing	37.3
Day work	52.4
Decrease or Increase of Costs	70.1
Default of Contractor in Compliance with Instructions on Improper Work	39.2
Default of Contractor, Remedies for	63.1
Default of Employer	69.1
Defective Materials and Work	39.1
Defects, Contractor to Search for, if Required	50.1
Defects, Cost of Remedying	49.3
Defects Liability Certificate	62.1
Defects Liability Period	49.1
Defects, Remedying of	49.2
Definitions	1.1
Delay, Liquidated Damages for	47.1
Delays and Cost of Delay of Drawings	6.4
Design by Nominated Subcontractors	59.3
Discharge	60.7
Discrepancies in Documents	5.2
Dismissal of Contractor's Employees	16.2
Disorderly Conduct, etc.	34.1
Dispute, Engineer's Decision	67.1
Disruption of Progress	6.3

INDEX	Clause Reference
Documents Mutually Explanatory	5.2
Drawings	6&7
Drawings and Documents - Custody and Supply of	6.1
Drawings and Instructions – Supplementary	7.1
Drawing, Copy to be Kept on Site	6.2
Drawings, Delays and Cost of Delay of Drawings	6.4
Drawings, Failure by Contractor to submit	6.5
Employer not liable for Damage to Contractor's Equipment etc.	54.2
Employer's Liability, Cession of	60.9
Employer's Responsibilities	19.2
Employer' Risks	20.4
Engagement of Staff and Labour	34.1
Engineer's Authority to Delegate	2.3
Engineer's Determination Where Tests not Provided for	36.5
Engineer's Duties and Authority	2.1
Engineer to Act Impartially	2.6
Environment – Protection of	19.1
Errors in Setting Out	17.1
Evidence and Terms of Insurance	25.1
Examination of Work before Covering Up	38.1
Exceptions	22.2
Exchange, Rates of	72.1
Exclusions	21.4
Extension of Time, due to Engineer's Failure to give Possession of Site	42.2
Extension of Time for Completion	44.1
Extension of Time for Completion, Contractor's Claims	44.2
Extension of Time for Completion, Engineer's Determination	44.3
Extraordinary Traffic	30.
Facilities for Other Contractors	31.2
Facilities - Rights of Way and	42.3
Failure by Contractor to Submit Drawings	6.5
Failure to Comply with Claims Procedure	53.4
Failure to Comply with Engineer's Decision	67.4
Failure to give Possession of Site	42.2
Faulty Work, Removal of	39.1
Fees and Notices	26.1
Fencing, Watching, Lighting, etc.	19.1
Final Payment Certificate	60.8
Final Statement	60.6
Foreign Currencies, Payment in	72.
Fossils	27.1
Foundations, Examination of	38.1
General Responsibilities of Contractor	8.1
Giving of Notices – Payment of Fees	26.1
Headings and Marginal Notes	1.2
Improper Work and Materials, Removal of	39.1
Increase or Decrease of Costs	70.1
Indemnity by Contractor	22.1 & 24.1
Indemnity by Employer	22.3
Independent Inspection	37.5

INDEX**Clause Reference**

Injury to Persons – Damage to Property	22.1
Injury to Workmen	24.1
Inspection and Testing	37.2
Inspection of Testing, Dates for	37.3
Inspection of Foundations, etc.	38.1
Inspection of Operations	37.1
Inspection of Site by Contractor	11.1
Instructions for Variations	51.2
Instructions in Writing	2.5
Instructions, Supplementary	7.1
Insurance, Adequacy of	25.2
Insurance, Evidence and Terms of	25.1
Insurance, Minimum Amount of	23.2
Insurance of Works and Contractor's Equipment	21.1
Insurance, Remedy on Failure to Insurance	25.3
Insurance, responsibility for Amounts not Recovered	21.3
Insurance, Scope of Cover	21.2
Insurance, Third Party	23.1
Insurance, Workmen	24.2
Interference with Traffic and Adjoining Properties	29.1
Interim Determination of Extension	44.3
Interpretations	1.3
Labour, Engagements of	34.1
Language/s and Law	5.1
Law to which Contract Subject	5.1
Legislation, Subsequent	70.2
Lighting, Fencing, Watching, etc.	19.1
Liquidated Damages for Delay	47.1
Liquidated Damages, Reduction of	47.2
Loss or Damage due to Employer's Risks	20.3
Loss or Damage – Responsibility to Rectify	20.2
Lump-Sum Items – Breakdown of	57.2
Materials and Plant, Transport of	30.3
Materials - Approval of, etc, not Implied	54.8
Materials, Improper – Removal of	39.1
Materials, Quality of	36.1
Materials, Supply of	8.1
Measurement by Engineer	56.1
Measurement, Method of	57.1
Measurement, Quantities Estimated Only	55.1
Methods of Construction	8.2
Minimum Amount of Insurance	23.2
Monthly Payments	60.2
Nominated Subcontractors, Certification of Payments to	59.5
Nominated Subcontractors, Definition	59.1
Nominated Subcontractors, Design by	59.3
Nominated Subcontractors, Objection to Nomination	59.2
Nominated Subcontractors, Payment of	59.4
Not Foreseeable Physical Obstructions or Conditions	12.2
Notice of Claims	53.1
Notices and Fees, Payment of	26.1

INDEX	Clause Reference
Notices, Consents and Approvals	1.5
Notice to Contractor	68.1
Notice to Employer and Engineer	68.2
Objections to Contractor's Employees	16.2
Obstructions or Conditions - Not Foreseeable Physical	12.2
Omissions, Alterations and Additions	59.0
Openings, Uncovering and Making	38.2
Operations, Inspection of	37.1
Order of Work, Contractor to Furnish Program	14.1
Other Contractors, Opportunities for	31.1
Patent Rights	28.1
Payment if Contract Terminated for Contractor's Default	63.3
Payment if Contract Terminated for Employer's Default	69.3
Payment of Claims	53.5
Payment, Time for	60.10
Performance Security	10.1
Performance Security – Claims Under	10.3
Performance Security – Period of Validity	10.2
Period of Defects Liability	49.1
Permanent Works Designed by Contractor	7.2
Physical Obstruction or Conditions – Not Foreseeable	12.2
Physical Obstruction or Conditions – Engineer's Determination	12.3
Plant and Materials, Transport of	30.3
Plant, Conditions of Hire	54.5
Plant, Customs Clearance	54.3
Plant, Employer not Liable for Damage to	54.2
Plant, etc. – Exclusive Use for the Works	54.1
Plant, Quality of	36.1
Plant, Re-export of	54.4
Plant, Removal of	39.1
Policy of Insurance – Compliance with Conditions	25.4
Possession of Site	42.1
Possession of Site, Failure to Give	42.2
Power of Engineer to Fix rates	52.2
Priority of Contract Documents	5.2
Program to be Submitted	14.1
Progress – Disruption of	6.3
Progress-Rate of	46.1
Protection of Environment	19.1
Provision to Indemnify Contractor	22.3
Provision to Indemnify Employer	22.2
Provisional Sums, Currencies of Payment	72.3
Provisional Sums, Definition	58.1
Provisional Sums, Production of Vouchers	58.3
Provisional Sums, Use of	58.2
Quality of Materials and Workmanship	36.1
Quantities	55.1
Rate of Progress	46.1
Rates of Exchange	72.1
Rates, Power of Engineer to Fix	52.2
Rectification of Loss or Damage	20.2

INDEX	Clause Reference
Reduction of Liquidated Damages	47.2
Re-export of Plant	54.4
Regulations, Status etc. Compliance with	26.1
Rejection	37.4
Release from Performance	66.1
Remedies for Default of Contractor	63.1
Remedying of Defects,	49.2
Remedying of Defects, Cost of	49.3
Remedy on Contractor's Failure	25.3
Removal of Contractor's Employees	16.2
Removal of Contractor's Equipment	69.2
Removal of Improper Work, Materials or Plant	39.1
Removal of Plant, etc.	65.7
Responsibility to Rectify Loss or Damage	20.2
Responsibility Un-affected by Approval	7.3
Restriction on Working Hours	45.1
Resumption of Work	69.5
Retention Money, Payment of	50.3
Returns of Labour and Contractor's Equipment	35.1
Revised Program	14.2
Rights of Way and Facilities	42.3
Risks, Employer's	20.4
Risks, Special	65.0
Roads, etc., - Damage by Extraordinary Traffic	30.1
Roads, Interference with Access to	29.1
Royalties	28.2
Safety, Security and Protection of the Environment	19.1
Samples, Cost of	36.2
Security, Safety and Protection of the Environment	19.1
Setting-Out	17.1
Singular and Plural	1.4
Site, Clearance on Completion	33.1
Site, Contractor to Keep Clear	32.1
Site Inspection by Contractor	11.1
Site Operations and Methods of Construction	8.2
Site, Possession of	42.1
Special Risks	65.0
Staff, Engagement of	34.1
Statement at Completion	60.5
Statement, Final	60.6
Statutes, Regulations, etc. – Compliance with	26.1
Subcontracting	4.1
Subcontractors, Nominated	59.0
Subcontractors, Responsibility of the Contractor for Acts and Default of	4.1
Subsequent Legislation	70.2
Substantial Completion of Sections or Parts	48.3
Sufficiency of Tender	12.1
Supply of Plant, Materials and Labour	8.1
Surfaces Requiring Reinstatement	48.4
Supervision, Engineer's Determination	40.2
Suspension lasting more than 84 days	40.3

INDEX	Clause Reference
Suspension of Work	40.1
Taking Over Certificate	48.1
Taking Over of Sections or Parts	48.2
Tender Documents	11.1
Tender, Sufficiency of	12.1
Termination of Contract by Employer	63.1
Termination of Contract by Employer, Assignment of Benefit	63.4
Terms of Insurance	25.1
Tests, Cost of	36.3
Test not Provide for – Cost of	36.4
Third Part Insurance	23.1
Time for Completion	43.1
Time for Completion, Extension of	44.1
Time for Payment	60.1
Traffic, Extraordinary	30.1
Traffic Interference with	29.1
Traffic Waterborne	30.4
Transport of Contractor's Equipment and Temporary Works	30.2
Transport of Materials and Plant	30.3
Uncovering Work and Making Openings	38.2
Unfulfilled Obligations	62.2
Urgent Remedial Work	64.1
Valuation at Date of Termination by the Employer	63.2
Variations	51.1
Variations, Day work Basis	52.4
Variations, Exceeding 15 percent	52.3
Variations, Instructions for	51.2
Variations, Power of the Engineer to Fix Rates	52.2
Variations, Valuation of	51.3
Vouchers Production of	58.3
War, Outbreak of	20.4
Watching and Lighting, etc.	19.1
Waterborne Traffic	30.4
Work, Examination of Before Covering Up	38.1
Work, Improper, Removal of	39.1
Working Hours, Restriction of	45.1
Workmanship, Quality of	36.1
Workmen, Accident or Injury to	24.1
Works, Care of	20.1
Works, Completion of (Defects Liability Certificate)	62.1
Works Commencement of	41.1
Works Insurance of	21.1
Works Remedying of Defects	49.2
Works, Time for Completion of	43.1
Works to be Measured	56.1
Works, Suspension of	40.1
Work to be in Accordance with the Contract	13.1

PART II

PARTICULAR CONDITIONS OF CONTRACT

CONTENTS

PART II - PARTICULAR CONDITIONS OF CONTRACT

Clause	Title
1.1	Definitions
2.1	Engineer's Duties and Authority
2.2	Engineer's Representative
2.7	Engineer Not Liable
2.8	Replacement of the Engineer
5.1	Language(s) and Law
5.2	Priority of Contract Documents
6.6	Shop Drawings
6.7	As-Built Drawings
10.1	Performance Security
10.4	Performance Security Binding on Variations and Changes
14.1	Programme to be Submitted
14.3	Cash Flow Estimate to be Submitted
14.5	Detailed Programme and Monthly Progress Report
15.2	Language Ability of Contractor's Representative
15.3	Contractor's Representative
16.3	Language Ability of Superintending Staff of Contractor
16.4	Employment of Local Personnel
19.3	Safety Precautions
19.4	Lighting Works at Night
20.4	Employer's Risks
21.1	Insurance of Works and Contractor's Equipment
21.4	Exclusions
25.5	Insurance Company
31.3	Co-operation with Other Contractors
34.2	Rates of Wages and Conditions of Labour
34.3	Employment of Persons in the Service of Others
34.4	Housing for Labour
34.5	Health and Safety
34.6	Epidemics
34.7	Supply of Water
34.8	Alcoholic Liquor or Drugs
34.9	Arms and Ammunition
34.10	Festivals and Religious Customs
34.11	Disorderly Conduct
34.12	Compliance by Subcontractors
35.2	Records of Safety and Health
35.3	Reporting of Accidents
36.6	Use of Pakistani Materials and Services
41.1	Commencement of Works
47.3	Bonus for Early Completion of Works
48.2	Taking Over of Sections or Parts

Clause	Title
51.2	Instructions for Variations
52.1	Valuation of Variations
53.4	Failure to Comply
54.3	Customs Clearance
54.5	Conditions of Hire of Contractor's Equipment
59.4	Payments to Nominated Sub-contractors
59.5	Evidence of Payments
60.1	Monthly Statements
60.2	Monthly Payments
60.10	Time for Payment
60.11	Secured Advance on Materials
60.11	Financial Assistance to Contractor
63.1	Default of Contractor
65.2	Special Risks
67.3	Arbitration
68.1	Notice to Contractor
68.2	Notice to Employer and Engineer
70.1	Increase or Decrease of Cost
73.1	Payment of Income Tax
73.2	Customs Duty & Taxes
74.1	Integrity Pact
75.1	Termination of Contract for Employer's Convenience
76.1	Liability of Contractor
77.1	Joint and Several Liability
78.1	Details to be Confidential

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 **Quaid-e-Azam Thermal Power (Pvt.) Limited, First Floor, 7 C-1, Gulberg-III, Lahore, Pakistan.**

(a) (iv) The Engineer is **M/s Master Consulting Engineers (Pvt.) Ltd., Lahore, 119-G, Commercial Phase-I, DHA, Lahore Cantt.**

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.

(a) (vii) "Employer's Representative" is **General Manager Admin & HR, Quaid-e-Azam Thermal Power (Pvt.) Limited, First Floor, 7 C-1, Gulberg-III, Lahore, Pakistan** or any other competent person appointed in writing by the Employer and shall take effect on delivery of such appointment to the Engineer and the Contractor. The Employer may from time-to-time delegate to the Employer's Representative any of the duties and authorities vested in the Employer and may at any time revoke such delegation.

(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 here below, 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 of the contractor, 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.”

In both the cases, a copy of the same notice will be forwarded to “The Engineer”

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 General Conditions – Part I;
- (7) The priced Bill of Quantities (Appendix-D to Bid);
- (8) The completed Appendices to Bid (B, C, E to L);
- (9) The Drawings;
- (10) The Specifications; and
- (11) The price Bill of Quantities.

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

The following Sub-Clauses 6.6 and 6.7 are added:

6.6 Shop Drawings

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

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

6.7 As-Built Drawings

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

10.1 Performance Security

The text is deleted and substituted with the following:

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

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

The following Sub-Clause 10.4 is added:

10.4 Performance Security Binding on Variations and Changes

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

14.1 Programme to be Submitted

The programme shall be submitted within 07 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. AND
- ii) a CPM identifying the critical path/activities.

14.3 Cash Flow Estimate to be Submitted

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

The following Sub-Clause 14.5 is added:

14.5 Detailed Programme and Monthly Progress Report

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

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

- (b) During the period of the Contract, the Contractor shall submit to the Engineer not later than the 8th day of the following month, 10 copies each of Monthly Progress Reports covering:
- (1) A Construction Schedule indicating the monthly progress in percentage;
 - (2) Description of all work carried out since the last report;
 - (3) Description of the work planned for the next 56 days sufficiently detailed to enable the Engineer to determine his programme of inspection and testing;
 - (4) Monthly summary of daily job record;
 - (5) Photographs to illustrate progress; and
 - (6) Information about problems and difficulties encountered, if any, and proposals to overcome the same.
- (c) During the period of the Contract, the Contractor shall keep a daily record of the work progress, which shall be made available to the Engineer as and when requested. The daily record shall include particulars of weather conditions, number of men working, deliveries of materials, quantity, location and assignment of Contractor's equipment.

The following Sub-Clauses 15.2 and 15.3 are added:

15.2 Language Ability of Contractor's Representative

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

15.3 Contractor's Representative

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

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

The following Sub-Clauses 16.3 and 16.4 are added:

16.3 Language Ability of Superintending Staff of Contractor

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

16.4 Employment of Local Personnel

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

The following Sub-Clauses 19.3 and 19.4 are added:

19.3 Safety Precautions

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

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

19.4 Lighting Work at Night

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

20.4 Employer's Risks

The Employer's risks are:

Delete the text and substitute with the following:

- (a) insofar as they directly affect the execution of the Works in Pakistan:
 - (i) war and hostilities (whether war be declared or not), invasion, act of foreign enemies,
 - (ii) rebellion, revolution, insurrection, or military or usurped power, or civil war,
 - (iii) ionizing radiations, or contamination by radioactivity from any nuclear fuel, or from any nuclear waste from the combustion of nuclear fuel, radioactive toxic explosive or other hazardous properties of any explosive nuclear assembly or nuclear component thereof,
 - (iv) pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds,
 - (v) riot, commotion or disorder, unless solely restricted to the employees of the Contractor or of his Subcontractors and arising from the conduct of the Works;
- (b) loss or damage due to the use or occupation by the Employer of any Section or part of the Permanent Works, except as may be provided for in the Contract;
- (c) loss or damage to the extent that it is due to the design of the Works, other than any part of the design provided by the Contractor or for which the Contractor is responsible; and

- (d) any operation of the forces of nature (insofar as it occurs on the Site) which an experienced contractor:
 - (i) could not have reasonably foreseen, or
 - (ii) could reasonably have foreseen, but against which he could not reasonably have taken at least one of the following measures:
 - (a) prevent loss or damage to physical property from occurring by taking appropriate measures, or
 - (b) insure against.

21.1 Insurance of Works and Contractor's Equipment

Contractor is bound to provide all the below mentioned insurance policies for the persons, works and equipment, etc. on the Contract.

(a) General Requirements

The Engineer/Engineer's Representative and their designate staff for supervision of work shall be included as an insured party against all risks and liabilities. The Contractor shall insure with any one of the Insurance Companies approved for this purpose by the Employer in the joint names of the Employer, the Engineer, and the Contractor against all loss or damages as stated in the General Conditions and as stated herein.

Notwithstanding the responsibilities of the Contractor for indemnities and insurance as described above, the Contractor before commencing work on Site, must discuss fully with the Engineer & Employer the Insurance coverage provided by each under any general policies which are to be applied to this Contract to ensure that there are no contingencies let uncovered and to reduce, as far as practicable, duplication of coverage. Should any areas of possible damage or loss be discovered that are not covered by definition of responsibilities set out in these conditions, the addition or reduction in premiums required to give such insurance coverage will be paid by the Contractor and the policies obtained by the mutual agreement of the Employer and the Contractor.

All payments will be in Pakistan Rupees required to replace the damaged items.

The Contractor shall be responsible for deductibles and losses not covered by insurance.

An insurance loss shall not affect the Employer's or Contractor's rights and obligations under the Contract.

All policies shall state that: -

- i. the Employer shall receive at least twenty-eight (28) days written notice of intended cancellation or change affecting coverage.
- ii. The Contractor is fully protected so as to provide full indemnity to Employer, in respect of liability against loss or damage assumed by the Contractor under the Contract.

- iii. the inclusion of more than one insured shall not affect the rights of any other insured.

The Contractor shall be responsible for observance by his Sub Contractor(s) of insurances noted herein. Before each Sub Contractor starts work the Contractor shall give the Employer proof that the Sub contractor(s) are covered by insurance equivalent that specified herein for the Contractor.

(b) The Contractor shall include the following insurances:

- i. Third Party Liability Insurance

Risks insured: bodily injury, death and property damage.

Scope of coverage: contractual liability, tortuous liability, premises and operations liability, Contractor's contingent liability with respect to Sub Contractor's contingent liability with respect to Sub Contractor's operations.

Minimum limit: as indicated in Appendix 'A' to the Form of Bid inclusive, each occurrence.

- ii. All Risk property Insurance:

All risks including fire, floor, storm and earthquake.

Scope of coverage: the Works, during the entire duration of the Contract including the period of Maintenance, and all permanent, temporary and consumable materials related to the Works which are in storage, in transit or at site of the Works.

Minimum limit: the sum of the Contract Price plus fifteen percent (15%). This policy shall state that: -

- (a) if a loss occurs the Contract, the Employer and the Engineer shall be paid in relation of their share of the loss.
- (b) (Waiver of subrogation) the Insurer has no subrogation rights against any person, corporation or organization (including directors, officers, employees, servants and agents thereof) which: is an insured under the policy, or is controlled by, owned by, or associated with an insured, or is a Sub Contractor on the Works, or has, before a loss occurs, been released from liability by an Insured.

"Hold harmless" provision: the Employer and the contractor shall be indemnified against all losses.

Employer use or occupancy: If the Employer uses or occupies all or part of the Works during the life of the Policy the Contractor shall ensure that the policy continues in full force and the Employer shall pay any resulting extra cost of insurance.

Loss Procedure: if a loss occurs the Contractor shall, on behalf of the Employer and himself negotiate the value of the loss with the insurer. Unless directed otherwise by the Engineer, when agreement is reached the contractor shall repair all damage and the Employer shall pay him, in accordance with the Engineer's certificates, for that part of the repairs which is the Employers responsibility.

If directed by the Engineer, instead of carrying out repairs, the Contractor shall pay to the party suffering the loss that part of the agreed value of the loss which is the Contractor's responsibility.

iii. All Risk Contractor's Plant Insurance

Scope of coverage: all construction machinery by the Contractor for the Works.

iv. Automobile Liability Insurance.

Risks insured: Bodily injury, death, property damage and theft.

Scope of coverage: all licensed vehicles owned, hired operated or licensed by the Contractor.

Minimum limit: as indicated in Annexure "A" to the form of Bid inclusive each occurrence.

Cost of compliance with the requirements of the sub-clause and providing all insurance policies shall be borne by the Contractor.

21.2 Scope of Cover

Para. (a) of Sub-clause 21.2 is amended by deletion of the words "from the start of work at the site." And by the substitution therefore of the words "from the first working day after the commencement Date."

In Part I, the following is added as sub-para (c) under Sub-Clause 21.2.

it shall be the responsibility of the Contractor to notify the insurer of any change in the nature and extent of the Works and to ensure the adequacy of the insurance coverage at all times during the currency of the Contract.

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).

25.1 Evidence and Terms of Insurance

Sub-Clause 25.1 of the General Conditions of Contract Part-I, the first sentence "The Contractor shall Policies to the Employer" is deleted and substituted with the following sentence.

"The Contractor shall provide evidence to the Employer as soon as practical but in any case, prior to the start of the work at site that the insurances required under

the Contract have been affected and shall provide the insurance policies to the Employer.”

Following new paragraph is added at the end.

The Contractor shall also submit in original the receipts of all the premiums paid by the Contractor in connection with the above insurances.

The following Sub-Clause 25.5 is added:

25.5 Insurance Company

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

Costs of such insurances shall be borne by the Contractor.

The following Sub-Clause 31.3 is added:

31.3 Co-operation with other Contractors

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

The following Sub-Clauses 34.2 to 34.12 are added:

34.2 Rates of Wages and Conditions of Labour

The Contractor shall pay rates of wages and observe conditions of labour not less favorable 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 favorable 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 recognized festivals, days of rest and religious and other customs.

34.11 Disorderly Conduct

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

34.12 Compliance by Subcontractors

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

The following Sub-Clauses 35.2 and 35.3 are added:

35.2 Records of Safety and Health

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

35.3 Reporting of Accidents

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

The following Sub-Clause 36.6 is added:

36.6 Use of Pakistani Materials and Services

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

41.1 Commencement of Works

The text is deleted and substituted with the following:

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

The following Sub-Clause 47.3 is added:

47.3 Bonus for Early Completion of Works

The Contractor shall in case of earlier completion for either whole or part(s) of the Works pursuant to Sub-Clauses 48.1 and 48.2(a) respectively of the General Conditions of Contract, be paid bonus up-to a limit and at a rate equivalent to 50% of the relevant limit and rate of liquidated damages prescribed in Appendix-A to Bid "Special Stipulations". 47.3 is Deleted entirely /Not Applicable

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.

In the seventh line, after the words "failing which" add the following:

The evaluation will be carried out on the basis of actual with the application of current market rates for labour and material. No escalation on account of material or labour wages shall be allowed on such items if the valuation is carried out on the basis of actual. The percentage of overhead, taxes and profit, etc. all-inclusive to be allowed in such cases shall be up to 25%.

In the seventh line till the end of sentence in 9th line, the word “after due and the contractor” are deleted.

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.

The following Paragraph is added at the end of sub-clause 52.1 of part-1:
The approval / finalization of rates of all variations shall not relieve the contractor of his obligations under

52.3 Variations Exceeding 20 Percent

Change the Heading of the sub-clause to read as “Variation Exceeding 20 Percent”.

Replace “15 Percent” wherever mentioned in this sub-clause with “20 Percent”.

53.4 Failure to Comply

This Sub-Clause is deleted in its entirety.

54.3 Customs Clearance

(Employer may vary this Sub-Clause) This Sub-Clause is deleted in its entirety.

54.5 Conditions of Hire of Contractor’s Equipment

The following paragraph is added:

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

The following Sub-Clauses 59.4 & 59.5 are added:

59.4 Payments to Nominated Subcontractors

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

59.5 Certification of Payments & Nominated Subcontractors

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

- a) submits reasonable evidence to the Engineer, or
- b) i) satisfies the Engineer in writing that the Contractor is reasonably entitled to withhold or refuse to pay these amounts, and

ii) submits to the Engineer reasonable evidence that the nominated Subcontractor has been notified of the Contractor's entitlement,

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

60.1 Monthly Statements

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

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

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

(In case Clause 60.11 is applicable)

60.10 Time for Payment

The text is deleted and substituted with the following:

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

The following Sub-Clause 60.11 is added:

60.11 Secured Advance on Materials

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

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

- (2) Such materials have been delivered to the Site and are properly stored and protected against loss or damage or deterioration to the satisfaction of the Engineer but at the risk and cost of the Contractor;
 - (3) The Contractor's records of the requirements, orders, receipts and use of materials are kept in a form approved by the Engineer, and such records shall be available for inspection by the Engineer;
 - (4) The Contractor shall submit with his monthly statement the estimated value of the materials on Site together with such documents as may be required by the Engineer for the purpose of valuation of materials and providing evidence of ownership and payment therefor;
 - (5) Ownership of such materials shall be deemed to vest in the Employer and these materials shall not be removed from the Site or otherwise disposed of without written permission of the Employer; and
 - (6) The sum payable for such materials on Site shall not exceed 75 % of the (i) landed cost of imported materials, or (ii) ex-factory / ex-warehouse price of locally manufactured or produced materials, or (iii) market price of other materials.
- (b) The recovery of Secured Advance paid to the Contractor under the above provisions shall be effected from the monthly payments on actual consumption basis.

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).

65. 6 Out Break of War

In sub-clause 65.6, delete "in any part of the World" from the second line of the paragraph.

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 (Pvt.) Limited.
First Floor, 7 C-1, Gulberg-III, Lahore
(042-35750936-8)
- b) The Engineer:
The Engineer is **M/s Master Consulting Engineers (Pvt.) Ltd., Lahore, 119-G, Commercial Phase-I, DHA, Lahore Cantt.**

69.1 Default of Employer

In Sub-Clause 69.1(a), second line "56" is substituted by "28".

70.1 Increase or Decrease of Cost

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

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

- (a) Other Changes in Cost
To the extent that full compensation for any rise or fall in costs to the Contractor is not covered by the provisions of this or other Clauses in the Contract, the unit rates and prices included in the Contract shall be deemed to include amounts to cover the contingency of such other rise or fall of costs.
- (b) Adjustment Formula
The adjustment to the monthly statements in respect of changes in cost shall be determined from the following formula: -

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

Where:

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

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

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

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

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

(c) Sources of Indices and Weightages

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

(d) Base, Current, and Provisional Indices

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

(e) Adjustment after Completion

If the Contractor fails to complete the Works within the Time for Completion prescribed under Clause 43, adjustment of prices thereafter until the date of completion of the Works shall be made using either the indices or prices relating to the prescribed time for completion, or the current indices or prices, whichever is more favorable to the Employer, provided that if an extension of time is granted pursuant to Clause 44, the above provision shall apply only to adjustments made after the expiry of such extension of time.

(f) Weightages

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

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

73.1 Payment of Income Tax

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

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

74.1 Integrity Pact

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

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

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

75.1 Termination of Contract for Employer's Convenience

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

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

76.1 Liability of Contractor

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

77.1 Joint and Several Liability

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

78.1 Details to be Confidential

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

PART II –PARTICULAR CONDITIONS OF CONTRACT

Index	Clause
Alcoholic Liquor or Drugs	34.8
Arbitration	67.3
Arms and Ammunition	34.9
As-Built Drawings	6.7
Bonus for Early Completion of Works	47.3
Cash Flow Estimate to be Submitted	14.3
Commencement of Works	41.1
Compliance by Sub-Contractors	34.12
Conditions of Hire of Contractor's Equipment	54.5
Contractor's Representative	15.3
Co-operation with Other Contractors	31.3
Customs Clearance	54.3
Customs Duty and Taxes	73.2
Default of Contractor	63.1
Definitions	1.1
Detailed Programme and Monthly Progress Report	14.5
Details to be Confidential	78.1
Disorderly Conduct	34.11
Employer's Risks	20.4
Employment of Local Personnel	16.4
Employment of Persons in the Service of Others	34.3
Engineer Not Liable	2.7
Engineer's Duties and Authority	2.1
Engineer's Representative	2.2
Epidemics	34.6
Exclusions	21.4
Failure to Comply	53.4
Festivals and Religious Customs	34.10
Financial Assistance to Contractor	60.11
Health and Safety	34.5
Housing for Labour	34.4
Increase or Decrease of Cost	70.1
Instructions for Variations	51.2
Insurance of Works and Contractor's Equipment	21.1
Insurance Company	25.5
Integrity Pact	74.1
Joint and Several Liability	77.1
Language Ability of Contractor's Representative	15.2
Language Ability of Superintending Staff of Contractor	16.3
Language(s) and Law	5.1
Liability of Contractor	76.1
Lighting Work at Night	19.4
Monthly Payments	60.2
Monthly Statements	60.1
Notice to Contractor	68.1
Notice to Employer and Engineer	68.2

Index	Clause
Payment of Income Tax	73.1
Payments of Nominated Subcontractors	59.4
Performance Security	10.1
Performance Security Binding on Variation and Changes	10.4
Priority of Contract Documents	5.2
Programme to be Submitted	14.1
Rates of Wages and Conditions of Labour	34.2
Records of Safety and Health	35.2
Replacement of the Engineer	2.8
Reporting of Accidents	35.3
Safety Precautions	19.3
Secured Advance on Materials	60.11
Shop Drawings	6.6
Special Risks	65.2
Supply of Water	34.7
Taking Over of Sections or Parts	48.2
Termination of Contract for Employer's Convenience	75.1
Time for Payment	60.10
Use of Pakistani Materials and Services	36.6
Valuation of Variations	52.1

**CONDITIONS OF CONTRACT
PART-III**

**SUPPLEMENTARY CONDITIONS OF
CONTRACT**

CONDITIONS OF CONTRACT PART-III

SUPPLEMENTARY CONDITIONS OF CONTRACT

SCC – 1 Attendance of Meetings

- (a) The Contractor shall attend and shall cause his Sub-Contractors to attend any or all meetings when called by the Employer or the Engineer to discuss progress of the Project and other matters related to the Project and the Contract, without any compensation from the Employer.
- (b) The Contractor shall bear all expenses of the Employer and representatives and the Engineer, and representatives for any meetings requested by the Contractor for instructions and approvals away from the site within Pakistan.

SSC – 2 Supply of Steel Reinforcement

The Contractor shall arrange and ensure timely supply of Steel reinforcement, Cement and other materials required for the project. The Employer does not assume any responsibility for the supply of materials.

SSC – 3 Electric & Water Supply and Charges

The Contractor shall make his own arrangements for Water and Electricity at his own expenses and No charges will be paid by the Employer in this regard.

SSC – 4 Rate and Prices Inclusive

The rates and prices quoted by the Contractor in the priced Bill of Quantities shall include all freight, customs, import duties, sales taxes/other taxes, postages, landing demurrage charges, wharf-age, toll taxes, octroi, excise duties, royalties and all other costs, charges imposed whatsoever in respect of any or other things provided by him for the Project.

The prices in the Bill of Quantities include also all additional costs and provisions required for the acceptable execution of work in compliance with the time Schedule and the Specification. By way of illustration but not enumeration the Unit Prices shall include besides the costs for supply of material, labour and equipment, cost of their transport, Contractor's profit and overhead charges etc, the cost for provision of the following:

- (a) Furnishing and maintenance of Contractor's Equipment, fuel for Equipment, temporary works, materials & structures testing, sampling and all labour necessary for execution of the project, Equipment for transport, machines, testing laboratories, Site Offices and sheds including all expenses for the furnishing and maintenance of the Workshops and storage areas used by the Contractor.
- (b) Required power, water and other services.
- (c) Illumination and safety at Site.
- (d) All additional costs due to any kind of difficult working, conditions and interruptions which may possibly be caused by adverse physical conditions.
- (e) Staff allowance, ambulances, expenses for medical treatment, traveling expenses, holiday wages and salaries and all other costs for all employees,

the required means of communications such as telephone and the like, the required means for protection against accidents.

- (f) All expenses for royalty's license, liabilities insurances, rent, hire and the like in connection with the Works.
- (g) Other special work arrangements and provisions not mentioned here but necessary for the proper and complete execution of the Works.
- (h) All Government and or Municipal taxes, customs duties, excise duties, stamp duties or any other dues, taxes or charges.
- (i) Cost of all insurances to be kept in force during the period of constructions and the period of maintenance of the works under the Contract.
- (j) Mobilization, demobilization and clearance of site.
- (k) Contractor's camp for staff and labour including the services.
- (l) Performance Security and Bank Guarantees as and when required under the Contract. The cost of the above shall be deemed to be included in the rates and prices tendered for the project and no separate payment shall be made on this account.

SCC – 5 Provision of Plant

In respect of any contractor's Equipment in general, except as provided for in these Documents, which the Contractor shall be required to have available at Site for execution of Project Works in accordance with the Drawings, Specifications, Special Provisions or as directed by the Engineer. The Contractor shall make his own arrangements for foreign exchange, import formalities, customs, transport to the Project Site and all other formalities whatsoever at his own cost and responsibility.

The Contractor shall be deemed to have taken into consideration all Government or Local Bodies regulations, for the time being in force, regarding the re-export of any plant and equipment which he may have to import in connection with the project. Any amendments to the existing rules and/or further regulations imposed in this respect by the Government of Pakistan shall be strictly followed by the Contractor.

SCC – 6 Times for Completion of Works

The Project is required to be completed in the time stated in "Appendix A" to Bid and the Bidder to whom the Contract is given will be required to complete and deliver the whole of the Permanent Works strictly within the time so stated. If the Bidder states, in his Tender/Bid a shorter time than shown in the Appendix A, then such shorter time will govern.

SSC – 7 Documents Not to be Altered or Mutilated

No alteration or mutilation (other than filling in all the blanks intended to be filled in) shall be made in the Tender Documents or in any of the documents attached to it. Any comments which it is desired to make shall not be placed on any of the documents attached hereto, but shall take the form of a separate statement which shall be as brief as possible and referenced to items, clauses and pages of the annexed documents.

Such statements shall not qualify the acceptance of the Tender based upon a proposed change or changes in the annexed documents, nor shall be binding upon the Employer in any way in making the award. Alterations of already written prices must be signed in the place of alteration by the Tenderer/Bidder or his legally authorized representative.

SCC – 8 Utility Lines

The Contractor shall conduct his operations, make necessary arrangements, take suitable precautions and perform all required work incident to the protection of an avoidance of interference with power transmission, fiber optic cables, telephone and sui gas lines, oil lines water and sewerage mains and other utilities within the areas of his operations in connection with this Contract and the cost thereof shall be borne by the Contractor and the Contractor shall save harmless and indemnify the Employer in respect of all claims, demands, proceedings, costs, charges and expenses whatsoever arising out of or in relation to any such interference.

SCC – 9 First Aid Facilities

The Contractor shall provide and maintain adequate First Aid Facilities convenient to the Project Site with the approval of the Engineer.

SCC – 10 Location of Contractor's Camp

The location of houses, barracks, stores and offices etc., shall be determined in consultation with Employer. Installation for the supply of electricity and water, fuel, lighting, etc., must be presented to the necessary extent as per instructions of the Engineer.

SCC – 11 Final Hand Over

At the end of the Defects Liability Period stipulated in the Contract, the Employer/Engineer on application of the Contractor, shall decide the members of the final hand over committee and announce the same to the Contractor. The committee, after investigation/checking of the Project, if satisfied that there are no deficiencies or defects due to work of the Contractor, shall certify the final hand-over, and the Employer/Engineer will then issue a Defects Liability Certificate as provided under Clause 62.1 of Conditions of Contract.

SCC – 12 Making Good the Damage to Services, Earthwork, etc.

The Contractor shall make good, at his own cost, all damages to telephone, fiber optic and electric cables or wires, sewers, water or other pipes except where the Authority, Employer or Private Party owing or responsible for the same elects to make good the damage.

All damages to the surface of the land, to the beds of water courses, protecting adjacent structures etc. which are disturbed by the works (other than where specifically ordered by the Engineer/Employer) shall be repaired by the Contractor or from the Authorities concerned at the Contractor's expense. All such making good shall be to the approval of the Engineer/Employer.

SCC – 13 Returns of Plant, Materials etc.

The Contractor shall forward to the Engineer/Employer at the end of each month returns showing the Constructional Plant, materials, etc., on Site, in a form prescribed by the Engineer/Employer.

SCC – 14 Progress Photographs

The Contractor shall furnish to the Engineer every two weeks at least four photographs to clearly show the progress of construction. The photographs shall be submitted in Email plus three glossy prints 20 cm x 20 cm. Each print shall be marked on the back with the date and serial number. There shall be no writing, lettering or marking on the face of the photograph.

SCC – 15 As Built Drawings/Shop Drawings

During construction/execution, the Contractor shall keep an accurate record of all deviations of his work as actually installed from that shown or indicated on the Contract Drawings. Upon completion of the work, the Contractor shall deliver to the Employer through Engineer the same size as Contract Drawings and at an approved scale showing the Work as actually executed/installed. All drawings are to become the property of the Employer.

All the shop drawings/fabrication drawings shall be prepared by the Contractor and submitted to the Engineer at least ten days before the start of the particular activity. The Engineer shall check and approve or return the same to the Contractor for correction/modification within the period of 07 days from the day of receipt of the drawings. All work is to be executed by the Contractor in accordance with the approved drawings before the commencement of the works.

SCC – 16 Safety Precautions

The Contractor shall adequately provide for the safety, health and welfare of persons and of the prevention of damage to works, material equipment for the purpose of or in connection with the Contract.

SCC – 17 Rates Works NOT IN CONTRACT

No deviation from specification stipulated in the contract or additional items of work shall be carried out by the contractor unless the rates of the substituted, altered or additional item have been approved in writing by Engineer/Employer; failing which client will not be bound to entertain any claim on this account.

SCC – 18 NO COMPENSATION ON ALTERNATION IN OR RESTRICTION OF WORK TO BE CARRIED OUT

Clause-13:- If at any time after the commencement of the work the client shall for any reason whatsoever not require the whole work or part thereof as specified in tender to be carried out, the Engineer/Employer shall give notice in writing of the fact to the contractor who shall have no claim to any payment or compensations whatsoever on account of any profit, or advantage, which he might have derived from the execution of the work in full, but which he did not

derive in consequence of the full amount of the work not having been carried out; neither shall have any claim for compensation by reason of any alterations having been made in the original specifications, drawings, designs and instructions which shall involve any curtailment of the work as originally contemplated.

SCC – 19 DECLARATION – CONTRACTOR'S RELATIONSHIP WITH CLIENT EMPLOYEES

I/We hereby declare that no member of my/our firm who has a financial interest in its profits and losses is an employee of the client and undertake that the firm will not allow any such relation of an employee to have financial interest in the firm during currency of the contract.

SCC – 20 CHANGES IN CONSTITUTION OF FIRM

In the case of a tender by partners any change in constitution of the firm shall be forthwith notified by the contractor to the Engineer/Employer for his information.

SCC – 21 TENDERED RATES ARE INCLUSIVE OF TAXES

The tendered rates or amounts should be inclusive of all taxes and Sale tax etc., payable to the Central and Provincial Governments or Local Bodies and no claim on this account shall be entertained by the client.

SCC – 22 RATES ARE INCLUSIVE OF LEAD AND LIFTS.

The tendered rates shall be inclusive of all lead and lifts unless otherwise specified in the schedule of the quantities.

SCC – 23 DISPOSAL OF SURPLUS MATERIAL

Material obtained from excavation will be property of the Employer. Materials are to be stocked in places pointed out by Engineer/Employer. The contractor undertakes to have the site clean free from rubbish to the satisfaction of Engineer-in-charge. All surplus materials, rubbish, etc will be removed to places to be fixed by the said Engineer and nothing extra will be paid for this.

SCC – 24 REMOVAL OF TEMPORARY STRUCTURE ON COMPLETION OF WORK

On completion of the work or earlier as directed by the Engineer-in-charge, the contractor shall remove all temporary structures (godown, site offices, etc) erected by him at the site of work. He shall fill tanks dug out by him at site, remove all debris and other materials like surplus sand; stone ballast, rubbish etc and in short, shall leave the site in a neat and tidy condition.

SCC – 25 REMOVAL OF MATERIAL CONSIDERED INCONVENIENT TO THE PUBLIC

The contractor shall not deposit any materials on any site which will inconvenience the public. The Engineer-in-charge may require the contractor to remove any materials which are considered by him to be a source of danger or inconvenience to the public, or cause them to be removed at the contractor's cost.

SCC – 26 ALL MATERIALS – CLIENT PROPERTY

The contractors in the course of the works should understand that all materials (e.g. stone and other materials) obtained in the work of dismantling, excavation, etc will be considered client property and issued to the contractors (if they require the same for their own use) at rates approved by the Engineer/Employer, if these materials are not required by them they will be disposed off in the interest of the client.

SCC – 27 EMPLOYMENT OF LABOUR FROM THE SURROUNDING AREA

The contractor to whom this work is allotted will as far as possible employ labour of the surrounding area.

SCC – 28 NO CLAIM TOWARDS INCREASE/DECREASE IN AMOUNT AND QUANTITY

The cost of work given in the notice is approximate and is liable to change and no claim of contractor whatsoever will be entertained due to increase/decrease in amount and quantity of work.

SCC – 29 WORK TO BE CARRIED OUT IN 2-3 SHIFTS IN CASE OF INADEQUATE PROGRESS

In case the progress of the work is not adequate as laid down in relevant clauses of the contract, the contractor shall be required to carry out the work in two or three shifts by arranging additional labour and lightening arrangement for which no additional payment of any kind shall be made to him.

SCC – 30 No Female Labour shall be employed during the execution of work. no Laborer below the age of 12 years shall be employed at the work.

SCC – 31 No Work to be carried out on weekly /Gazetted holidays without the sanction in writing of Employer.

SCC – 32 SECURITY CLEARANCE:

The contractor will submit the Photo copy of CNIC of All the labour/staff prior to their deployment at site for permission by the Security officer, of the client or for the information of the engineer incharge at site.

SCC – 33 During execution phase, no labour or company staff will be allowed to enter the building without prior permission

SCC – 34 The Contractor will issue Identification Cards signed by the Security concerned to all Labour/staff working/deployed at site.

SPECIFICATIONS – SPECIAL PROVISIONS

CONTENTS

SPECIFICATIONS – SPECIAL PROVISIONS

Clause	Title
1.	General
2.	Description of Project and site
3.	Code Standards & Certificates
4.	Manufacturer's Recommendations
5.	Units of Measurements
6.	Plant Equipment & Tools
7.	Storage & Handling facilities
8.	Filed Laboratory & Testing
9.	Surveying Instruments
10.	Approval of Materials & Plants
11.	Bar Bending drawing/Schedule
12.	Drawings
13.	Protection of the works
14.	Restoration and cleaning
15.	Site Office & Temporary facilities to be provided by the Contractor
16.	Other facilities for Engineers personnel to be provided by the contractor
17.	Construction Procedures
18.	Notification to Engineer
19.	Night work
20.	Weather
21.	Coordination with other contractors
22.	Accident prevention, protective equipment
23.	Setting Out of work and survey
24.	Environmental protection
25.	Payment of work

SPECIFICATIONS – SPECIAL PROVISIONS

1. GENERAL

- 1.1 Specifications-Special Provisions shall form an integral part of Bidding & Contract document.
- 1.2 The Contractor shall notify all sub-contractors of the provisions of these Special Provisions

2. DESCRIPTION OF PROJECT, WORKS INVOLVED AND SITE

The works comprise Civil, Electrical and related Ancillary Works lying within the lines, boundaries and limits shown on the Drawings and any such additional areas adjacent thereto as may be designated by the Engineer from time to time for the construction to be performed under the Contract, and all such areas and additional areas shall be completed at the site.

The Employer will give to the Contractor possession of the area designated and defined as the Site and shown on the drawing as may be required to implement as much of the Works, when the Engineer's Notice to Commence the Works is given.

3. CODES, STANDARDS AND CERTIFICATES

A. Applicable Standards

Except as otherwise provided by these Specifications or the Drawings, all materials, equipment and fabrication and testing thereof shall conform to the latest applicable standards and codes referred in the Specifications by use of the explained below:

ACI	-	American Concrete Institute (USA)
AISI	-	American Iron and Steel Institute (USA)
AISC	-	American Institute of Steel Construction (USA)
ANSI	-	American National Standard Institute (USA)
ASTM	-	American Society for Testing and Materials (USA)
AASHTO-		American Association of State Highway & Transportation Officials.
AWS	-	American Welding Society (USA)
BS	-	British Standards (UK)
CP	-	Codes of Practice (UK)
PS	-	Pakistan Standards (Pak)
SSPC	-	Steel Structures Painting Council (USA)
UBC	-	Uniform Building Code (USA)
USBR	-	United States Bureau of Reclamation (USA)

If the Contractor, at any time and for any reason, wishes to deviate from the above standards or desires to use material or equipment not covered by the above standards, he shall state the exact nature of the changes, the reason for making the change and shall submit complete specifications of the materials and equipment to the Engineer for approval.

B. Standards other than those Specified

Where requirements for materials or equipment are specified by reference to a standard which has its origin in one country, it is not the intention to restrict the requirements solely to that standard and that country. Other standards, including standards of other countries, will be accepted provided the requirements thereof, in the sole opinion of the Engineer, are at least equal to the requirements of the standard specified. The Contractor may propose to the Engineer an equivalent standard other than that specified, in which case he shall submit the proposed standard and all other information required and shall submit written proof that his proposed standard is equivalent in all significant respects to the standard specified. All submissions must be made in the English language.

C. Codes and Standards at Site

The Contractor shall supply and have at his site office: -

- a) Copies of all latest editions of codes and standards referred to in these Specifications or equivalent codes and standards as approved by the Engineer.
- b) Catalogues and published recommendations from manufacturers supplying products and materials for the project.
- c) The Contractor shall provide manufacturer's or supplier's materials which must meet the requirements of a specific code or standard as stated in these Specifications.

4. MANUFACTURER'S RECOMMENDATIONS

Installation of manufactured items shall be in accordance with procedures recommended by the manufacturer or as approved by the Engineer.

5. UNITS OF MEASUREMENTS

Both FPS and MKS System of Units shall be used throughout the Project, as mentioned.

6. PLANT, EQUIPMENT AND TOOLS

The Contractor shall provide at his cost modern plant, equipment and tools, adequate and befitting to the nature, magnitude and size of this Contract, in strict compliance with the requirements of the General Conditions of Contract, Conditions of Particular Applications and Technical Specifications.

7. STORAGE & HANDLING FACILITIES

The Contractor shall make his own arrangements for providing the necessary space for the storage of plant, equipment and materials and for Contractor's temporary office, in and around the site of works, during the currency of the Contract.

8. FIELD LABORATORY AND TESTING

8.1 General

The Contractor shall provide and maintain a field laboratory equipped with approved equipment to perform all the tests required by the Engineer. The quality control testing shall be performed by the Contractor's competent personnel in accordance with a site testing and quality control program to be established by the Contractor and approved by the Engineer. The Engineer may however, require certain tests to be performed in any other laboratory designated by him.

The Contractor shall provide laboratory helpers to the Engineer for testing.

The Field Laboratory, including all equipment and staff shall be placed at the disposal and direction of the Engineer during the Contract.

The Contractor shall keep a complete record of all quality tests performed on site. All quality control and tests shall be carried out in accordance with applicable standards and codes.

8.2. Field Laboratory Equipment Requirements

The Laboratory shall be equipped with new unused and latest Equipment to perform tests as per Technical Specifications and General Conditions of Contract. Additional equipment/materials shall be supplied by the Contractor as and when required by the Engineer to perform any specified test, at no additional cost to the Employer.

8.3. Testing Laboratory Certificates

The Engineer may accept a certificate from a commercial testing laboratory, satisfactory to him, certifying that the product has been tested within a period acceptable to the Engineer and that it conforms to the requirements of these Specifications.

8.4. Method of Payment

The cost of providing running and maintenance of the laboratory, equipment, materials and staff, testing charges for materials supplied by the Employer and all other tests to be performed in any other laboratory designated by the Engineer shall be deemed to be included in the price quoted by the Contractor and no separate claim for payment on this account shall be entertained by the Engineer. Furthermore, the cost of any additional laboratory, field and shop tests required through the resubmission of samples because of failure of compliance with Specifications shall be borne by the Contractor.

In case the Contractor does not provide the specified equipment and testing facility, cost of testing plus 100 percent overheads shall be recovered from his bills.

9. SURVEYING INSTRUMENTS

9.1 General

The minimum quantity of survey equipment is stated below which shall be available with the Contractor at site of Works along with qualified Surveyors and Survey Helpers. The equipment shall be maintained throughout the

Contract Period and replaced by the Contractor in case of damage or loss. The survey equipment shall be made available to the Engineer when requested. All surveying equipment shall be in good working condition.

9.2 Surveying Equipment Required

The Contractor shall provide and maintain the following surveying equipment at site.

- | | | |
|----|---|---------|
| a) | Electronic distance measuring device complete with (400 grades) Universal Theodolite with data logger, aiming head and standard equipment supplied by the manufacturer, including tripod, control unit stand, batteries, charging unit, pole reflector, single prism reflector, three, six and nine prism reflectors complete with tripods and Traverse Equipment for Theodolite. | 01 No. |
| b) | Automatic Levels with tripods. | 4 Nos. |
| c) | Steel measuring tapes 50 m long | 4 Nos. |
| d) | Steel measuring tapes 20 m long | 4 Nos. |
| e) | Leveling Staff | 10 Nos. |
| f) | All other miscellaneous tools, equipment and materials required in surveying. | |

10. APPROVAL OF MATERIALS AND PLANT

10.1 Quality of Materials

All materials, fixtures, fittings, supplies and plant furnished under the Contract shall be new and unused, standard first grade quality and of the best workmanship and design. No inferior or low-grade materials, supplies or articles will be either approved or accepted, and all work of assembly and construction shall be done in a first-class and workmanlike manner. In asking for prices for materials intended for delivery to the Site and incorporation in the Works under any portion of these Specifications, the Contractor shall provide the manufacturer or supplier with complete information as may be necessary to secure compliance to this Clause and, in every case, he shall quote this Clause in full to each such manufacturer or supplier.

10.2 Submission of Samples and Data

- 10.2.1 The Contractor shall furnish for approval of the Engineer with reasonable promptness all samples as directed by the Engineer or specifically called for in the Specifications and in accordance with the time schedule provided in the schedule of submittals. The Engineer shall check and approve such samples with reasonable promptness only for conformance with the design concept of the Works and for compliance with the information given in the Contract Documents. All work shall be in accordance with approved samples.
- 10.2.2 Samples shall be furnished so as not to delay fabrication, allowing the Engineer reasonable time for consideration of the sample submitted.
- 10.2.3 Each sample shall be properly labeled with the name and quality of the material, manufacturer's name, name of the project, the Contractor's name and the date of submission, and the Specifications Article number to which the sample refers.

- 10.2.4 The manufacturer's installation directions shall be provided with each sample. The Contractor shall pay all transportation costs and deliver samples to the Engineer's office, Site or testing laboratory as directed by the Engineer.
- 10.2.5 Samples shall be of adequate size to permit proper evaluation of the material by the Engineer. Where variations in color, texture, dimensions or other characteristics are to be expected, the Contractor shall submit samples showing the maximum range of variation. Materials exceeding the range of variation of the approved samples shall not be used on the Work.
- 10.2.6 In order to permit coordinated selection of colors and finishes, the Contractor shall deliver samples of all related items to the Engineer at one time. Samples of such materials will not be approved until all related samples have been submitted.
- 10.2.7 If both Shop Drawings and samples are required for the same item, the Engineer may require both to be submitted before approving either.
- 10.2.8 The Contractor shall erect Mock-up samples of finished items where specifically called for in the documents or as directed by the Engineer.
- 10.2.9 No acceptance or approval of any Shop Drawings or sample, or any indication or request by the Engineer on any Shop Drawings shall constitute an authorization for any increase in the Contract Sum.

10.3 Inspection

All material and Plant furnished and all work performed under this Contract will be subject to inspection by the Engineer at all times and in all states of completion both off-Site and on-Site. The Contractor shall furnish promptly without additional charge, all facilities, labor and materials reasonably needed for performing such inspection and testing as may be required by the Engineer.

10.4 Approved Sample at Site

The Contractor shall, at all times, keep on the Site approved samples. All such samples shall be made available to the Engineer as and when required.

11. BAR BENDING SCHEDULE

Bar bending (reinforcement bars) schedule of all structural drawings shall be prepared by the Contractor through computer software and submitted in triplicate along with soft copy to the Engineer for approval.

12. DRAWINGS

12.1 Bid Drawings

Bid Drawings issued with the Bidding Documents, called the Bid Drawings, show scope of the work to be performed by the Contractor. The Drawings are generally in sufficient detail so as to be used as a basis for construction, fabrication and for placing orders for materials subject to corrections based on the future issue of supplementary Drawings as provided under Sub-Clause 12.2 hereof.

12.2 Construction Drawings, Supplementary Drawings

After award of Contract, the Bid Drawings will automatically become Construction Drawings,

The Engineer shall have authority to issue to the Contractor, from time to time, such supplementary Drawings and instructions as shall be necessary for the purpose of the proper and adequate execution and completion of the Works and the remedying of any defects therein. The Contractor shall follow these drawings. The Contractor shall study the details and drawings provided in the Bid for their sufficiency to carry out the Construction works and shall provide along-with the Programme a schedule of requirement for any further detail/drawing/information which he may require during the Construction activities.

12.3 Definition of Term Drawings

The term Drawings as used in the Specifications means the Drawings referred in Clauses 12.1 and 12.2 above.

12.4 Checking of Drawings

The Contractor shall check all Drawings carefully as soon as practicable after receipt thereof, and shall promptly notify the Engineer of any errors discovered.

12.5 Copies of Drawings

Drawings will be issued to the Contractor as described below.

12.5.1 Bid Drawings (at Construction stage)

Three (3) sets of the Bid Drawings will be issued to the Contractor at the time of Construction free of charge. Additional sets will be provided at cost of reproduction to be borne by the contractor upon written request of the Contractor.

12.5.2 Supplementary Drawings

Three (3) prints of each supplementary Drawing will be issued to the Contractor free of charge. Additional sets will be provided at cost of reproduction to be borne by the contractor upon written request of the Contractor.

12.6 Drawings to Be Furnished By the Contractor

The Contractor shall submit to the Engineer for review, such drawings as are required under the Contract, sufficiently in advance of the work intended to be executed.

12.6.1 Reinforcement Drawings

Reinforcement placement drawings and bar bending schedules (to be provided by the Contractor as per clause 11 above) of all RCC work shall be prepared by the Contractor and submitted in triplicate to the Engineer for approval, sufficiently in advance of the works in which they are intended to be used.

12.6.2 Shop Drawings

- (a) The Contractor shall submit to the Engineer for review three (3) copies of all drawings to be issued for setting out, fabrication, supply order and construction; based on data, requirements, dimensions, details, codes, standards and design provided in the drawings issued by the Engineer. Such drawings shall be submitted at least fourteen (14) days before they are required for use. The Engineer may notify the Contractor that a drawing fails to comply with the relevant requirement of the Contract, in which case the drawing shall be rectified and resubmitted for approval at the Contractor's cost. Fabrication or construction shall not commence on any part of the Works until the shop drawings or construction drawings for that part of the Works have been approved by the Engineer.

The Works shall be executed in accordance with the drawings as approved by the Engineer. If the Contractor wishes to modify any approved drawings, he shall immediately notify the Engineer and submit revised drawings for approval. If the Engineer instructs that further drawings are necessary for executing the Works, the Contractor shall prepare such drawings and submit them for approval.

The Contractor at his cost shall rectify errors, omissions, ambiguities, inadequacies and other defects.

Approval by the Engineer, in accordance with this paragraph, shall not relieve the Contractor of any of his responsibilities under the Contract.

- (b) The shop drawings shall be properly identified indicating the part of the Works, the name of the contractor / supplier etc., the date of preparation and the dates of all revisions. The Shop Drawings shall be complete and shall show the design dimensions, proposed materials to be used, finishes, type of shop paint and all other details in connection thereto.
- (c) Where adjoining work requires shop drawings, the Contractor shall prepare and submit composite shop drawings, which shall show and define the work under all affected trades. If the Contractor executes work before coordinating with other trades so as to cause interference with work of those trades, he shall make changes necessary to correct the conditions without extra cost to the Employer.
- (d) No changes shall be made by the Contractor in the resubmitted shop drawings in excess of the corrections spelled out by the Engineer and in a separate note on the shop drawings.
- (e) No work in the shop shall be started and no material or plant ordered until the Engineer has approved the shop drawings. It shall be the responsibility of the Contractor to submit the shop drawings on a schedule that allows reasonable time for checking and approval and subsequent fabrication. Failure to submit shop drawings in ample time for checking, correcting, and rechecking will not justify extension of time for completion of the Works.

- (f) The Contractor shall also check and verify all site measurements whenever requested by other Specialist Contractors or by other Sub-Contractors to enable them to prepare their own shop drawings and pass on the information with sufficient promptness, so as not to delay the work in any way. A copy of all such information passed on shall be given to the Engineer.

12.6.3 As-Built Drawings

The Contractor shall, at all times, keep on Site a separate set of prints of all drawings on which all significant changes between the work shown on the Drawings and that which is actually constructed, shall be noted neatly, accurately and promptly as the work progresses. The Subcontractor(s) for plumbing, mechanical and electrical shall, at all times, keep on Site, a separate set of prints of the drawings (showing their parts of the Works) on which all significant changes between the work shown on the Drawings and that which is actually constructed, shall be noted neatly, accurately and promptly as the work progresses. Such drawings shall show the exact physical location and configuration of the works as actually installed.

The Contractor shall, within fourteen (14) days of issuance of Taking-Over Certificate for whole of the Works, furnish to the Engineer for his approval two (2) copies of such marked up drawings. One (1) copy of each of the marked-up drawings approved by the Engineer shall be returned to the Contractor by the Engineer and these shall be used for the preparation of the As - Built Drawings. The Contractor shall furnish to the Engineer/Employer 6 copies, one reproducible and a soft copy on CD of all drawings amended to comply with the Works as built. The price of such Drawings and copies (including CD) shall be deemed to be included in the Contract Price.

13. PROTECTION OF THE WORKS

The Contractor shall whenever necessary cover up and protect the works from weather and damage by his own or other workmen performing subsequent operation. The Contractor shall provide all necessary dustsheets, barriers and guard rails and clear away the same at completion.

14. RESTORATION AND CLEANING

Upon completion of the works the Contractor shall restore all items covered by the Contract to the satisfaction of the Engineer. Special care shall be taken by the Contractor that the roads and right of ways around the Site are not damaged or blocked to traffic during the period of Construction activities at Site. Should any of the roads are damaged due to any operation of the Contractor or his Sub-contractors, the same shall be immediately repaired by Contractor. If the traffic on the roads is blocked due to any movement of Contractors machinery of equipment, the Contractor shall make alternate arrangement/diversions for the flow of traffic and maintain necessary personnel to control/monitor the same.

The Contractor shall do regular cleaning and clear away all rubbish and excess materials that may accumulate from time to time on completion and before handing over. Upon completion of the works he shall obliterate all signs of

temporary construction facilities such as work areas, structures, foundations of temporary structures, stock piles of excess or waste materials, or any other vestiges of construction, as directed by the Engineer. All buildings shall be cleaned; floors and paving scrubbed and the works and site shall be left in a clean and satisfactory state for immediate use and occupation. Care shall be taken not to use any cleaning materials, which may cause damage to the surface to be cleaned.

The Contractor shall also take all necessary precautions to keep the works and site free from vermin during construction and he shall leave the works vermin free on completion. Application of pest control agents shall not commence until the specific product, name, method and extent of application have been submitted to and approved of by the Engineer.

15. SITE OFFICE AND TEMPORARY FACILITIES TO BE PROVIDED BY THE CONTRACTOR

15.1 Contractor's Office, Facilities Etc.

The Contractor shall establish and maintain a Site office. The Contractor shall provide all facilities in connection with the execution, completion, of the Works, remedying defects therein and maintenance of the utility's services. The facilities shall not be limited to the Contractor's Site Office, labor camps, work yard and storage areas, temporary water supply, waste water disposal, temporary electricity, medical unit, temporary roads, fire protection and firefighting equipment etc. The Contractor shall be solely responsible for arranging all utilities and the Contractor shall setup, maintain and operate an architectural and engineering facility at site with adequate number of technical and support staff as well as equipment required for particular nature of job covered under the Contract to prepare drawings/shop drawings for approval of the Engineer.

The Contractor shall make arrangements for his own camp, workshops, yards, storage areas, and areas for erection of equipment, offices within the site area available at site.

15.2 Temporary Roads

The Contractor shall prepare and maintain such temporary roads as may be necessary, from the site to the nearest road and also within the plot. Such roads shall be positioned strictly in accordance with the Engineer's instructions and the Contractor shall reduce or control any dust nuisance by regularly spraying water and compaction as directed.

15.3 Temporary Services

The Employer may if requested allow the Contractor the use of Services, such as Electricity, water, gas, etc. (if the same are available with the Employer at Site) provided that the Contractor shall take all responsibility for their maintenance, upkeep, further connections for his use, etc. and shall bear all costs in this regard. Furthermore, the Contractor shall also be responsible for the payment of consumption charges for services used. If the Contractor requires the

connection(s) to be up-graded or enhanced he shall do so on his own and all charges in this regard shall be borne by the Contractor.

15.3.1 Temporary Water Supply

The Contractor shall supply in sufficient quantity all necessary potable and other water for construction purposes for all trades at points within a reasonable distance of any building

being constructed. The Contractor shall make arrangements and pay charges for water service installation, maintenance and removal thereof, and pay the costs of water for all trades.

At completion of the work, the temporary water services equipment and piping shall be removed by the Contractor at his own expense.

15.3.2 Temporary Electricity

The Contractor shall make all the necessary arrangements for a temporary electricity service, pay all expense in connection with the installation, operation and removal thereof and pay the costs of electricity consumed by all trades. If the Contractor is un-able to arrange a temporary electrical connection, then he shall arrange and furnish an Electric Power Generating set at site and maintain the generating set-in perfect working condition through-out the duration of Contract. The generating power of the set shall be sufficient to operate all plant and equipment as well as the camps and offices of the Contractor and the offices of the Engineer/Employer, during construction at site. Should the set fail to meet the required demand at site or fail to function or operate, the Contractor shall immediately replace the same with other generating set/s to the satisfaction of the Employer as well as the Engineer.

A temporary lighting system shall be furnished, installed and maintained by the Contractor as required to satisfy the minimum requirements for safety and security and to the satisfaction of the Engineer.

At completion of construction work, temporary electricity services shall be removed by the Contractor at his own expense.

15.3.3 Waste Disposal

The Contractor shall make such temporary provisions as may be required in order to dispose of any chemicals, fuels, oils, grease, bituminous materials, waste and soil waste and the like without causing pollution to either the site or the environment. Disposal of any materials, wastes, effluent, garbage, oil, grease, chemicals and the like shall be in areas specified by the concerned local authority proposed by the Contractor and subject to the approval of the Engineer. If any waste material is dumped in unauthorized areas the Contractor shall remove the material and restore the area to the condition of the adjacent undisturbed area. If necessary, contaminated ground shall be excavated, disposed off as directed by the Engineer and replaced with suitable fill material compacted and finished with topsoil all at the expense of the Contractor.

15.3.4 Fire Protection

The Contractor shall provide and maintain adequate fire protection in the form of barrels of water with buckets, fire bucket tanks, fire extinguisher, or other effective means ready for instant use, distributed around the project and in and about temporary inflammable structures during construction of the works. Gasoline and other flammable liquids shall be stored in and dispensed from safety containers approved by the Engineer and storage shall not be within building. Torch-cutting and welding operations performed by the Contractor shall have the

approval of the Engineer before such work is started and a chemical extinguisher is to be available at the location where such work is in progress.

The Contractor shall follow the instructions and specifications of the Civil Defense Department or any other local department concerned with such activities.

15.4 Sign Board

The Contractor shall erect and maintain at the Site in a location to be approved by the Engineer one (01) Sign Boards of dimensions approved by the Engineer. The Sign Boards shall be made of metal. It shall be mounted on steel posts securely anchored and braced. The Contractor shall paint on the Sign Boards, the name of the Works, and the names of the Employer, Engineer and the Contractor both in English and Urdu Language.

15.5 Site Office for Engineer and Employer

The Contractor shall construct, provide, furnish and maintain for Engineer, a site office as per his requirement.

The said offices shall be provided by the Contractor within twenty-eight (28) days of the receipt by the Contractor of Engineer's Notice to Commence or twenty-one (21) days of the payment of the first half of the Mobilization Advance, whichever is earlier.

The site office shall be maintained by the Contractor.

No payment shall be made to the Contractor for the works involved under this Sub-Clause.

15.6 Site Facilities to Be Provided by the Contractor**15.6.1 General**

Without prejudice to the generality of the various clauses of the Contract, particular attention is drawn to the obligation of the Contractor to make his own arrangement at his own expense for the following.

15.6.2 Labour Camps and Staff Residences

The Contractor shall provide, operate and maintain labor camps and staff residences and are required for the proper and efficient progress of the work to house his own employees. For the purposes of operation and maintenance of the

Camps and Residences, the Contractor shall comply with the rules of Pakistan Labor Camp Rules 1960 and all other applicable provisions of the Pakistan Labor Laws.

15.6.3 Administrative and Field Office

The Contractor shall provide, operate and maintain administrative and field offices required for his staff and would be responsible for Operation and maintenance, furniture, equipment, appliances, janitor services and security of the same.

15.6.4 Work yards and Storage Areas

The Contractor shall provide, operate and maintain all sheds, fencing, foundations and all above ground structures required to store material or equipment brought on to the site by him. The Contractor shall be responsible for the security of his entire camps, residence, site and field offices work yard and storage area.

15.6.5 Medical Care

The Contractor shall arrange provision of adequate medical facilities for his employees. Adequately equipped and properly staffed first aid stations or dispensaries shall be provided by the Contractor at camps and other strategic locations, to administer first aid treatment at all times free of charge to all persons on the Site, including personnel of the Engineer and the Employer. The nature, number and location of facilities furnished and the Contractor's staff for administering first-aid treatment shall meet the requirements of the Health Services of the Government of Pakistan and of Section III of the Manual "Safety Requirements for Construction by Contract", published by the Employer, and shall be subject to approval by the Engineer.

15.6.6 Other Facilities

The Contractor shall also be responsible for providing at his own cost other facilities for his own staff and labour such as educational, recreational, transport, telephone and catering if required.

16. CONSTRUCTION PROCEDURES

The Contractor shall advise the Engineer of proposed construction procedures in accordance with the General Conditions of Contract.

If the Engineer shall see that the work progress is slow in such a way that the work will not be completed in the time specified, then he shall order the Contractor to work overtime or in more shifts and the Contractor shall obey these orders without any additional payments and without any objections or request for compensation.

17. NOTIFICATION TO ENGINEER

The Engineer shall be notified weekly in writing of the nature and location of the Works the Contractor intends to perform the next week so as to enable necessary inspection and measurement to be carried out. The Engineer may, if necessary, direct that longer notice be given of certain operations.

18. NIGHT WORK

When work is done at night the Contractor shall maintain from sunset to sunrise such lights on or about his work and plant as the Engineer may deem necessary for the proper observations of the work and the efficient execution thereof.

19. WEATHER

No work is to be undertaken when, in the opinion of the Engineer, the weather is so unsuitable that proper protection of the work cannot be ensured.

20. CO-ORDINATION WITH OTHER CONTRACTORS

The Contractor shall take cognizance that during the execution of the project, other Contractor will be working concurrently on this site. It shall be the responsibility of the Contractor to keep-up good relations with other Contractors employed on site by the Employer. The Contractor shall cooperate and coordinate his work with that of the other Contractors working at the Site, to whatever extent may be necessary to complete the Project in accordance with the approved programme of the Works and in accordance with the Engineer's instructions. Should a disagreement or dispute arise between the Contractor and other contractors, the same shall be referred without delay to the Engineer for his decision. Upon such decision, the Contractor shall proceed with the work in accordance therewith. In case the access to the works of other contractors is through the Site area of the Contractor, the Contractor shall coordinate

with and permit all reasonable access to other Contractors. With a view to coordinate the works, the Engineer may from time to time direct the order of the works to be carried out. Should a disagreement or dispute arise between the Contractor and other contractors, the same shall be referred without delay to the Engineer for this decision, upon such decision. Upon such decision, the Contractor shall proceed with the work in accordance therewith.

The Contractor shall ensure that the necessary safety precautions will be observed and interferences shall be avoided especially for the works executed side-by-side by different Contractors.

No payment shall be made to the Contractor for the works involved under this Sub-Clause.

21. ACCIDENT PREVENTION, SAFETY MEASURES AND PROTECTIVE EQUIPMENT

The Contractor shall comply and enforce compliance by all his sub- contractors with the highest standards of safety and accident prevention in accordance with international standards and in compliance with all applicable laws, ordinances and statutory provisions.

The Contractor shall provide and maintain all requisite barriers, fences, warning signs, lights and other safety precautions as required for the protection of persons and property on or adjacent to the site.

The Contractor shall also provide and maintain all false work, scaffolding and handrails which shall be well constructed and secured at all times. Where overhead work is being carried out, warning signs shall be installed at ground level clearly warning of the overhead work.

All warning signs shall be in two languages, English and Urdu, and shall at all times be maintained in a clean and legible condition, to the satisfaction of the Engineer.

All the Contractor's personnel shall be provided with safety helmets, colour coded according to international standards which shall be worn at all times by Contractor's personnel on the site except when in the offices. Adequate supply of these helmets shall be provided by the Contractor for the use of the Employer, the Engineer and his staff and any visitor. Contractor shall ensure that workers are provided with proper clothing, suitable for the type of operation being carried out. No loose clothing shall be allowed. Furthermore, all the Contractor's personnel shall be provided with gloves, safety boots, safety harness, safety vests and other protective clothing suitable for the nature of work they are performing and their working environment.

Safety netting shall be provided at all levels where work is in progress, all around the building where work is in progress,

As the work at site is expected to be carried out round the clock, the Contractor shall keep and maintain at all times a transport facility to move the patients to the hospital in case of an emergency. Trash shall be removed at frequent intervals to the satisfaction of the Engineer.

22. SETTING OUT OF WORK AND SURVEY

22.1 Reference Points, Lines

The Contractor shall establish benchmarks and / or reference line at the Site in accordance with the instructions of the Engineer. The Contractor shall set out its work from these benchmarks and lines. The Contractor shall supply plant, equipment, materials and labour for checking if required of the survey control by the Engineer. Slope stakes will be set by the Contractor before commencement of excavation and will be re-established as required during progress of work using established bench-marks and reference points.

22.2 Verification

The Engineer may make checks as the work progress to verify lines and grades established by the Contractor and to determine the conformance of the work as it progresses with the requirements of the Drawings and Specifications. Such checking by the Engineer shall not relieve the Contractor of his responsibility to perform all work in accordance with the Drawings and Specifications and the lines and grades given therein.

Based upon the basic control, the Contractor shall provide his own primary control points, as needed for the Works, and shall preserve and maintain them until otherwise authorized.

The Contractor shall be responsible for maintaining all survey markers/monuments, and property corners. If any markers/monuments are destroyed by the Contractor, the Contractor shall arrange, at his own cost, to retrace and replace them to the entire satisfaction of the Engineer. If a monument cannot be replaced in its original position, the Contractor shall install a witness corner. The Contractor shall complete and file monument reference cards on all monuments as per instructions of the Engineer.

The Contractor shall provide experienced construction surveyors with adequate experience in the construction surveys similar in nature as required by this Contract.

Based upon established basic control monuments the Contractor shall establish all lines and grades necessary to control the Works, and shall be responsible for all measurements that may be required for execution of the Works to the tolerance prescribed below.

The Contractor shall perform such surveys and computations as are necessary to determine quantities of work performed or placed during each progress payment period, and shall also perform all surveys necessary for the Engineer to determine final quantities of work in place. The Engineer will determine final quantities based on original ground levels determined by the Contractor and agreed by the Engineer.

The Contractor shall notify the Engineer at least one week before performing a quantity survey and, unless specifically waived, quantity surveys shall be performed in the presence of an authorized representative of the Engineer.

Degree of accuracy for the survey works shall satisfy the following specified tolerances:

- (a) Structure points shall be set within 0.01 foot accuracy from point to point, except where tighter tolerances are required.
- (b) Cross-section points shall be located within 0.10 foot, horizontally and 0.01 foot vertically.
- (c) Permissible closing error for a levelling line meant for establishing Temporary Bench Mark (TBMs) shall not exceed $0.045 \times \sqrt{M}$ foot, where M is in miles. The permissible closing error shall be duly adjusted.

The Contractor shall provide all materials, equipment and labour required for surveying work, including, but not limited to, instruments, stakes, spikes, steel pins, templates, platforms, and tools, and except as required to be incorporated

in the work or left in place, all such materials and equipment, shall remain the property of the Contractor. Surveying instruments shall be in perfect working condition and shall be subject to rigid inspection for proper operation at least after every two weeks of use. Defective instruments shall be promptly replaced or repaired and adjusted to the satisfaction of the Engineer.

Survey data shall be recorded in accordance with recognized professional

surveying standards. Original field notes, computations, and other surveying data shall be recorded in the Contractor furnished field books. Notes or data not in accordance with standard formats will be rejected. Illegible notes or data, or use of erasures on any page of a field book will be considered sufficient cause for rejection of part or the entire field book. Copied notes or data will not be permitted; therefore, rejection of part or all of a field book may necessitate re-surveying. Corrections by ruling or lining out errors will be satisfactory.

The cost of all materials, equipment, surveyors and labour required for surveys for the Works and quantity surveys required by this clause shall be deemed to be included in the rates and prices of the various items in the Bill of Quantities and no separate measurement and payment in their respect shall be made.

22.3 Survey Instruments

The Contractor shall maintain at the Site the requisite surveying instruments in perfect working conditions to enable the Engineer's Representative to check levels and lines of the work at all times.

23. ENVIRONMENTAL PROTECTION

The Contractor shall exercise care to protect the natural landscape and shall conduct his construction operations so as to prevent any unnecessary destruction, scarring or defacing of the natural surroundings in the vicinity of the Works. Except where clearing is required for the Permanent Works, approved construction roads and the Temporary Works, and for excavation operations, all trees and native vegetation shall be preserved and shall be protected from damage which may be caused by the Contractor's construction operations and equipment. On completion of the Works, all work areas shall be smoothed and graded in a manner to conform to the natural appearance of the landscape. Where unnecessary destruction, scarring, damage or defacing may occur as a result of the Contractor's operations, it shall be repaired, replanted, or otherwise corrected as directed by the Engineer at no additional cost to the Employer.

24. PAYMENT OF WORK

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

The cost thereof shall be deemed to have been included in the total price quoted by the Contractor.

SPECIFICATIONS- TECHNICAL PROVISIONS

These have been provided in Volume -II.

BILL OF QUANTITIES

BOQ

These have been provided in Volume -III.

TENDER DRAWINGS

These have been provided in Volume – IV



GENERAL MANAGER ADMIN & HR
Quaid-e-Azam Thermal Power (Pvt.) Limited
Government of the Punjab

**First Floor, 7 C-1, Gulberg-III, Lahore
042-35750936-8**

Hiring of Contractor

for

**SHIFTING OF BOUNDARY WALL & MAIN
GATE AT BIKKI POWER PLANT**

TENDER DOCUMENTS

VOLUME-2
TECHNICAL SPECIFICATIONS

OCTOBER – 2022

Project Consultant



MASTER CONSULTING ENGINEERS PVT. LTD.

Architects, Engineers, Town Planners & GIS Experts

119-G, Commercial Area, Phase-I, DHA, Lahore Cantt.

Phone: +092 42 35728412, Fax: +092 42 35896395,

Email: maconsult@hotmail.com, Web: www.masterconsulting.com.pk

**GENERAL MANAGER ADMIN & HR,
Quaid-e-Azam Thermal Power (Pvt.) Limited,
First Floor, 7 C-1, Gulberg-III, Lahore
(042-35750936-8).**

**THE WORK IS
“SIFTING OF BOUNDARY WALL & MAIN
GATE AT BIKKI POWER PLANT”**

**BIDDING DOCUMENTS
VOLUME 2
TECHNICAL SPECIFICATIONS**

Section – 0101	Clearing and Grubbing	1-2
Section – 0130	Stake-out Survey	1-2
Section – 1000	Demolition Works	1-4
Section – 1100	Earthwork	1-12
Section – 2200	Reinforcement	1-6
Section – 2300	Plain And Reinforced Concrete	1-36
Section – 3000	Structural Steel Works	1-8
Section – 4200	Brick Masonry	1-9
Section – 6411	Insulation, Damp Proofing/ Water Proofing & Built-up Roofing	1-7
Section – 6521	Cement Plaster And Pointing	1-6
Section – 6600	Floor And Wall Finishes	1-16
Section – 6700a	Painting	1-7

OCTOBER, 2022

SECTION – 0101**CLEARING AND GRUBBING****1 SCOPE**

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

2 CONSTRUCTION REQUIREMENTS**2.1 CLEARING/ GRUBBING**

The stumps, roots, vegetation, bushes, logs, rubbish shall be cleared and / or grubbed as directed by the Engineer. In areas where clearing and grubbing is required, same shall be carried out to the depth of 0.30 Mtr below natural surface level.

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

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

All trees above 1 Meter and falling within the construction limits shall be felled & removed by the Contractor. The excavation and removal of trees, roots and stumps including backfilling and compacting of holes and restoring the natural ground to the original condition shall be responsibility of the contractor for which no extra payment shall be made to him. The trees, stumps & roots remain the property of the Contractor, which shall be removed by him.

2.2 PROTECTION AND RESTORATION

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

3 MEASUREMENT & PAYMENT**3.1 General**

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.

3.2 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.

3.3 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).

SECTION – 0130

STAKE-OUT SURVEY

1 SCOPE

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

2 MATERIAL AND EQUIPMENT

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

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

3 CONSTRUCTION

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

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

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

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

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

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

4 PAYMENT OF WORK

No payment shall be made for the Works involved within the scope of this section of Specifications unless otherwise specifically stated in the Bills of Quantities or herein. The cost thereof shall be deemed to have been included in the quoted unit rate of other items of the Bills of Quantities.

SECTION-1000

DEMOLITION WORKS

1 SCOPE

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

2 SUBMITTALS

2.1 Method Statement and Details

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

3 DISMANTLING PROCEDURES

3.1 Demolitions shall be performed in an orderly manner and the Contractor shall take all necessary precautions and expedients to prevent damages to the adjacent structures.

3.2 Explosives shall not be used to remove or demolish the Plain and Reinforced Cement Concrete Structures unless otherwise directed by the Engineer.

4 EXECUTION

4.1 Description of Site

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

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

4.2 Notice to Commence Work

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

4.3 Demolitions near Existing Buildings

The Contractor shall be attentive particularly to his obligations under the General Conditions of Contract in respect of those works, which are in close proximity of existing buildings.

4.4 Shoring, Planking and Strutting

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

4.5 Utility Lines

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

4.6 Stockpiling of Demolished Materials

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

5 DISPOSAL

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

6 PROPERTY OF MATERIAL

All materials designated as reusable prior to the start demolition including electrical & mechanical fixtures shall be the property of the Employer and the Contractor shall stack / store these in an approved manner at a place within the site area designated as approved by the Engineer.

7 MEASUREMENT AND PAYMENT

7.1 General

- 7.1.1 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.
- 7.1.2 The item rates quoted by the Contractor shall be deemed to include full compensation of works executed at any depth, floor and at any height except where otherwise specifically stated in the relevant item of the Bill of Quantities or Contract Documents.
- 7.1.3 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.
 - 7.1.3.1 Timber shoring, planking, strutting and providing slope for upholding the sides of demolished work.
 - 7.1.3.2 Stacking of reusable materials.
 - 7.1.3.3 Operations and the steps taken for the safety of the existing adjoining structures including danger direction/ diversion sign boards of appropriate size and temporary segregating the area with corrugated sheet steel plates or with brick masonry in mud.
 - 7.1.3.4 Temporary diversion of existing utility lines.
 - 7.1.3.5 Disposal of demolished debris materials out of Municipal limits including loading unloading and spreading.
 - 7.1.3.6 Arrangement of water and power supply for the works, if required.
 - 7.1.3.7 Tools, Plants and equipments used for the demolition.
 - 7.1.3.8 Any damage caused to the structures and installation due to negligence of the Contractors during dismantling operations and their repair/replacement. to the satisfaction of the Engineer.
 - 7.1.3.9 Cleaning and restoring the site to the satisfaction of the Engineer.

7.2 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.

7.3 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).

SECTION - 1100

EARTHWORK

1. SCOPE OF WORK

The work under this section of the specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with earthwork of all underground services and structural units, roads and temporary drainage, stock piling of suitable excavated material, disposal of unsuitable and surplus excavated material, the applicable drawings and subject to terms and conditions of the Contract.

2. SUBMITTALS

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

3. EXPLOSIVES

No explosives are permitted to be used for excavation or any other purpose.

4. EXECUTION

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

4.1 EXCAVATION SUPPORT

- 4.1.1 Prior to Commencing any structural excavation work which is 5 feet or greater in depth, the Contractor shall design an excavation support system.
- 4.1.2 Details of the excavation support system shall be submitted to the Engineer for review and approval at least one week before any excavation work commences. Details of the excavation support system shall be complete with, but not limited to, the following:

- (a) Drawings of the structural support members showing materials, sizes and spacing,
 - (b) Calculations showing the maximum theoretical deflection of the support member.
 - (c) The Contractor shall make a detailed inspection of all adjoining structures and prepare a report on the pre-construction condition of all structures that may be affected during construction of the Works. The report will include photographs, drawings and sketches with levels and dimensions fully illustrating the structure's condition. In particular, it shall note any existing damage or structural inadequacy. Deficiencies and damages shall be suitably marked on the structure in a way that it is not permanently defaced. This report shall be submitted along with excavation support system.
- 4.1.3 The system is to be designed so that no members extend through surfaces exposed in the finished construction and no shoring or bracing is placed under permanent structures.
- 4.1.4 The Contractor shall submit to the Engineer calculations of lateral earth pressure for the full excavation depths, surcharge loads of any description, equipment loads, and forces at various stages of support during excavation, the maximum design loads to be carried by various members of the support system and strut pre-load forces.
- 4.1.5 If the structure support system proposed includes tieback anchors, the Contractor's submitted details shall include drawings that show the profile of the soil in which each anchor is to be installed.
- 4.1.6 Tieback anchors that project beyond the vertical limits of the Site boundary on to adjoining property shall only be permitted if permission to do so is given by the owner of the property in writing. Copies of such written permission shall be submitted to the Engineer along with excavation support system proposals.

4.2 SITE PREPARATION

- 4.2.1 The Contractor shall set out the work and shall be responsible for true and perfect setting out of the same and for correctness of the positions, levels, dimensions and alignments of all parts thereof. If at any time any error in this respect shall appear during the progress of the work, the Contractor shall at his own expense rectify such error, to the satisfaction of the Engineer.
- 4.2.2 The Contractor shall construct and maintain accurate bench marks so that the Lines and Levels can be easily checked by the Engineer.

4.3 EXCAVATIONS

- 4.3.1 Excavation shall include the removal of all material of every name, kind and nature.
- 4.3.2 The major portion of excavations shall be carried out by mechanical excavators and excavated materials disposed off to stock on spoil as directed by the Engineer. The excavation may be done by normal means. Unless otherwise directed by the Engineer, leveling, trimming and finishing to the required levels and dimensions shall be done manually. The material suitable for fill and backfill if approved by the Engineer shall be stockpiled within the limits of whole of the Project Site at locations designated and approved by the Engineer.

Excavated material unsuitable for use as fill and backfill shall be disposed off by the Contractor anywhere outside the municipal limits of the city of project's location or within the limits at locations designated and/or approved by the Engineer.

- 4.3.3 The Contractor shall give reasonable notice that he intends to commence any excavation and shall submit to the Engineer full details of his proposals. The Engineer's approval of any proposal(s) shall not relieve the Contractor of his responsibility with respect to such work.
- 4.3.4 The Contractor shall preserve the completed excavation from damage due to slips and earth movements, ingress of water from any source whatsoever and deterioration by exposure to the sun and the effects of the weather.

All excavations shall be kept free of water and shall be maintained dry to the satisfaction of the Engineer. The Contractor shall prevent surface water and sub-surface water from flowing into the excavation and flooding the project site and surroundings.

Also the Contractor shall take all pre-emptive measures that will not allow water to accumulate in excavations, remove water from excavations to prevent softening of foundation bottoms, under cutting footings and soil changes detrimental to the stability of sub-grades and foundations. Provide discharge lines necessary to convey the water away from the excavations. Convey water, removed from excavation and rain water, to outside the limits in manner that no damages are caused to the surrounding services properties.

- 4.3.5 No blasting will be permitted for excavation or for any other purpose.
- 4.3.6 Excavation for pits, cable trenches, equipment-foundations and other structures shall be taken out to the levels and dimensions shown on Drawings or such other levels and dimensions as the Engineer may direct.
- 4.3.7 Excavation shall extend to adequate distance from walls and footings to allow for placing and removal of forms, installations of services and for inspection, except where the concrete for walls and footings is authorized to be deposited directly against excavated surfaces. Undercutting will not

be permitted. The additional excavation for placing and removal of forms, installation of services, for inspection and generally for working area on slopes for stability shall not be measured for payment and shall be deemed to be included in the rates for excavation as measured net.

- 4.3.8 All excavations in foundations shall be taken to 6 inch above the final excavation elevations shown on the drawings and the last 6-inch shall be trimmed carefully to a smooth and level surface. Immediately after trimming to the final elevation, a layer of blinding concrete shall be placed to the thickness shown on the drawings. All excavations for foundations which have been trimmed and disturbed shall be compacted and covered with lean concrete by the end of the day.
- 4.3.9 No excavation shall be refilled nor any permanent work commenced until the foundation has been inspected by the Engineer and his permission to proceed is given.
- 4.3.10 If excavation for sub-structures are carried below the required level, as shown on the Drawings or as directed by the Engineer, the surplus depth shall be filled in with concrete of same grade as of blinding concrete at the sole cost of the Contractor.
- 4.3.11 The placing of blinding / lean concrete, placing of reinforcement and casting of the permanent works in the excavation shall be carried out in the dry condition.
- 4.3.12 Shoring, where required during excavation, shall be installed to protect workmen and the bank, adjacent paving, structures and utilities. The term shoring shall also be deemed to cover whatever methods the Contractor elects to adopt, with prior approval of the Engineer, for holding the sides of excavation and also for planking and strutting to excavation against the side of roadways and adjoining properties in existing hardcore of any other material. The Contractor will be held responsible for upholding the sides of all excavations and no claim for additional excavation, concrete or other material shall be considered in this respect.
- 4.3.13 Existing utility lines that are shown on the drawings or the locations of which are made known to the Contractor prior to excavation and that are to be retained, as well as utility lines constructed during excavation and backfilling, and if damaged, shall be repaired by the Contractor at his own expense. Any existing utility lines which are not known to the Contractor in sufficient time to avoid damage, if inadvertently damaged during excavation, shall be repaired by the Contractor and adjustment in payment will be made as approved by the Engineer. When utility lines which are to be removed, are encountered within the area of operations the Contractor shall notify the Engineer in ample time for the necessary measures to be taken to prevent interruption of the service.
- 4.3.14 Where applicable the excavation work shall include the excavation above water table and excavation below water table. The Contractor shall provide all plant, equipment, pumps, sheeting, well points as required to keep the water table 3.0 feet below the deepest foundation as shown on the drawings till the completion of foundation works.

- 4.3.15 Before starting the excavation for pipelines, the Contractor shall ensure the correct alignment of the pipeline on the ground the depth and width of excavation of the trench, all in accordance with the Drawings and instructions of the Engineer. The Contractor shall make profile with cement concrete pillars.

Excavation shall be carried out true to lines, levels, grades and widths as shown on the drawings or as directed by the Engineer ensuring proper laying of the pipe line, the bedding fill, construction of chambers for appurtenances and any other structures. The trench bottom shall be graded to provide even and substantial bearing over the specified bedding and of the structure.

Without the written permission of the Engineer, not more than 600 feet of the trench shall be opened in advance of the completed pipeline.

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

4.4 EXCAVATION TOLERANCES

All slopes, lines and grades shall be true, correct and accurate to those shown in the plans or otherwise directed and approved by the Engineer. The sub-grade in cuts shall be accurate to the authorized profile grade for the sub-grade to \pm one inch (1"). Where discrepancies are found in the work the Contractor shall make the necessary corrections.

4.5 FILL AND BACKFILL

- 4.5.1 The backfilling shall include filling under the floors, around and under the foundation trenches, pipes, conduits, ducts and channels.

The backfilling shall include loading, unloading, transporting, placing, stacking, spreading of earth, watering, rolling, ramming and compacting, etc., complete as specified herein.

- 4.5.2 Backfill shall be either using granular backfill material or common backfill as directed and approved by the Engineer. Granular backfill materials shall meet the following requirements.

a) Grading Requirements

mm	Inch	A	B
25	1"	100	100
19	3/4"	60 – 100	75 – 100
4.75	No. 4	50 – 85	55 – 100
2.0	No. 10	40 – 70	40 – 100
0.425	No. 40	25 – 45	20 – 50
0.075	No. 200	0 – 15	5 – 15

b) Material satisfying the requirements of coarse sand falling under soil classification A-3 (AASHTO). In case coarse sand is utilized for granular fill it shall be ensured that the same is confined properly with approved material.

c) The material shall have a plasticity index of not more than six (6) as determined by AASHTO T – 89 and T – 90.

4.5.3 The excavated material if found suitable shall be stockpiled within the free haulage limit of the Project Boundary. This material shall be used for filling/ backfilling if approved by the Engineer and shall be transported by the Contractor anywhere required for the purpose of filling/back-filling work in this Contract.

4.5.4 The Contractor shall provide the approved quality of backfill and fill material required to complete the fill and backfilling work from the places as designated by the Engineer.

Deep filling shall be predominantly granular material and free from slurry mud, organic or other unsuitable matter and capable of compaction by ordinary means.

4.5.5 Sweet soil filling for gardens/ lawns shall be "Loam" type which contains a mixture of clay, silt, sand and some organic matter. It shall retain water well, yet is loose and contains plenty of air pockets for roots to breathe Best of all; it shall be rich in minerals and nutrients vital to plants growth and development. Healthy soils need a balance of mineral nutrients, approximately to the following percentages:

- Calcium: 65 to 70 percent
- Magnesium: 12 to 22 percent
- Potassium: 4 to 5 percent
- Other trace materials

The pH of soil should range between 5.5 and 7.5.

4.5.6 Material for backfilling shall be as approved by the Engineer and shall be placed in layers not exceeding six (06) inches measured as compacted material with sufficient water and compacted to produce in-situ density not less than 95% of the maximum dry density at optimum moisture content.

Depending on the depth of fill the Engineer may instruct increased thickness of successive layers to be placed.

The filling shall be compacted by mechanical means as approved by the Engineer.

- 4.5.7 Filling around pipes and cables shall be carefully placed with fine material to cover the pipe or cable completely before the normal fill is placed.
- 4.5.8 Backfilling of trenches/foundations shall be carried out only after the pipe line/structural works within the excavations have been inspected, tested and approved by the Engineer.
- 4.5.9 Fill shall not be placed against foundation walls prior to approval by the Engineer. Fill shall simultaneously be brought up evenly on each side of the walls as far as practicable. Heavy equipment for spreading and compacting the fill shall not be operated closer to the wall than a distance equal to the height of the fill above the top of footing.
- 4.5.10 Before the start of fill and backfill, the Contractor shall satisfy himself as to the levels and slopes of the fills and backfill shown on the Drawings, the requirements of compaction, the possibility of settlement & all other particulars whatsoever in connection with the filling works.
- 4.5.11 All areas that are filled shall be left neat, smooth and well compacted with the top surface consisting of the normal soil at site, unless otherwise directed.

4.6 TOLERANCES

The stabilization of compacted backfill/fill surface shall be smooth and even and shall not vary more than 3/8 inch in 10 feet from true profile and shall not be more than 1/2 inch from true elevation.

4.7 DISPOSAL OF SURPLUS EXCAVATED MATERIAL

- 4.7.1 The rejected unsuitable material and surplus excavated material shall be disposed off anywhere as directed by the Engineer. No compensation of any lead/lift is admissible and rates quoted shall be deemed to include the same. The surplus excavated material shall be so placed that it will present a neat appearance and not offer any danger to abutting properties.
- 4.7.2 The material shall be declared unsuitable if the soaked CBR (96 hours) is less than five (5) percent or if it falls under A-6 or A-7 of AASHTO Soil Classification.
- 4.7.3 The disposal of surplus/unsuitable excavated material shall include loading, unloading, transporting, stacking, spreading, leveling and / or as directed by the Engineer.

5. CONSTRUCTION OF A CRICKET PITCH

5.1 General

The construction of cricket pitch means the creation of a cricket pitch from scratch. It consists of a meticulous process in which a number of factors need to be taken into consideration. These include the dimensions of the pitch, the profile of the pitch and the precautionary measures to be taken to prevent pitch deterioration.

5.1.1 Pitch Dimensions

The following measurements denote the standard dimensions of a cricket pitch.

Length of pitch	80 feet
Width of the pitch	10 feet
Depth of the pitch	14 inches

5.1.2 Construction Process

Following is a step-by-step process of pitch construction:

5.1.2.1 Analysis of Water Properties

Water in the vicinity of the pitch area should be clinically analyzed to find out its levels of salinity, toxins and impurities since they will play an important role in compaction of the pitch during construction and at the time of preparation.

The natural tendency of saline water is to break up a pitch. If the water in the pitch area is too salty, then the water should be first treated with gypsum before using it for pitch preparation or construction.

5.1.2.2 Selection of Pitch Site

Site selection is a very important consideration for the construction of a pitch. It is necessary that direct sunlight is prevented from interfering with the batsman's line of vision at all times during a match. After determining the exact position of the sun at different hours of play, a North-South direction of the pitch is advisable.

5.1.2.3 Demarcation

The pitch area needs to be demarcated before construction. The demarcation should be done with white powder so that it remains prominent while excavating the areas.

5.1.2.4 Excavation

Once the pitch site is selected, the demarcated area is excavated 14 inches deep. The whole of the pitch area is soaked in water and left untouched till it is dry. This area is then compacted with a heavy roller.

The depth of the excavation of the pitch may vary and should be determined by the exact water level in the area of the pitch block. If the water level is high, excavation should be extended to a deeper level to provide a more solid base.

5.1.2.5 Spraying of Insecticide

Insecticide (chlorphrifos 10-inch x 80-inch per 50mm of pitch) is sprayed on the excavated pitch area to avoid harm caused by insects, termites, weeds or disease after construction. Hollowness weakens the compaction and damages grassroots growth.

5.1.2.6 Sand

A layer of sand will form the base of the pitch. Dust-free sand is used due to its excellent drainage properties. 4 inches of loose sand is spread on the excavated area, soaked in water and rolled dry till a 2-inch compacted layer is attained.

5.1.2.7 Gravel

A 6-inch layer of gravel should be set on top of the layer of sand. It should be rolled with the heaviest roller to attain a 4-inch compacted level. The strength of the gravel should be tested before use since it has to sustain the pressure of heavy rolling.

Note: The gravel layer should be compacted by using a very thin stone screening and water spray while keeping the drainage passages open. At the end of compaction the gravel layer should measure 4-inches.

5.1.2.8 Crush

A 3-inch layer of crush should then be added to the profile of the pitch and rolled to attain a 2-inch compacted level. The tendency of the crush to break into powder should be tested before usage. A study quality of crush needs to be used as this will further consolidate the base.

5.1.2.9 Clay

After the layer of crush is laid, three layers of dry clay each of a depth measuring 3 inches should be spread separately on top of the crush. 2 kilograms of fertilizer (potassium, nitrite and super phosphate) should be mixed in the clay for early and strong root growth. Each layer of clay should be loosened with an iron comb before adding the next layer.

Drying will cause the clay to compact to a 6-inch solid layer. Horizontal cracks will indicate poor construction.

When the clay has been added, compacted and level, the whole profile should be heavily watered to soak the clay right to the base.

The pitch block area should remain soaked for at least one week. This will start the compaction process by the sheer weight of water in the clay.

5.1.2.10 Leveling

A competent surveyor should check the final level of the pitch with a laser. The surveyor will help to find an exact level and should provide a drawing of the areas which need regular attention.

5.1.2.11 Grass

Dhaka grass suitable to the surrounding area's climate, temperature and soil should form the topmost layer of the pitch. The grass sprigs should be planted at 2-inch intervals. It should be ensured that the pitch is kept damp for at least 20 days till the grass shows the sign of growth. Subsequently, watering should be reduced to twice a day (morning and evening).

In the course of grass plantation, some damage will have been done to the surface level. It is important to re-level the surface 3 to 4 times with fine clay. A fairly thin amount of powder clay should be applied to readjust this level. Special care should be taken so that the grass is not smothered and stays visible.

5.1.3 Root System

The most vital part of a successful pitch construction is the establishment of a strong, deep root system for the grass. Roots are vital organs that keep the grass strong and healthy during periods of deterioration that it suffers during preparation and at the time of a match. The roots supply the grass with moisture and essential nutrients which they require to keep them alive during this stressful period. It is very important that every effort is made to keep healthy root system in place for 12 months a year as it is the lifeline of the grass.

Once the pitch is prepared, the grass basically begins to die because of the effects of rolling, lack of water, compaction and wear and tear.

After the conclusion of a match, every effort should be made to rejuvenate the grass plants by removing all dead grass and debris and cleaning the pitch surface with stiff brushes. Regular watering, surface aeration, fertilization and replanting of bare areas to maintain a healthy grass cover over the whole pitch area is essential so that it is much easier to produce a good pitch later on in the season.

6 MEASUREMENT & PAYMENT

6.1 General

- 6.1.1 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.
- 6.1.2 The item rates quoted by the Contractor shall be deemed to include full compensation of works executed at any depth except where otherwise specifically stated in the relevant item of the Bill of Quantities or Contract Documents.
- 6.1.3 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.
 - 6.1.3.1 Designing of excavation support system and all measures required as per the approved excavation support system, including but not limited to, timber shoring, planking, strutting, anchoring, providing slope for upholding the sides of excavations, etc.
 - 6.1.3.2 Any fill with approved material necessitated by over excavation due to fault or convenience of the Contractor except under structural members.
 - 6.1.3.3 Stockpiling the excavated material at approved location within free haulage limit and transporting back suitable material to places requiring fill or backfill.
 - 6.1.3.4 Specified foundation bed preparation.
 - 6.1.3.5 Excavation involved in providing adequate working space around sides of foundation and service line trenches.
 - 6.1.3.6 Providing approved quality fill /backfill material obtained from excavated material or from an approved/specified source.
 - 6.1.3.7 Rolling, leveling, watering & compacting the fill and backfill to specified in-situ density.
 - 6.1.3.8 All laboratory and field tests stipulated in these specifications.
 - 6.1.3.9 Disposal of rejected surplus and unsuitable excavated material at any location directed by the Engineer. No compensation of any lead/lift shall be admissible and rates quoted shall be deemed to include the same.
 - 6.1.3.10 De-watering to keep the foundations dries during construction.

6.2 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.

6.3 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).

SECTION - 2200

REINFORCEMENT

1. SCOPE

The work under this section of specifications consists of furnishing, cutting, fabricating, bending and placing steel reinforcement and Welded wire fabric in any floor and at any height in concrete structures or elsewhere as shown on the drawings or as directed by the Engineer.

2. APPLICABLE STANDARDS

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

British Standards

BS 785	Hot rolled bars and hard drawn wire for the reinforcement of concrete.
BS 4449	Hot rolled steel bars for reinforcement of concrete
BS 4466	Bending dimensions and scheduling of bars for the reinforcement of concrete.
BS 4483	Welded steel wire fabrics.

ASTM Standards

A 305	Minimum requirement for the deformations of deformed steel bars for concrete reinforcement.
A 615/ A 615 M-96	Deformed billet steel bars for concrete reinforcement.
A 185	Welded steel wire fabric for concrete reinforcement.

All reinforcement other than 3/8 inch dia bars shall be deformed hot rolled billet steel bars conforming to ASTM A-615 Grade 60 with Specified Yield Strength not less than 60,000 psi nor more than 78,000 psi and ratio of Ultimate Strength to yield Strength not less than 1.25. 3/8 inch dia bars shall be mild steel deformed bars Grade 40 with a minimum Yield Strength of 40,000 psi.

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

3. SUBMITTALS

3.1 Reinforcement shall be obtained only from manufacturers of Karachi billet/ imported billet as approved by the Engineer. Each consignment of reinforcement steel shall be accompanied by the manufacturer's certificate or shall refer to a previous certificate, if the consignment is from the same batch, showing that the reinforcement steel complies with the specified requirement. If such

certificate is not made available or if the Engineer considers that the manufacturer's tests are inadequate, samples shall be taken for acceptance test from different consignments as the Engineer may direct and shall be tested at the contractor's cost. Should the result of such tests show that the sample does not meet with the specifications the whole consignment shall be rejected and removed from the site at the Contractor's cost.

3.2 Bar Bending Schedules

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

All detailing shall be done as per AC, standards AC1-315 & 318. The Contractor shall obtain approval of the bar bending schedules before starting actual bar bending works.

4. MATERIAL AND SIZE OF BARS

- 4.1 Reinforcement for concrete shall conform to the respective British, ASTM, or other Standards as specified in the Drawings and in the Contract Documents or as may be specified by the Engineer.
- 4.2 Unless otherwise specified, all plain reinforcing bars shall comply with the requirements of BS 4449 for plain mild steel bars and shall have a minimum characteristic strength of 40 ksi.
- 4.3 All reinforcement shall be deformed; Hot rolled Billet steel bars conforming to ASTM A-615 grade 60 with the yield strength of not less than 60,000 psi nor more than 78,000 psi and ratio of ultimate tensile strength/ yield strength not less than 1.25.
- 4.4 Reinforcement shall be free from all loose or flaky rust and mill scale, or coating, including ice, and any other substance that would reduce or destroy the bond. Reduced section steel reinforcement shall not be used.

5. DELIVERY AND STORAGE

5.1 Delivery

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

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

5.2 Storage

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

6. FABRICATING, BENDING & PLACING

- 6.1 Bars used for concrete reinforcement shall be fabricated in accordance with the dimensions shown in the bar-bending schedule approved by the Engineer.
- 6.2 The cutting tolerance for all bars shall be ± 1 inch.
- 6.3 Where an overall or an internal dimension of a bent bar is specified in the schedule, the bending tolerance, unless otherwise stated, shall be as in Table 1.

Table 1: Bending Tolerances

Dimensions of bent bars		Tolerance	
Over Feet	Upto & including feet	plus inch	minus inch
--	3	1/5	1/5
3	6	1/5	1/5
6		1/5	1

- 6.4 Reinforcement shall not be bent or straightened in a manner that will injure the material.

No bars shall be bent twice in the same place, nor shall they be straightened after bending.

Unless permitted by the Engineer, reinforcement shall not be bent after being partially embedded in hardened concrete.

Bars which depend for their strength on cold working shall not be welded or heated for any reason.

- 6.5 Welding shall be permitted for bars only under suitable conditions and with suitable safeguards in accordance with BS 693, BS 1856, or AWS D12.1, provided the type of reinforcing bar has the required welding properties. Tack welding may be used to fix in position bars that cross each other, only with prior approval of the Engineer. Welding shall be done as in lectum structural steel & metal works.
- 6.6 No splice of reinforcement shall be made except as shown on the working drawings.

- 6.7 Reinforcement is to be accurately placed as shown in the drawings, and secured against displacement by using 18-20 gauge black annealed wire ties or suitable slips at intersections and supported from the formwork by using concrete, metal or plastic chairs and spacers or hangers of an approved pattern. Where concrete blocks are used for ensuring the cover, they shall be made of mortar not leaner than 1 part of cement to 2 parts of sand.

Where the concrete surface will be exposed to the weather in the finished structure, the portions of all accessories in contact with the formwork shall be galvanized or shall be made of plastic.

- 6.8 Concrete clear cover for reinforcing steel shall be as follows:

Structural Members	Minimum Cover (inches)
a) Concrete cast against and Permanently exposed to earth	3
b) Concrete exposed to earth or weather:	
For reinforcing bars # 6 or larger	2
For reinforcing bars less than # 6	1-1/2
c) Concrete not exposed to weather or in contact with ground:	
Slabs, Walls	3/4
Beams, Columns: (Primary Reinforcement)	1-1/2

- 6.9 Bars shall be placed to the following tolerances:

1. Concrete cover to formed surfaces	$\pm 1/4$ inch
2. Minimum spacing between bars	- $1/4$ inch
3. Top bars in slabs and beams	
a. Members 8 inch deep or less	$\pm 1/4$ inch
b. Members more than 8 inch but not over 2 feet deep	$\pm 1/2$ inch
c. Members more than 2 feet deep	± 1 inch
4. Crosswise of members: spaced evenly within	2 inch
5. Lengthwise of members	± 2 inch

- 6.10 Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits, or embedded items. If bars are moved more than one bar diameter or enough to exceed the above tolerances, the resulting arrangement of bars shall be subject to approval of Engineer.
- 6.11 Vertical bars in columns shall be offset at least one bar diameter at lapped splices. To ensure proper placement, templates shall be furnished for all column dowels.
- 6.12 Exposed reinforcement intended for bonding with future extensions is to be effectively protected from corrosion. Protection is also to be provided to reinforcement partly built into concrete where the exposed part is to be built into later concrete.
- 6.13 All reinforcement, at the time concrete is placed, shall be free of loose mill scale, loose rust mud, oil grease, or other materials that may adversely affect or reduce the bond.
- 6.14 No concreting is to be carried out until the reinforcement has been checked and approved by the Engineer.

7. MEASUREMENT & PAYMENT

7.1 General

- 7.1.1 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.
- 7.1.2 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.
- 7.1.3 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.
 - 7.1.3.1 Providing and installing chairs, supports, hooks, spacers, binding wires, and laps not shown on drawings including wastage and rolling margin. Laps shown on drawings shall be payable.

- 7.1.4 The Contractor shall not claim for the difference in the actual weights of bars and their standard weights given in Table-2 below.

Table 2: Reinforcement Bars Weight

Nominal Bar Diameter (Inches)*	Bar No.	Weight lbs/ft.
1/4"	-	0.167
3/8"	#3	0.376
1/2"	#4	0.668
5/8"	#5	1.043
3/4"	#6	1.502
7/8"	#7	2.044
1"	#8	2.670
1-1/8"	#9	3.400
1-1/4"	#10	4.303
1-3/8"	#11	5.313

Conversion from lbs to kg

2204.60 Lbs = 1.00 M. Tonne (1000 kg)

* to the nearest 1/7"

7.2 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.

7.3 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).

SECTION - 2300

PLAIN AND REINFORCED CONCRETE

1 SCOPE

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

2 GENERAL

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

3 CODES AND STANDARDS

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

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

ASTM C 150-latest	Standard specifications for Portland cement.
ASTM C 260-latest	Standard specifications for air-entraining admixtures for concrete.
ASTM C 309-latest	Specification for liquid membrane-forming compounds for curing concrete
ASTM C 404-latest	Standard specifications for aggregate for masonry grout.
ASTM C 494-latest	Standard specifications for chemical admixtures for concrete.
ASTM C 566-latest	Standard test method for total moisture content of aggregate by drying.
ASTM C 869-latest	Standard specifications for foaming agents used in making preformed foam for cellular concrete.
ASTM D 596-latest	Reporting results of water analysis.
ASTM D 1190-latest	Standard specifications for concrete joint sealer, hot-poured elastic type.
ASTM D 1751-latest	Standard specifications for preformed expansion joint filler for concrete paving and structural construction (non-extruding and resilient bituminous types).
ASTM D 1752-latest	Preformed sponge rubber and cork expansion joint fillers for concrete paving and structural construction.
BS 12-latest	Specifications for ordinary and rapid hardening Portland cement.
BS 3148-latest	Methods of tests for water for making concrete.
PS 232-latest	Portland cement (ordinary, rapid hardening and high strength)
PS 243-latest	Concrete coarse and fine aggregates from natural sour.
PS 279-latest	Abrasion of coarse aggregates by the use of Los Angeles machines.
PS 280-latest	Method of test for determination of aggregates crushing value
PS 281-latest	Method of test for organic impurities in sand for concrete aggregates.
PS 283-latest	Method of test for soundness of aggregates by the use of sodium sulphate or magnesium sulphate.
PS 284-latest	Sampling aggregates for concrete
PS 285-latest	Method of test for sieve or screen analysis of fine and coarse aggregates
PS 286-latest	Description and classification of mineral aggregates
PS 421-latest	Sampling of fresh concrete
PS 560-latest	Making and curing concrete compression test specimen in the field
PS 612-latest	Sulphate resisting Portland cement type 'A'
PS 716-latest	Mixing and sampling of fresh concrete in the laboratory
PS 717-latest	Test for concrete compacting factor
PS 849-latest	Making and curing concrete compression test cubes
PS 1638-latest	Fresh concrete, determination of consistency slump test.

4. SUBMITTALS

4.1 Delivery and Storage Record

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

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

4.2 Details of Constructional Plants

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

4.3 Shop Drawings

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

4.4 Methodology

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

The method statement shall also include proposals for:

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

4.5 Samples and Specimens

The Contractor shall submit to the Engineer for his approval:

- Samples and specimens of all constructional materials together with the supplier/manufacturer's literature containing his instructions/recommendations. Afterwards the approved samples of aggregate, admixtures and the embedded items shall be submitted properly labelled and identified for future reference.

- Samples of precast concrete units for inspection, testing and for the Engineer's review and approval.
- A minimum of two units or portions of units of each of the architectural and In-situ concrete, of a size as required by the Engineer, shall be submitted. These specimens will be reviewed and approved on the basis of colour, texture, dimensional accuracy, surface finish and general appearance.
- Samples/specimens, when accepted, will describe the allowable limits between which variation can be acceptable.
- Approved specimen/samples shall remain at Site, well protected from damage and dilapidation, as required by the Engineer.

4.6 Certificates and Mill-Test-Data

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

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

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

4.7 Results of Routine Tests and Daily Reports

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

4.8 Bar-Bending Schedule

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

4.9 Concreting Record

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

The returns shall include but shall not be limited, to the following information:
For each specified grade and type of concrete

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

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

5. TOLERANCES

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

These tolerances are not cumulative.

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

5.1 Cast in Place Concrete

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

Table-A

Columns,piers,walls and arrises	Exposed corner columns, control joint grooves and other conspicuous lines
In any length or height 3m 6mm	In any bay or 6m length or height 10mm
In any storey or 6m height 10mm	Maximum for the entire length or height 13mm
Maximum for the entire length 25mm	

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

Table-B

Columns,piers,walls and arrises	Exposed corner columns, control joint grooves and other conspicuous lines
In any 3m length or height 6mm	In any bay or 6m length 6mm
In any bay or 6m height 13mm	Maximum for the entire length 13mm
Maximum for the entire length 19mm	

VARIATION FROM POSITION IN PLAN: Variation of the linear building lines from established position in plan and related position of columns, walls

and partitions shall not exceed 13mm in any bay of 6m nor a maximum of 25mm in the entire length.

VARIATION IN LOCATION OF OPENINGS: Variation in the sizes and locations of sleeves, floor openings, and wall openings shall not exceed a maximum of 13mm.

VARIATION IN DIMENSIONS: Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls shall not exceed minus 25mm nor plus 13mm.

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

Table-C

Dimension in Plan	Misplacement or eccentricity	Thickness
Minus 13mm Plus 50mm	2% of footing width in the direction of misplacement but not more than 50mm.	decrease 5% increase No limit

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

VARIATION IN STEPS: Variation in consecutive steps shall not be more than 2mm in rise and 3mm in tread. The maximum variation in the flight of stairs shall not be more than 3mm in rise and 2mm in treads.

5.2 Precast Concrete

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

Table-D

Variation in Overall dimensions of members	1 m	per 2mm
<ul style="list-style-type: none"> — Variation in Cross-sectional dimensions: <ul style="list-style-type: none"> * sections less than 75mm * sections over 75mm and less than 450mm * sections over 450mm — Deviations from straight line in long sections — Deviation from specified camber — Maximum differential between adjacent units in erected position 	<ul style="list-style-type: none"> Not more than per 3m. 3m of span 	<ul style="list-style-type: none"> 3mm 7mm 3mm 2mm 6mm

5.3 Pavements

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

- | | |
|---|------|
| – Established alignment | 6mm |
| – Established longitudinal grade on any line | 13mm |
| – Transverse template contour except at transverse joints | 3mm |
| – Transverse template contour at transverse joints in width of one traffic lane | 6mm |

6. QUALITY ASSURANCE

6.1 Cement

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

6.2 Aggregate - Requirements

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

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

6.3 Sampling and Testing of Aggregate

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

6.4 Deleterious Substances

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

Table-E

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

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

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

Table-F

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

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

6.5 Moisture Control

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

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

6.6 Admixtures

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

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

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

6.7 Testing Facilities

The Contractor shall make arrangement for testing of cylinders to be fixed by the Engineer from time to time shall be tested from an approved laboratory. Concrete strength shall be determined on the basis of test cylinders, however with the approval of the Engineer compressive strength may also be controlled on the basis of test cubes. The cube strength in such case shall be multiplied by a relevant factor shown in Table-M or as agreed by the Engineer to arrive at the cylinder strength.

7. CONCRETE MIX DESIGN

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

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

8. INSPECTION AND TESTING

8.1 Inspection

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

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

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

8.2 Testing of Concrete

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

STRENGTH TESTS DURING THE WORK: Strength tests of the concrete placed during the course of the work shall be made by the Contractor. The Contractor shall test, for control purposes, such number of cylinders as the Engineer may direct. In general three set of three cylinders shall be taken from each 7 cubic meter or fraction thereof or from each day's pour, whichever is less, of each class of concrete placed. Test specimens shall be made and cured in accordance with the applicable requirements of ASTM C-31. Specimens shall be cured in the manner and environments as the pertinent structure.

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

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

TESTS OF HARDENED CONCRETE IN OR REMOVED FROM THE STRUCTURE: Where the results of the strength tests of the control specimens indicate that the concrete as placed does not meet Specification requirements, or where there is other evidence that the quality of the concrete is below Specification requirements, core-boring tests will be made by the Engineer in accordance with the applicable requirements of ASTM C-42. If the concrete in the structure will be more than superficially wet under service conditions, the cores shall be immersed in water for at least 48 hours and tested wet. In the event that the core-boring test indicates that the concrete placed does not conform to the Drawings and Specifications, measures as prescribed by the Engineer shall be taken to correct the deficiency. However, the Engineer shall have the authority to prescribe such corrective measures, and the Contractor shall take such measures if in the Engineer's opinion the results of the test specimens, without coring, warrant such action. If a strength deficiency is found and is in the opinion of the Engineer due to the Contractor's fault or negligence, the entire cost of replacing faulty concrete or carrying out prescribed corrective measures shall be borne by the Contractor who shall also reimburse the Employer for the cost of making tests. Otherwise, payment for removing and replacing faulty concrete or carrying out prescribed corrective

measures will be made under applicable Items of the Bill of Quantities as determined by the Engineer.

RELATION BETWEEN ALLOWABLE STRENGTH AND CONTROL TEST CYLINDER STRENGTH: Where cylinders are made by wet screening of concrete with aggregate greater than 38mm size, such as 75mm aggregate concrete, the cylinders will be required to have a compressive test strength greater than the allowable strength shown on the Drawings, to indicate that the respective concrete in place in the work has the allowable strength shown. The mix design shall be such that the average strength of the specimens tested is greater than the allowable strength shown on the Drawings for the (75mm aggregate) concrete. Such increments over the allowable strength shown will be established by the Engineer after the mix design has been done and prior to mixing of concrete, and shall be approximately ten per cent.

9. DELIVERY AND STORAGE

9.1 Transportation of Cement

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

9.2 Storage of Cement

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

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

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

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

9.3 Storage of Aggregates

Aggregate shall be stored at the Site in such a manner as to prevent its contamination. Aggregate which has deteriorated or which has been

contaminated shall not be used for concrete. All methods employed by the Contractor for loading, unloading, handling and stockpiling aggregates shall be subject to the approval of the Engineer. Sufficient quantities of aggregate shall be maintained at the Site at all times to assure continuous placement and completion of any lift of concrete started.

10. MATERIALS

10.1 CEMENT

10.1.1 General

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

10.1.2 Portland Cement

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

10.2 AGGREGATES

10.2.1 Requirements

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

10.2.2 Composition

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

10.2.3 Source

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

10.2.4 Processed Aggregates

The Contractor in procuring the processed aggregates or in planning his aggregate processing operations shall ensure that the aggregates, as delivered to the mixer, consist of clean, hard and uncoated particles; light weight elements (chalk, clay, coal) are separated by segregation under water by vibration where required and the fines are removed from the coarse aggregate by adequate washing. The coarse aggregate shall be rescreened just prior to delivery to the concrete mixer bins. The moisture content shall conform to the provisions of sub-section 6.5 "Moisture Control". Compliance with the aggregate grading and uniformity requirements shall be determined before the material is delivered at the mixer. All aggregates shall be sieved and washed with clean water. The aggregates shall conform to the specific requirements given hereinafter.

10.2.5 Fine Aggregate

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

Table-G

<i>Sieve size Standard square mesh</i>	<i>Percentage passing (by weight)</i>
9mm	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No.100	2 to 10

The Fineness Modulus shall range between 2.31 and 2.51

10.2.6 Coarse Aggregate

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

TABLE-H Grading Requirements for Coarse Aggregate

		Amounts Finer than Each Laboratory Sieve (Square openings) Weight Percentage												
	Nominal Size (Sieves with Square Openings)	100mm	88mm	75mm	63mm	50mm	38mm	25mm	19mm	13mm	9mm	No.4	No.8	No.100
	88mm to 38mm	100	90 to 100	-----	25 to 60	-----	0 to 15	-----	0 to 5	-----	-----	-----	-----	-----
	63mm to 38mm	-----	-----	100	90 to 100	35 to 70	0 to 15	-----	0 to 5	-----	-----	-----	-----	-----
	50mm to 25mm	-----	-----	-----	100	90 to 100	35 to 70	0 to 15	-----	0 to 5	-----	-----	-----	-----
	50mm to No.4.	-----	-----	-----	100	95 to 100	-----	35 to 70	-----	10 to 30	-----	0 to 5	-----	-----
	38mm to 19mm	-----	-----	-----	-----	100	90 to 100	20 to 55	0 to 15	-----	0 to 5	-----	-----	-----
	38mm to 19mm	-----	-----	-----	-----	100	95 to 100	-----	35 to 70	-----	10 to 30	0 to 5	-----	-----
	25mm to 13mm	-----	-----	-----	-----	-----	100	90 to 100	20 to 55	0 to 10	0 to 5	-----	-----	-----
	25mm to 19mm	-----	-----	-----	-----	-----	100	90 to 100	40 to 85	10 to 40	0 to 15	0 to 5	-----	-----
	25mm to No.4.	-----	-----	-----	-----	-----	100	95 to 100	-----	25 to 60	-----	0 to 10	0 to 5	-----
	19mm to 9mm	-----	-----	-----	-----	-----	-----	100	90 to 100	20 to 55	0 to 15	0 to 5	-----	-----
	19mm to No.4.	-----	-----	-----	-----	-----	-----	100	90 to 100	-----	20 to 55	0 to 10	0 to 5	-----
	13mm to No.4.	-----	-----	-----	-----	-----	-----	-----	100	90 to 100	40 to 70	0 to 15	0 to 5	-----
	9mm to No.8.	-----	-----	-----	-----	-----	-----	-----	-----	100	85 to 100	0 to 30	0 to 10	0 to 5

10.2.7 Particle Shape

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

10.2.8 Soft Particles

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

Table-I		
Size No.	Nominal Size	Weight of Sample in Kilograms
8.	9mm to No.8	0.6
7.	13mm to No.4	1.0
6.	19mm to 9mm	1.5
5.	25mm to 13mm	3.0
4.	38mm to 25mm	4.5
3.	50mm to 25mm	7.0
2.	63mm to 38mm	16.0

10.3 WATER

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

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

10.4 ADMIXTURES

10.4.1 Approval Required

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

10.4.2 Air-Entraining Admixtures

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

10.4.3 Water-Reducing Admixtures

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

10.5 WATERSTOPS

10.5.1 PVC Waterstops

PVC (Polyvinylchloride) waterstops shall be extruded from an elastomeric plastic compound, the basic resin of which shall be polyvinylchloride. The compound shall contain such additional resins, plasticizers, stabilizers or other materials needed to ensure that when the material is compounded and extruded to the shapes and dimensions shown and tested it shall have the physical characteristics when tested by the U.S Corps. Of Engineer test method as shown in Table-J.

Table-J

Corps of Engrs. Tests Method No.	No. of Specimens Tested	Physical characteristics	Requirement
1	2	3	4
568	5	Tensile strength using die III, not less than	12 MPa
573	5	Ultimate elongation using die III, not less than	350%

Corps of Engrs. Tests Method No.	No. of Specimens Tested	Physical characteristics	Requirement
1	2	3	4
570	3	Low temperature brittleness, no sign of failure such as cracking or chipping at	-37° C
571	3	Stiffness in flexure 1/2 inch span, not less than	28 MPa

10.6 JOINT SEALING COMPOUND

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

10.7 EXPANSION JOINT FILLER

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

10.8 NON-SHRINK GROUT

Non-shrink grout of a thickness less than one inch shall consist of one part cement, one part clean sharp sand and 1:22000 to 1:15000 part of grained aluminium powder containing non-polishing agent. Non-shrink grout one inch or more in thickness shall be proportioned as above except that 1.5 parts of 9mm to 6mm (pea-size) gravel shall be added to the mix. The above composition may be varied if so required by the Engineer. In each case, however, the Contractor shall, at his own cost, prepare optimum mix design and conduct testing of the grout composition for strength and non-shrink performance. Pre-mix non-shrink grout from approved manufacturers may also be used as required by the Engineer.

10.9 EPOXY CONCRETE AND MORTAR

10.9.1 General

Epoxy concrete for installation adjacent to embedded metal and epoxy concrete and/or mortar for the replacement of faulty concrete or for other special purposes as ordered or approved by the Engineer shall conform to the requirements specified hereunder. Epoxy concrete and

epoxy mortar shall be mixed in the proportions by such methods and with such equipment as are recommended by the manufacturer of the epoxy resin and approved by the Engineer. The proportions of epoxy mortar and epoxy concrete and the methods of mixing and placing will be subject to change to meet field requirements. The individual batch size of epoxy concrete and mortar which may be prepared at one time shall not exceed the amount that may be mixed, placed and finished in accordance with the manufacturer's instructions as approved by the Engineer.

10.9.2 Materials

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

AGGREGATES FOR EPOXY CONCRETE: The aggregates used for epoxy concrete shall be clean, dry, crushed river cobble gravel $\frac{3}{4}$ inch maximum size. Except for gradation, fine and coarse aggregates shall meet the requirements of ASTM C-33. Gradation of fine aggregate shall be the same as specified in sub-section 10.2.5, except that the percentage passing a No. 100 sieve shall be held to the lower limit specified to the greatest extent practicable. The fine and coarse aggregates used in preparation of epoxy resin concrete shall be oven dry and shall be conditioned to a temperature of 15°C to 21°C prior to mixing the epoxy resin binder. Gradation of the coarse aggregate shall conform to the requirements of Table-K when tested in accordance with ASTM C-136.

Table-K

Sieve Size Standard Sq. Mesh	Per cent passing (by weight)
19mm	100
13mm	90 - 100
9mm	40 - 70
No.4	0 - 15
No.8	0 - 5

The aggregates shall be well graded from coarse to fine.

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

Table L

Sieve Size Standard Sq.mesh	Percentage Passing (by weight)
No. 4	100

No. 8	95 - 100
No. 16	60 - 100
No. 30	35 - 70
No. 50	15 - 35
No. 100	2 - 5
No. 200	0 - 2

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

10.10 VAPOR BARRIER

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

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

The material shall be supplied in rolls and laid by rolling over the prepared surface at the levels and position in the areas shown on the Drawings. Where joint is necessary at the side or end of a sheet, this shall be a double weld folded joint made by placing the edges together and folding over twice continuously taking the top edge prior to concreting. The Contractor shall protect the film sheets from damages during laying and subsequent operations and shall replace at his own cost all damaged film sheets to the satisfaction of the Engineer.

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

11. EXECUTION

11.1 PROPORTIONING OF CONCRETE

11.1.1 General

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

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

11.1.2 Cement Content

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

11.1.3 Aggregate Content

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

11.1.4 Water Content

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

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

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

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

11.1.5 Concrete Strength

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

Table -M

Cylinder Strength (kg/cm²)	Cylinder Strength MPa
70	7
210	21
250	25

11.1.6 Slump

In general, the slump of the concrete, after concrete has been deposited but before it has been consolidated, shall not exceed the values specified below for the structures and/or parts thereof unless otherwise directed by the Engineer. Check slumps shall be taken at the mixer and at locations of placement and or as directed by the Engineer. The Engineer may order the

placement of concrete having lesser slump, wherever concrete of such lesser slumps can be consolidated readily into place by means of the specified vibrations. The use of buckets, chutes, hoppers, or other equipment of types that will not readily handle and place concrete of such lesser slumps will not be permitted. The slump will be determined in accordance with ASTM C-143.

The minimum slump shall be 19mm inch in all cases, except when plasticisers are used with the Engineer's approval. The maximum slump shall not exceed the undermentioned limits:

Mass concrete	50mm
Slabs, floors and foundations	50mm
Columns, beams, walls, parapets etc.	100mm
Other parts	75mm

11.2 BATCHING AND MIXING

11.2.1 Type and Capacity

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

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

11.2.2 Mixers

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

11.2.3 Water Batcher

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

11.2.4 Locations

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

11.2.5 Arrangement

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

Table-N

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

11.2.6 Cooling

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

11.2.7 Scales

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

11.2.8 Mixing Time

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

Table –O

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

11.3 CONVEYING

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

11.4 PLACING

11.4.1 General

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

No concrete shall be placed until all formwork, reinforcement, installation of parts to be embedded, bracing of forms and preparation of surfaces involved in the placing and the method of placement have been approved by the Engineer. Approval of the method of placement proposed will not relieve the Contractor of his responsibility for its adequacy and he shall remain solely responsible for the satisfactory construction of all work under the Contract. Before concrete is placed, all surface upon or against which concrete is to be placed shall be free from standing water, mud, debris or any loose material. All surfaces of forms and embedded material that have become encrusted with dried mortar or grout from concrete previously placed shall be cleaned of all such mortar or grout before the surrounding or adjacent concrete is placed. The surfaces of absorptive materials against or upon which concrete is to be placed shall be moistened thoroughly so that the moisture will not be drawn from the freshly placed concrete. Concrete shall be worked into the corners and angles of the forms and around all reinforcement and embedded items without permitting the material to segregate. Concrete shall be deposited as close as possible to its final position in the forms. The depositing of concrete shall be regulated so that the concrete may be effectively compacted with a minimum of lateral movement into horizontal layers approximately 450mm in thickness. No concrete that has partially hardened or been contaminated by foreign materials shall be deposited in the structure, nor shall retamped concrete be used unless approved by the Engineer. The surfaces of construction

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

11.4.2 Time Interval Between Mixing and Placing

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

11.4.3 Placing Temperature

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

THIN SECTIONS: Concrete for thin sections shall be delivered to the forms at the coolest temperature which is practicable to produce under current conditions but in no case at a temperature in excess of 30°C. Except as otherwise determined by the Engineer, sections to which this provision shall apply shall be less than 450mm in thickness.

MODERATE SECTIONS: Concrete for moderate sections shall have a temperature of not more than 21°C when placed. A moderate section will be one that is greater than 450mm but less than 900mm in thickness.

11.4.4 Blinding Concrete

Where concrete is to be placed on a flat excavated surface or on an excavated surface inclined at not more than 1V: 1.75 H, a 75mm layer of blinding concrete, if not otherwise shown on the Drawings, shall be placed immediately after completion of excavation and cleaning. The upper surface of the blinding concrete shall not be higher than the required cover below the lowest layer of the reinforcing steel. The final excavated level shall be calculated to allow for the 75mm thickness of the blinding layer.

11.4.5 Lifts In Concrete

Concrete shall be placed in lifts or depths as directed by the Engineer. The placement of concrete shall be carried on at such a rate and in such a manner that formation of cold joints is prevented. Slabs shall be placed in one lift, unless otherwise authorized or directed. In walls, lifts shall terminate at such levels as shall conform to structural details. Where slabs and beams are placed continuously with walls and columns, the concrete in walls and columns shall have been in place for at least two hours, or for a longer period when directed by the Engineer, before placing concrete in the

slabs and beams. The top surface of vertically formed lifts shall be generally levelled. The concrete in columns shall be placed in one continuous operation, unless otherwise authorized. In general, the construction joints in beams and slabs shall be located as shown on the Drawings and concrete shall be placed in the sequence indicated on the Drawings or as authorized by the Engineer. The maximum differential in height between the various pours of the structure shall be as shown on the Drawings or as directed by the Engineer.

11.4.6 Elapsed Time between Placement of Lifts

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

11.4.7 Time between Adjacent Pours

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

11.4.8 Concrete for Blockouts

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

11.4.9 Placing Concrete through Reinforcement

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

In certain cases, like the bottom of beams and slabs, the congestion of steel near the forms may make placing difficult. In such cases, as decided by the Engineer, a layer of mortar of a composition compatible with the required concrete strength shall be first deposited to cover the surface to a depth of 16mm.

11.4.10 Vibration of Concrete

Recommended Practice given in ACI-309 shall be followed for concrete consolidation. Concrete shall be compacted with mechanical vibrating equipment supplemented by handspading and tamping. In no case shall vibrators be used to transport concrete inside the forms. The vibrating equipment shall be of internal type and shall at all times be adequate in number of units and power of each unit to properly consolidate all the concrete. Form or surface vibrators shall not be used unless specifically

approved. The intensity (amplitude) of vibration shall be sufficient (frequency not less than 6,000 impulses per minute) to produce satisfactory consolidation. The duration of vibrations shall be limited to that necessary to produce satisfactory consolidation. Excessive surface working will not be permitted.

11.4.11 Precast Cement Concrete

The work to be done under this item consists of manufacturing, storing, handling, transporting and laying precast concrete members as may be required. Materials and methods for precast concrete work shall conform to the applicable requirements of these Specifications - Plain and Reinforced Concrete. Except as otherwise shown or specified, maximum size of coarse aggregate shall be 19mm. Concrete shall be mechanically vibrated in placing. Slump shall be limited to 38mm. Precast concrete shall be water cured for 14 days. Precast units shall not be removed until they have attained at least 75% of their required 28 days strength and shall be picked up only by their lifting hooks. The precast members which are subjected to overstress or otherwise injured during curing or handling shall be removed from the Site by the Contractor.

11.5 EXPANSION, CONTRACTION AND CONSTRUCTION JOINTS

11.5.1 Construction Joints

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

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

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

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

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

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

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

11.6 INSTALLATION OF WATER STOPS

11.6.1 General

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

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

11.6.2 PVC Waterstops

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

11.7 CURING

11.7.1 General

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

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

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

11.7.2 Moist Curing

Concrete shall be moist-cured maintaining all surfaces continuously (not periodically) wet for 14 days immediately following the placing or until covered with fresh concrete. Precast elements shall also be water-cured for 14 days. Curing water shall be removed without allowing stagnant pools of water to form on the exposed lift surface. Water for curing shall comply with the applicable requirements of sub-section 10.3 "Water". Where forms of tongue-and groove or shiplap sheathing are used and are left in place during curing, the sheathing shall be kept wet at all times. When in contact with concrete, steel forms shall be kept wet. Horizontal construction joints and finished horizontal surfaces cured with sand shall be covered with a minimum uniform thickness of 50mm of sand and kept continuously saturated with water.

11.7.3 Liquid Curing Membrane

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

11.8 REPAIR OF CONCRETE

11.8.1 General

Concrete that is damaged from any cause; concrete that is honeycombed, fractured, or otherwise defective; and concrete which, because of excessive surface depressions, must be excavated and built up to bring the surface to

the prescribed lines; shall be removed and replaced with drypack mortar, or concrete, as hereinafter specified. Repair of concrete shall be performed only by skilled workmen and within 24 hours of removal of forms. The Contractor shall keep the Engineer advised as to when repair of concrete will be performed. Unless an inspection is waived in each specific case, repair of concrete shall be performed only in the presence of the Engineer. Repairs shall be made in accordance with the procedures approved by the Engineer.

11.8.2 Materials

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

11.8.3 Protrusions

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

11.8.4 Depressions

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

CONCRETE FILLING: Concrete filling shall be used for holes extending entirely through concrete sections; for holes in which no reinforcement is encountered and which are greater in area than 0.1 square meter and deeper than 100mm; and for holes in reinforced concrete which are greater than 0.05 square meter in area and which extend beyond the reinforcement.

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

DRYPACK MORTAR FILLING: Drypack mortar fillings shall be used for filling holes having a depth nearly equal to, or greater than, the least surface dimension; for narrow slots cut for repair of cracks; for grout pipes recesses; and for tie rod fastener recesses as specified. Drypack mortar shall not be used for filling behind reinforcement or for filling holes that extend completely through a concrete section. If removal of the ends of

form ties results in recesses, the recesses shall be filled with drypack mortar provided that filling of recesses in surfaces upon or against which fill material or concrete is to be placed will be required only where the recesses are deeper than 1 inch in walls less than 300mm thick.

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

11.9 EPOXY CONCRETE AND MORTAR

11.9.1 Mixing and Batching

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

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

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

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

11.9.2 Temperature, Moisture and Protection for Epoxy Mortars and Concrete

Epoxy concrete and mortar shall be placed and repairs shall be made when the atmospheric and concrete temperature are above 5°C and less than 38°C and remain in this range for a period of at least 24 hours. If the work is required to be done at temperatures lower or higher than those specified; approved means as recommended by the manufacturer of the epoxy binder and approved by Engineer shall be provided to raise or lower the ambient and concrete temperatures as required for satisfactory work. Such means will include heating or cooling equipment and necessary shelters. If temperatures below 5°C are anticipated during the cure-out or hardening period of the epoxy concrete or mortar, heated enclosures shall be maintained over the repair area with care taken to avoid localized heating

or hot-spots. Circulating air shall be used to ensure that surface temperatures do not exceed 35°C during curing. Epoxy resin concrete and mortar shall be placed only on sound, clean and dry surfaces. Suitable methods shall be used to dry and to maintain dry the contact surfaces of the concrete to which the epoxy concrete or mortar is to be applied. All repairs shall be protected from rain or seepage water for at least 24 hours and from all types of traffic for a period of 72 hours.

11.9.3 Preparation and Placing

EPOXY CONCRETE: All fines, dust, and other loose material on the contact surface shall be removed by scrubbing with a stiff bristle brush followed by washing. The dry, cleaned surfaces shall receive a prime coat of epoxy resin. The prime coat shall be applied in a thin coat and briskly scrubbed into the dry concrete surface with a stiff bristle brush. Placement of the epoxy resin concrete shall be delayed until the prime coat becomes tacky. The epoxy resin concrete shall be placed in layers not over 100mm in thickness. The thickness of courses and time interval between courses, shall be such that the temperature of the epoxy concrete does not exceed 60°C at any time during hardening. Mechanical plate, screed or float vibrators or hand tampers shall be used to consolidate the epoxy concrete. Excess epoxy concrete which becomes spread on the adjacent surfaces of hardened concrete shall be removed before it hardens.

EPOXY MORTAR: Defective concrete in areas as determined by the Engineer, shall be repaired with the aid of a saw cut at least 25mm outside the faulty area. The concrete between the saw cut and the edge of the faulty area and the concrete throughout the area shall be chipped out to solid concrete. The cavity thus formed shall be thoroughly cleaned with compressed air, sand blasting or other method to remove all loose material. The dry, cleaned surfaces of the cavity shall receive a prime coat of epoxy resin binder of composition as recommended by the manufacturer of the epoxy. The prime coat shall be applied in a thin coating and scrubbed into the surface with a stiff bristle brush. Placement of epoxy resin mortar shall be delayed until the prime coat becomes tacky. The epoxy mortar shall then be placed in the cavity in layers not exceeding 25mm in thickness. The time interval between placement of additional layers shall be such that the temperature of the epoxy resin mortar does not exceed 60°C at any time during hardening. Mechanical plate, screed or float vibrators or hand tampers shall be used to consolidate the epoxy resin mortar. Excess epoxy resin mortar, which becomes spread on the adjacent surfaces of the hardened concrete, shall be removed before it hardens.

11.10 Health and Safety Precautions

- Full face shields shall be used during all mixing and blending operations and for placing operations as required.
- Protective skin creams of a suitable nature for the operations shall be used.
- Portable eye washing facilities shall be maintained at mixing, batching and placing operations.
- Adequate fire protection shall be maintained at all mixing and placing operations.

- Smoking or the use of spark or flame producing devices is prohibited within 50 feet of mixing and placing operations.
- The mixing, placing, or storage of solvent is prohibited within 4.5m of any vehicle, equipment or machinery which could be damaged from fire or could ignite vapors from the material.
- Contaminated clothing which cannot be decontaminated shall be burned at an approved burning area at the end of each working day.
- Facilities shall be provided for decontamination of clothing and equipment at the job site.
- Care should be taken in handling solvent for cleaning equipment to avoid problems of toxicity, fires and possible explosions.
- Adequate ventilations shall be provided.

11.11 FINISHES AND FINISHING

11.11.1 General

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

The Contractor shall keep the Engineer informed as to when finishing of concrete will be performed. Unless inspection is waived in each specific case, finishing of concrete shall be performed only in the presence of the Engineer. Concrete surfaces will be tested by the Engineer where necessary to determine whether surface irregularities are within the limits hereinafter specified. Surface irregularities are classified as abrupt or gradual. Offsets caused by displaced or misplaced form sheathing or lining or form sections or otherwise defective form lumber will be considered as abrupt irregularities, and will be tested by direct measurements. All other irregularities will be considered as gradual irregularities and will be tested by the use of a template, consisting of a straight edge or the equivalent thereof for curved surfaces. The length of the template will be 4 feet 6 inch. The classes of finish for concrete surfaces shall be as shown on the Drawings or as directed by the Engineer. No grinding will be required on formed surfaces other than that necessary for repair of surface imperfections as specified herein.

11.11.2 Ordinary Finish (OF)

Ordinary finish (OF) applies to surfaces upon or against which fill material or concrete is to be placed. If unformed, the finishing operation shall consist of sufficient 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 sub-section 11.8 –“Repair of Concrete”. Correction of surface irregularities shall be required for depressions only and only for those which exceed 25mm when measured as described in sub-section 11.11.1.

11.11.3 Rough Concrete Finish (RC)

Rough concrete finish (RC) applies to surfaces which are intended to receive tiles, metallic lining or other applications as indicated on the Drawings. After consolidation and 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 sub-section 11.11.1 General, shall not exceed 6mm for floors and 3mm for walls.

11.11.4 Ordinary Slab Finish (OS)

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

floated surface and produce a dense uniform surface, free from blemishes and trowel marks. Surface irregularities measured as described in sub-section 11.11.1 General, shall not exceed 6mm for abrupt irregularities and 13mm for gradual irregularities.

11.11.5 Fair Faced Finish (FF)

Fair Finish (FF) shall be applied to all exposed surfaces of walls and ceilings which are not to be covered by any other finish. Surface irregularities shall not exceed 3mm for abrupt irregularities and 6mm for gradual irregularities, when measured as described in sub-section 11.11.1. All abrupt irregularities and all gradual irregularities in excess of 6 mm shall be reduced by grinding to conform to the specified limit for gradual irregularities.

12. MEASUREMENT AND PAYMENT

12.1 General

- 12.1.1 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.
- 12.1.2 The item rates quoted by the Contractor shall be deemed to include full compensation of works executed at any depth, floor and at any height except where otherwise specifically stated in the relevant item of the Bill of Quantities or Contract Documents.
- 12.1.3 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.
 - 12.1.3.1 Removal and replacement of rejected concrete with Portland cement mortar, epoxy concrete, epoxy mortar or by any other method.
 - 12.1.3.2 Testing of cement; sampling and testing of aggregates; providing and testing concrete for slump and compressive strengths on the basis of test cylinders as specified or cubes if approved by the Engineer; providing and designing the trial mixes and testing for each grade of concrete as required by the Engineer and other tests as specified to be made in the laboratory at Site and/or in a laboratory approved by the Engineer.
 - 12.1.3.3 Providing samples and testing precast concrete units manufactured outside the Site;

- 12.1.3.4 Providing any type of admixtures; waterstops; embedded items; expansion/contraction joint, expansion joint/contraction joint filler materials, Aluminium, G.I, Copper, stainless steel strip cover (any size) etc. cost of which shall be deemed to be included in the cost of respective item.
- 12.1.4 Concrete shall be measured as per approved execution, and no deduction shall be made for the following:
- Volume of any reinforcing steel embedded in the concrete.
 - Volume occupied by water pipes and conduits etc, not exceeding 25 sq. cm each in cross-sectional area.
 - Voids not exceeding 900 sq. cm. If any void exceeds 900 sq. cm total area of void shall be deducted.
- 12.1.5 Voids, which are not to be deducted as specified above, refer only to openings or vents which are wholly within the boundaries of measured areas. Openings or vents which are at the boundaries of measured areas shall always be subject to deduction irrespective of their size.
- 12.1.6 Concrete work shall be classified and measured separately as listed under the Items of BOQ.
- 12.1.7 Junction between straight and curved works shall in all cases be deemed to be included with the work in which they occur.
- 12.1.8 Measurement of walls shall be taken between attached columns, piers or pillar. The thickness of attached columns, piers or pillar shall be taken as the combined thickness of the wall and columns, pier or pillar. Attached or isolated columns, piers, pillar and the like (except where caused by openings) having a length on plan not exceeding four times the thickness shall be classified as columns. Those having a length over four times the thickness and caused by openings in wall shall be classified as walls.
- 12.1.9 Columns shall be measured from the top of footing/footing beams or floor surfaces to the underside of beams or slabs as the case may be. Where the width of beams is less than the width of columns, the extra width at the junction shall be included in the beams.
- 12.1.10 The depth of the beams shall be measured from bottom of the slab to the bottom of the beams except in case of inverted beams where it shall be measured from top of slab to the top of beam. The cross-section of the beam shall be the actual cross- section below or above the slab.

12.2 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.

12.3 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).

SECTION - 3000

STRUCTURAL STEEL WORKS

1. SCOPE

The work covered by this section, consists of supply of all material, labour, plant, equipment and appliances including welding, bolts, nuts, washers, anchor bolts, embedded parts etc, fabrication, erection, galvanizing and painting in accordance with the specifications and as per drawings and as directed by the Engineer.

2. APPLICABLE STANDARDS

Latest edition of the following standards are relevant to these specifications wherever applicable:

AISC Code of standard practice

AISC Specifications for Design, Fabrication and Erection of Structural Steel for Buildings.

AISC Specifications for structural joints using ASTM A325 or A490 Bolts.

ASTM Specifications for materials

AISC/
SSPC Guide to shop painting of structural steel

AWS Specifications for welding of steel structures

BS 449 Use of structural steel in Buildings

3. SUBMITTALS

Design drawings shall be prepared by the Consultant and supplied to the Contractor after approval of the Engineer. These shall contain main dimensions, sizes of members, typical details of joints.

Workshop drawings shall then be prepared by the Contractor from the design drawings supplied and submitted to the Engineer for approval.

4. MATERIAL

Except otherwise stated in the drawings, the material specifications shall conform to the following. Wherever necessary the Contractor may use equivalent alternative material subject to approval of the Engineer.

4.1 Structural Steel

Structural steel for structures shall conform to the requirements of ASTM A-36 or equivalent

4.2 Steel Forging

Steel forging shall conform to the requirements of ASTM A235.

4.3 Steel Casting

Steel casting shall conform to the requirements of ASTM A27.

4.4 Welding

Welding Electrodes for manual shielded metal arc welding shall conform to AWS A 5.1 latest edition or the A 5.5 latest edition. Equivalent locally manufactured electrodes may be used subject to the approval of the Engineer.

4.5 Common Bolts, Anchor Bolts, Nuts And Washers

Common Bolts, Anchor Bolts, Nuts and Washers Bolts and Nuts shall conform to the requirements of ASTM A 307.

4.6 High Strength Bolts

High strength carbon steel bolts including nuts and washers shall conform to the requirements of ASTM A325 latest editions and of AISI B18.2

4.7 Washers

Cut Washers: Shall be of structural grade steel and shall conform to the dimension of the manufacturer's regular standard for plain washers for the size of bolts used.

4.8 Cast Iron

Shall conform to the requirements of latest edition of ASTM A 48.

4.9 Galvanizing

Galvanizing of iron and steel products shall conform to the requirements of ASTM A-123 of steel hardware, ASTM A-153 and ASTM A-392.

5. CONNECTIONS

5.1 Design of Connection

All connections shall be designed and detailed for forces shown on the drawings, if any or 50% of the effective capacity of the member, whichever is greater.

Shop connections may be welded or bolted. Field connections shall be bolted unless noted otherwise on design drawings.

5.2 Installation of Bolts

High strength bolts shall be installed in accordance with AISC “Specifications for Structural Joints using ASTM A 325 or A 490 bolts”.

5.3 Minimum Spacing of Bolts

The distance between centers of boltholes shall not be less than 3d, where d is the diameter of the bolt in inches.

5.4 Minimum Edge Distance

The minimum edge distance i.e. center of standard hole to edge of connected part shall be as given in the table below:

NOMONAL BOLT DIAMETER (INCHES)	AT SHEARED EDGES (INCHES)	AT ROLLED EDGES OR PLATES, SHAPES OR GAS CUT EDGES (INCHES)
1 / 2	1.5 TIMES THE DIAMETER OF BOLTS	3 / 4
5 / 8		7 / 8
3 / 4		1
7 / 8		1 – 1 / 8
1		1 – 1 / 4

5.5 Allowable Stresses

Allowable design stresses for structural steel members and their connections, including temporary bracings and shorings shall be in accordance with AISC Specifications.

6. EXECUTION

6.1 Fabrication

The Contractor shall notify the Engineer about any problems or doubts/errors discovered in the drawings for clarification/rectification well in time to prevent any fabrication errors. Fabrication shall not be commenced until approval has been obtained from the Engineer.

6.1.1 Straightening of Material

Rolled material, before being worked upon must be straightened within tolerances by ASTM specifications A6 Straightening, necessarily shall be done by mechanical means or by the application of a limited amount of localized heat. The temperature of heated areas, as measured by approved methods, shall not exceed 1100°F for A 514 steel or 1200°F for other steels.

6.1.2 Cutting

As far as possible cutting must be done by shearing, Oxygen cutting shall be done where shear cutting is not possible and shall preferably be done by Machine. All edges shall be free from gauges, notches or burs. If necessary the same shall be removed by grinding.

6.1.3 Holes Punching Drilling.

Holes shall be punched where thickness of the material is not greater than the diameter of bolt + 1/8". Where the thickness of the material is greater the holes shall either be drilled or sub-punched and reamed to size. The die for all sub-punched holes and the drill to all sub-drilled holes shall be at least 1/16" smaller than the nominal diameter of the rivet or bolt. Holes for A514 steel plates over 1/2" thick shall be drilled.

6.1.4 Welding

a) General:

The execution and inspection of welding will be done in accordance with the provisions of the American welding society code for welding in Building construction, D1.0. No welding for piping/electrical supports shall be made transverse to any tension flanges of trusses, beams or columns.

b) Automatic sub-merged Arc Welding:

For all built-up members, i.e. sections fabricated from plates and flat bars or compound rolled sections, plate and box girders, where long continuous, welding is to be done, should be executed by Automatic submerged Arc Welding process in accordance with relevant AWS specifications.

c) Maximum and minimum size and lengths of fillet welds shall be in accordance with AISC specifications.

Surface to be welded shall be free from loose scale, slag, rust, grease, paint or any other foreign matter except mill scale, which withstands vigorous wire brushing.

d) Tolerances

- A variation of 1 mm is permissible in the over all length of members with both ends finished for Contact bearing. The bearing surfaces prepared to a common plane by milling.
- Members without end finished for contact bearing which are to be framed to other steel parts of the structure shall have a variation from detailed length not greater than 1/8" for length over 30 feet and not greater than 1/16" for length less than 30ft.
- Members with ends finished for contact bearing shall have a variation 1/32" in the over all length.

6.1.5 Galvanizing

- Structure steel sheets and plates shall be galvanized in accordance with the requirements of ASTM A-123.
- Bolts, nuts, washers, locknuts and similar hardware shall be galvanized in accordance with ASTM A-153.
- Only minor damage in galvanizing will be repaired by 3-coats of zinc paint at site.

6.2 Test Assembly

6.2.1 After fabrication and before galvanization or painting, test assembly of complete Structural Components shall be done on the shop floor as directed by the Engineer.

6.2.2 Each test assembly will be inspected by the Engineer and will be dismantled only after his approval in writing

6.3 Surface Preparation/Painting

6.3.1 Surface Preparation

- a) All structural steel material i.e. rolled steel sections, plates, pipes, flat bars, chequered plates shall be cleaned free from loose scale, rust, burrs slag, etc. by means of sand blasting.

6.3.2 Painting

- a) Immediately after surface preparation all material shall be given one prime coat of rust preventive paint.
- b) After fabrication one shop coat of prime paint and then one coat of enamel paint shall be applied.
- c) One final coat of enamel paint shall be applied after erection of all components.
- d) The type of primer and enamel paints to be applied shall be as specified on the drawings and the thickness of the paint shall be in accordance with the specifications of the paint manufacturer.
- e) All other requirements for the specified paint system shall be in accordance with the paint manufacturer's specification/recommendations.
- f) The Contractor shall use the best quality of the type of paint specified and shall get the same approved by the Engineer.
- g) Steel work/Surfaces not to be painted

- i) Steel work to be encased / embedded in concrete or surface in contact with concrete or grout shall not be painted, but shall be given a cement wash after sand blasting.
- ii) Machined finished surfaces shall not be painted but shall be coated with rust preventive compound, (approved by the Engineer) immediately after finishing. Such surfaces shall also be protected with wooden pads or other suitable means for transportation. Unassembled pins, keys, and bolt thread shall be greased and wrapped with moisture resistant paper.
- iii) Contact surfaces of connections using high strength bolts in friction type connections shall not be painted. Such surfaces of all components after fabrication shall be cleaned free of all paints, grease, burrs slag by means of sand blasting. No coating whatsoever shall be applied to these surfaces. The surface roughness for high strength friction grip bolts is a very important factor and the components therefore will not be erected unless approved by the Engineer.

6.4 Erection

6.4.1 Bracing

The structure shall be carried up true and plumb within the limits defined in the AISC code of standard practice. Temporary bracing shall be introduced wherever necessary to take care of all loads of which the structure may be subjected including the equipment and the operation of the same. Such bracings shall be left in place as long as required for safety.

6.4.2 Alignment

Bolts tightening as specified by ASTM A 325 shall not be done at site during erection until the structure has been fully aligned and leveled.

6.4.3 Joints using High Strength Bolts

All structural joints using high strength bolts shall be executed and inspected in accordance with “AISC Specification for structural joints using ASTM A 325 or A 490 bolts”.

6.4.4 Stubs

Stubbs of trusses before being embedded in concrete shall be erected in position timely aligned using stub setting templates.

7. INSPECTION AND TESTS

- 7.1 Manufacturer's Work Test Certificate for all material used shall be furnished by the contractor for Engineer's scrutiny and approval.
- 7.2 Rolling tolerance of all shapes and profile according to AISC shall be in accordance with the provisions of the American Society for Testing and Materials Designation A.6. The Contractor shall check these before being worked upon and these shall be rejected if found not within limits.
- 7.3 The Contractor shall arrange for analysis and test of all material rolled locally at a testing laboratory selected by the Engineer.
- 7.4 Inspection of Welding
- The inspection of welding shall be performed in accordance with the American Welding Society specifications, as directed by the Engineer.
- 7.5 Test for Galvanizing
- The galvanization shall be tested in accordance with ASTM A-90.
- 7.6 Rejection
- Materials or workmanship not in reasonable conformance with the provisions of these specifications shall be rejected at any time during the progress of the work or the completion and erection at site.

8. MISCELLANEOUS STEEL WORKS

8.1 General

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

- Steel jamb frame of specified gauges
- Steel doors and steel louvered doors
- G.I. Flashings/ Expansion joint covers
- Steel pipe handrail/fence/grill
- Steel gratings and chequered plates
- Steel ladders and platforms
- Steel Corner Guards
- Steel Rolling shutters
- Steel embedded plates anchor bolts and other miscellaneous items
- Stain less steel stair hand railing

The Contractor shall submit shop drawings for each item showing in sufficient detail the material, its fabrication, surface preparation and other relevant information so as to conform to the applicable requirements of relevant clauses of these specifications and notwithstanding to this the Contractor can also propose any deviation due to field conditions and availability of local material for the approval of the Engineer. After the approval of drawing the Contractor shall erect a mock-up sample showing exactly the finished item as it will be fabricated/erected. Only after the approval of the mock-up sample the Contractor shall start the fabrication of items to be installed in place.

9 MEASUREMENT & PAYMENT

9.1 General

- 9.1.1 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.
- 9.1.2 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.
- 9.1.3 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.
 - 9.1.3.1 Nuts, bolts, screw, rivets, heads, fillets, welds welding rods, locks, rollers, rolling tracks, pivot hinges, etc.
 - 9.1.3.2 Anti-corrosive prime coat
 - 9.1.3.3 Cleaning with sand blasting
 - 9.1.3.4 Painting
 - 9.1.3.5 Embedding/fixing of steel pipe hand rail in concrete work.
 - 9.1.3.6 All hardware in steel doors, locks, hold fasts, etc.
 - 9.1.3.7 All metal embedded parts, metal fittings and fixtures required for the operational process.
 - 9.1.3.8 Sealant for GI Flashing as specified
 - 9.1.3.9 Glazing in steel door/windows including seals and gaskets and providing/ fabricating louvers.
 - 9.1.3.10 Galvanizing

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.

9.3 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).

SECTION – 4200

BRICK MASONRY

1 SCOPE

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

2 CODES AND STANDARDS

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

2.1 **ASTM (American Society for Testing Materials)**

C 150	Portland Cement
C 67	Sampling and Testing of Bricks

2.2 **BS (British Standards)**

BS 5628-1	Structural use of unreinforced masonry
BS 5628-3	Code of practice for the use of masonry. Materials and components, design and workmanship
BS 3921	Specifications for Clay Bricks
BS 2028	Pre-cast Concrete Blocks

3 SUBMITTALS

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

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

4 Brick Masonry

4.1 Description

The work under this section shall include all type of brick work in foundation, super structure, fascia, drains manholes and elsewhere as shown on the drawings.

The brick work wherever referred to shall be first class brick work unless otherwise specified the work shall be carried out in English bond or as shown on drawings.

4.2 Material Requirements

The specifications and quality requirements of following materials used in the works related to this part of specifications are as under,

4.2.1 Cement

Cement shall conform to the requirements set forth in Sec-2300 Part-10.1 of this specification.

4.2.2 Sand

Sand shall conform to the requirements set forth in Sec-2300 Part-10.2 of this specification.

4.2.3 Water

Water shall conform to the requirements set forth in Sec-2300 Part-10.3 of this specification.

4.2.4 Mortar

Mortar is defined as a material composed of fine aggregate and cementing material which forms a hardened mass when mixed with a suitable proportion of water. It is used for plaster work and for bonding bricks and masonry solidly together so that stresses from super-imposed loads are evenly distributed. The cementing material may be either clay or Portland cement. The constituents of all mortars should be mixed thoroughly to ensure a uniformity of composition.

Mortars are usually defined by their composition rather than properties, and the proportions of Ingredients are generally taken by volume.

4.2.4.1 Cement Mortar

Cement mortar shall consist of Portland cement, sand (fine aggregate) and water. Waterproofing agent shall be added when specially required or directed by the Engineer.

- a. Portland cement shall conform to the requirements as stated above of this specification.
- b. Sand shall to conform to the requirements as stated above of specification.
- c. Water shall conform to the requirements as stated above of this specification.
- d. Unless otherwise specified or directed by the Engineer, the ingredients for cement mortar shall be proportioned by volume.
- e. Cement and sand shall be thoroughly mixed in a dry state on a pucca platform or in troughs as directed by the Engineer. It shall be gauged with a quantity of water sufficient to make the mortar workable. Water shall be added with a fine rose. Only such quantity of mortar shall be prepared as can be used before the initial setting time.
- f. Any mortar which has not been used within 30 minutes of the addition of water shall be discarded.
- g. At the close of day's work, the mixing troughs and pans shall be thoroughly washed and cleaned.
- h. The mixing platform shall not be used for stacking materials.

4.2.5 Clay Bricks and Tiles**4.2.5.1 Source Approval**

The Contractor shall submit to the Engineer for his review and approval full detail of the proposed sources & marks of bricks. Sources & marks of brick supply shall be regularly and thoroughly examined to ensure that the quality of the material supplied is satisfactory and that it does not get deteriorated during the entire performance period of the project. Predefined sources should be specified in Special Provision of the Contract Documents.

4.2.5.2 Quality Requirements

Bricks shall be the best available bricks from the area conforming to the specifications specified here in.

- a. The clay is obtained by chipping it out of a clay bank and when necessary, mixing it with sand to a mixture that will not crack during drying, Water is gradually added to make the clay plastic.
- b. The earth used in manufacturing bricks shall be carefully selected and shall be free from objectionable quantities of lime, gravel coarse sand, roots, or other organic matter. Salts shall not exceed 0.3 percent and calcium carbonate shall not exceed 2.0 percent.
- c. All bricks shall be of first class quality shall be hand moulded.
- d. In making bricks, the mould must be cleaned periodically with water. The moulds 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. Over-size, irregular and worn moulds shall be rejected.
- e. The bricks should be left to dry for about three days in the place where they were made. They will then be strong enough to be stacked for at least one week of further drying. Clay tends to become lighter in colour when dry and, when sufficiently dried, the brick, upon being broken in half, will show no colour differential throughout the section area. During drying the bricks should be protected from rain.
- f. All bricks shall be manufactured by the Trench Kiln Method or other standard methods approved by the Engineer.
- g. They shall be thoroughly burnt without being vitrified, shall be regular, uniform in shape and size with sharp and square edges, parallel faces and of deep red or copper colour.
- h. The correct brick for a job can be picked from a choice of colour, surface texture, density, weight, absorption and pore structure, thermal characteristics, thermal and moisture movement, and fire resistance.
- i. First class bricks shall be homogeneous in texture and shall emit a clear ringing sound when struck, and shall be free from flaws, cracks, chips, stones and modules of lime.

- j. First class brick in an oven dried condition shall not absorb more than 1/5 of its weight of water when immersed one hour in water at 21 to 27 degrees centigrade and shall show no signs of efflorescence on subsequent drying.
- k. The average compressive strength of five representative first class bricks shall be not less than 1800 psi and not less than 1400 psi for any individual brick.
- l. Each finished brick for brick masonry shall be Standard Size of 229 mm x 111 mm x 69 mm (9" x 4-3/8" x 2-11/16") and its Nominal Size shall be 229 mm x 114.57 mm x 76 mm (9" x 4-V2", x 3") and shall weigh between 7 lb. to 9 lb. All bricks shall have a "frog" 1/4" deep on one face. The frog size shall be 114.57 mm x 38.19 mm x 6.37 mm (4-Vz", 1-1/2", %").

4.2.5.3 Submittal and Sampling

- a. The Contractor shall submit to the Engineer for his review and approval, all data as specified.
- b. Samples of first class bricks, as specified in these specifications or as directed by the Engineer, shall be submitted to the Engineers with test reports for his approval.
- c. Bricks of approved samples shall only be used in the works.
- d. Samples of facing bricks/bricks to be used on exterior walls shall be full sized bricks and shall be submitted to the Engineer for approval.

4.2.5.4 Testing of Material

- a. ASTM Specification C 67 covers procedures for the sampling and testing of brick and structural clay tiles. The tests include modulus of rupture, compressive strength, absorption, saturation coefficient, effect of freezing and thawing, efflorescence, initial rate of absorption, and determination of weight, size, length change, and void areas.
- b. For purposes of these tests, full-size bricks, tiles, or solid masonry units shall be used as test specimens. They shall be representative of the lot of units from which they are to be selected in respect of the range of colours, textures, and sizes and shall be free of or brushed to remove dirt, mud, mortar, or other foreign materials unassociated with the manufacturing process.
- c. The test report shall contain the following information:
 - i. The method of sampling
 - ii. The date of delivery of the specimens
 - iii. The date of testing
 - iv. The name of the testing Laboratory
 - v. The number of specimens in the sample

- vi. The method of analysis, detailing whether chemical or alternative instrumental method were used
- vii. The soluble salts content of the sample, expressed as the percentage of the nearest 0.01% for the radicals of magnesium, sodium, potassium and water-soluble sulphate
- viii. Remarks

4.2.5.5 Delivery, Storage and Handling

- a. Contractor shall provide proper means of storing Bricks at each point where bricks delivered to the Site are to be carefully unloaded and handled so as to prevent chipping and breakage.
- b. The bricks are to be stacked on a level area in an orderly manner on planks or other suitable supports, to ensure that they are free from contact with the ground.

4.3 Brick Masonry Construction (General)

4.3.1 Cleaning of Tools and Equipment

All equipment used for mixing mortar, transporting it and for laying bricks shall be clean and free from set mortar, dirt, or other injurious foreign substances. It shall be thoroughly cleaned at the end of each day's work.

4.3.2 Bond to be used for Brickwork

Unless otherwise specified, all brick-work shall be laid in English Bond with frogs upward.

4.3.3 Laying of Bricks

- a. Bricks shall be laid "frog" upward with mortar joints and in mentioned bond as shown on the Drawings or as directed by the Engineer. Both bed and vertical joints shall be 9 mm (3/8") 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.
- b. Bricks are to be laid in a running bond with each course of masonry bonded at the corners or as directed by engineer. The bond of facing bricks in existing buildings shall be matched.
- c. Before starting work, facing bricks shall be laid on the foundation wall and the bond adjusted as needed for openings, angles, corners, etc. Exposed brickwork joints are to be symmetrical about centre lines of openings. No brick smaller than a half-brick shall be used at any angle, corner, break, or jamb. The bond pattern shall be maintained plumb throughout. Jumping of the bond is not allowed. Brickwork shall be anchored to concrete columns, beams and walls, to steel stud construction and to masonry backup with ties and anchors in accordance with the relevant provisions of BS 5628.
- d. Bricks shall be laid in a full bed of mortar. The mortar shall be spread over a few bricks at a time and shall not be furrowed. The mortar bed shall be slightly level led to incline towards the cavity. The brick shall be placed before the mortar has

become stiff. Head joints in stretcher courses are to be completely filled with mortar. Bricks shall be pushed into place so that the mortar oozes out at the top of the joints.

- e. Before connecting new masonry with masonry previously laid masonry, loose bricks or mortar shall be removed, and the previously laid masonry shall be cleaned and wetted. New work is to be toothed into unfinished work.
- f. Proper care should be taken to obtain uniform mortar joint throughout the construction.
- g. The walls should be raised uniformly in proper and approved bond. In construction of the wall, first of all two end corners are carefully laid to line and level and then in between portion is built, with a cord stretching along the headers or stretchers held in position at the ends. This helps in keeping the alignment of the courses and maintaining them in level. Similarly all other courses are built. Care shall be taken to keep the perpend properly aligned.
- h. All brickwork shall be truly plumb and each set of 4 brick course shall be checked with plumb bob and straight edge.
- i. Each brick shall be set with both bed and vertical joints filled with mortar and thoroughly bedded in by tapping with handle of trowel. At every fourth course bricks shall be flushed with mortar and grouted full.

4.3.4 Cavity Walls and Weep holes

- a. Care shall be taken during construction of cavity walls so as to avoid the filling up of cavity with mortar. G.I. flashing and weep holes shall be provided wherever specified on the drawings or as per instructions of the Engineer.
- b. Weep-holes will be formed by oiled rods, removed after the mortar is set, at specified locations. The external face of brick masonry surface of the exterior walls (where ever shown or as directed by the Engineer) shall be finished by deep struck pointing as the work proceeds.

4.3.5 Anchoring and Protection

- a. Anchoring all brick masonry shall be bonded to concrete columns/walls/beams with steel anchors as per details provided in drawing. Anchors/wall ties as specified or as instructed by the Engineer shall be provided in cavity walls.
- b. Anchoring should be proper by ensuring that the concrete surface coming in contact with brick masonry is backed / chipped / keyed, cleaned and cement slurry is applied so that a proper bond is achieved between the two dissimilar materials. It is responsibility of the contractors to ensure that there will not be any cracks / fissures anywhere in the brick masonry.
- c. In case the cracks appear subsequently in those areas, they should be made good by cement grouting or epoxy putty grouting/poly sulphide compound grouting or as per standard modern specifications/methods with the prior approval of the Engineer at the cost of the contractor.

- d. All door and window frames are to be solidly bedded and neatly pointed up. Leave ducts, chases, Offsets, openings, etc., in walls where shown on drawings or as directed by the engineer.

4.3.6 Tothing

Usually, new cross walls are joined to old main walls by cutting out a number of rectangular recesses in the main wall equal in width to the width of the cross wall, three courses in height, and half a brick in depth. A space of three courses is left between the sin kings, and the new cross wall is then bonded into the recesses with cement mortar to avoid any settlement. The sin kings should not be less than 9 inches apart, since in the cutting, the portion between is likely to become shaken and cracked. This is known as block-bonding.

4.3.7 Thickening

Where old walls have to be thickened, recesses 9" x 9" x 4-1/2" (225 x 225 x 113 mm) deep are usually cut, one in every yard square of the surface of the old wall. The new work is then built against the old and block-bonded at every recess. The surface of the old work is well cleaned, brushed and wetted before the new work is added. This is also known as block-bonding.

4.3.8 Attached Piers

Attached piers strengthen a wall at given intervals along its length. A usual spacing is 10 or 12 feet (3 m to 3.6 m).

4.3.9 Brick Masonry Joints

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.

- a. Thickness of joints, unless otherwise specified, shall, not be less than 14" (6 mm) and shall not be more than 3/8" (9 mm). The height of 4 courses and 3 joints as laid shall not exceed more than 1" (25 mm) the height of 4 bricks as piled dry one upon the other.
- b. Horizontal joints shall be struck to form a weathered joint and vertical joints shall be struck with a V notch. Care shall be taken that the striking tools do not develop a cutting edge as the object of striking the joint is to compress the mortar into the joints.
- c. The joints shall be struck by the help of a pointing tool to provide a notch in the green mortar after the brick work has been laid.

4.3.10 Corners

At all corners, alternate courses of bricks shall be laid header wise and stretcher-wise so as to bond the two walls well together.

Where particularly required, cut or mould bricks shall be used in jambs, arches and projecting corners, so as, to eliminate sharp angles from the inside of a building. This item shall be included in the unit rate if the radius of the finished (Plastered) corners

does not exceed %" (19 mm). In case it exceeds, %" (19 mm) extra payment shall be made by making linear measurement.

4.3.11 Round Pillars

Round pillars shall be built with quadrant shaped bricks; if the pillars are of considerable height flat circular discs of stone or cement concrete of the same diameter as the pillar about 3 inches (75 mm) thick shall be introduced at every 4 to 6 feet (1.2 to 1.8 m) as bond stone. The cost of this operation will be included in the unit rate.

4.3.12 Brickwork to be Truly Plumbed and Straight

All brickwork shall be truly plumbed and each set of 4 brick course shall be checked with plumb bob and straight edge.

4.3.13 Face Work

All face work shall be finished with neat drawn joints and pointed out if it has not to be plastered. If it has to be plastered the joints shall be raked out before any plaster is laid on. For face work the bricks shall be of true edges, uniform colour and correct dimensions. If specially required, face work shall be laid up with pressed bricks. All brick courses shall be proportioned that they will work out evenly with the height of windows and doors.

4.3.14 Joining Works

When fresh masonry is to join masonry that has partially or fully set, the exposed joining surface of the set masonry shall be cleaned, roughened and wetted so as to affect the best possible bond with the new work. All loose bricks and mortar shall be removed.

4.3.15 Striking of Joints

Where in the case of brickwork in cement mortar, pointing or plastering to the face work is not provided as a separate item the joints in face work shall be struck. This operation shall be paid for separately.

4.3.16 Raking Joints

Racking is the term applied to the method of arranging the edge of a brick wall, part of which is unavoidably delayed while the remainder is carried up. The unfinished edge must not be built vertically or simply toothed, but should be set back 21 inches at each course, with a maximum of twelve courses, to reduce the possibility and the unsightliness of defects caused by any settlement that may take place in the most recently built portion of the wall.

- a. The joints of brickwork, which is to be pointed or plastered, shall be raked out with a nook to a depth of half an inch. The raking shall be done before the mortar sets each day.
- b. The joints of brickwork, which is to be pointed or plastered, shall be raked out with a nook to a depth of Vi' (12 mm). The raking shall be done before the mortar sets each day.

4.3.17 Cut Brickwork

Bricks shall be cut, dressed or grooved, as required for shaping jambs, fitting chokhats and for architectural features of the building. Corners shall be made with cut bricks; five bricks shall be used for each corner.

4.3.18 Building in of Fixtures

Holdfasts and similar fixtures shall be built in with the surrounding brickwork in their correct position in specified mortar. They shall be built in as the work progresses and not inserted later on into space left for them.

4.3.19 Progressing of Brickwork

Brickwork shall be carried up in a uniform manner. No portion shall be raised more than 3 feet (1 m) above another at the same time. Temporary spaces left during construction shall be raked and not toothed. Straight edges supplied to bricklayer shall have courses marked on them with saw cut or measuring rod shall be provided and height of course shall be checked all over the building from time to time so as to keep all courses level.

4.3.20 Bed Plates

Bed plates of concrete or stone shall be provided under each beam and joint. They shall conform to the dimension given in the drawing and shall be carefully laid in specified cement mortar to correct level.

4.3.21 Openings for Doors and Windows

Door and window openings shall have flat or relieving arches or inlets spanning across them as shown on the drawing or as specified.

4.3.22 Centering for Openings

Centering for all openings shall be strong enough to support the lintels or arches spanning the openings. They shall be subject to the approval of the Engineer and shall remain in position till the brickwork has set. No additional payment will be made to the contractor for this item of work.

4.3.23 Scaffolding

Temporary erections constructed to support a number of platforms at different heights so as to enable the workmen to get at their work and to raise the necessary material, are termed as scaffolds.

- a. Scaffolds form a frame which is erected about 4.5 feet (1.35 m) from the face of the intended building with which it is connected by means of horizontal members called putlogs. They take a bearing on the wall at one end, and on the ledgers to which some are lashed at the other end. Ledgers are wedged to the wall when it has been built sufficiently to permit this being done.
- b. Putlogs are of square timber, usually 3" x 3" (75 mm x 75 mm) and 5 feet (1.5 m) long. The pieces are not cut but split, to ensure the length fibers being uncut. These are placed about 4 feet apart, and on them the scaffold boards are laid to form the platform, These boards are 12 feet (3.6 m) long, 9" x 1-1/2" (225 mm x 37.5 mm) in size; the ends are bound in hoop iron to prevent their splitting.
- c. The scaffold boards at their heading joints are butted. Two putlogs are placed at this part about 4 inches (100 mm) apart to support the ends. About the edges of

the staging, guard-boards are placed, consisting of boards placed on edge and nailed to the standards.

- d. The frames are braced to add stiffness and prevent the scaffold from rocking. The braces consist of poles lashed to the outside of the frames to triangulate the latter. For 9 inch (225 mm) walls a scaffold is only required on one side but for walls of a greater thickness it is required on both sides.
- e. The contractor shall provide all scaffolding, staging, and ladders, necessary for the work. AH walls or other brickwork shall be securely braced and protected against damages by wind and storms during the construction period. No extra rate shall be paid for this item.

4.3.24 Putlogs

Only headers shall be left out to allow a putlog to be inserted and not more than one brick shall be left out for each putlog. Under no circumstances shall putlogs be made immediately under gr. next to the impost or skew back of arches.

4.3.25 Protection against Weathering

All brickwork shall be protected during construction from the effects of rain and frost by suitable covering. The brickwork laid in cement or in cement mortar shall be kept moist for a period of 10 days.

4.3.26 String Courses

String courses shall comprise bricks laid on edge or flat in one or two courses as actually specified.

4.3.27 Piers in Brickwork

Piers in brickwork are constructed to support loads transmitted to them by beams and girders, or to receive the thrusts of two or more arches, the resultant of which falls in a vertical line. The height of any isolated brick or stone pier should not exceed eighteen times its least dimension. No pier should have a width less than 13 inches (325 mm).

4.3.28 Brick Laying in Freezing Weather

All bricks delivered for use in freezing weather shall be fully protected immediately upon delivery by a weather-tight covering that will prevent the accumulation of water, snow or ice on the bricks; loose board covering shall not be permitted.

- a. All sand shall be heated in such a manner as will remove all frost, ice or excess moisture but will prevent the burning or scorching of the sand.
- b. All frosted bricks shall be de-frosted by heating them to a temperature of approximately 180° F.
- c. All water used shall be heated to a temperature of approximately 180 °F.
- d. After the mortar has been mixed it shall be maintained at such temperature as will prevent its freezing at all times and if necessary the contractor shall use metal mortar board equipped with oil torches. No anti-freeze liquid, salt or other

substance shall be used in mortar, except when specified or permitted by the Engineer.

- e. All work under construction shall be protected from freezing for a period of 48 hours by means of enclosure, artificial heat or by other suitable methods duly approved by the Engineer.

4.4 Brick Work in Arches

One method of spanning an opening in brickwork is to form an arch. A curved template of wood is placed in position and the bricks forming the arch are bedded together on it.

The arches are curved and they transfer the weight of the walling above into the abutments. Lateral thrust is produced, the amount of which depends upon the span, the rise of the arch and the load of the brickwork above. This lateral thrust must be taken by either producing a sufficiently wide and heavy abutment or buttress, or by placing a similar arch alongside to balance the thrust,

4.4.1 General Requirements

The brickwork in arches shall not commence till abutments have been built to their full width and up to the level of skew backs. Arch work shall be carried up evenly from both abutments and as soon as the arch is complete, masonry shall be built up evenly on both sides to the heights of crown so as to load the haunches.

The brick work in arches shall conform to the General specifications for brick work given in section 4.6 above except for the followings:

- a. In all arches, the voussoir joints shall be truly radial and not to exceed 1/4" (6 mm) in thickness. In gauged arches the thickness of arches shall not exceed 1/8" (3 mm).
- b. Skew backs shall be formed of bricks correctly shaped to radiate from the centre of curvature and shall not be packed with mortar or chips,
- c. For gauged arch work, the arch shall be laid out full size on the ground and joints carefully marked out. Templates shall then be made as a guide for special shapes of bricks, which shall be carefully cut and rubbed to the required shape. All bricks for an arch shall be prepared in full and set up dry on the ground before the work begins.
- d. Segmental arches used over rectangular door or window openings shall have a flat rectangular soffit and segmental extrados.
- e. Flat arches shall be built in the same manner as gauged arches but with all the voussoir joints converging on the apex of an equilateral triangle described on the soffit of an arch. Cross joints and extrados shall be parallel to the soffit. The arch shall be built with a camber of 1/8" per foot (10 mm per meter) of the span.
- f. Arches shall be built in concentric rings and each ring shall be completed before work on the one above is commenced. In all cases, the centreline of the brick face

shall be radially placed. The arch ring shall, in all cases be bonded together by a special bond stone. (key stone) which shall be of stone, concrete or brickwork, as actually specified or shown on the drawing or as directed by the Engineer.

- g. Centres of arches over 5 feet in span shall be erected on wedges, those over 10 feet on double wedges and those over 20 feet span on sand boxes so as to allow the gradual lowering of centre.
- h. For single segmental arch, centre shall be struck immediately after the arch is finished. For series of segmental arches, centre of each arch shall be struck as soon as the arch succeeding is completed. For semi-circular, elliptical or pointed arches, centers shall be struck as soon as the brickwork has reached two thirds the height of such arches.

4.4.2 Striking of Centers

Center shall be struck as given below:

- a. For single segmental arch, centre shall be struck immediately after the arch is finished.
- b. For series of segmental arches, centre of each arch shall be struck as soon as the arch succeeding is completed.
- c. For semi-circular, elliptical or pointed arches, centers shall be struck as soon as the brickwork has reached two thirds the height of such arches.

4.4.3 Precaution for Relieving Arches

The spaces between the relieving and flat arches shall not be filled till the wall has been completed.

4.4.4 Centering

Centering shall be strong enough to bear the weight of an arch without any deflection. The surface of centering shall be correctly struck to the curvature of the soffit of the arch.

4.4.5 Wedges and Sand Boxes

Centers of the arches over 5 feet (1.5 m) in span shall be erected on wedges, those over 10 feet (3 m) in span on double wedges and those over 20 feet (6 m) span on sand boxes so as to allow the gradual lowering of centre (i.e. striking).

4.5 Brick Work in Corbelling

Unless otherwise specified or directed by the Engineer, corbelling shall be affected by 1/4th brick projection in ordinary work and 1/8th brick projection in a work where greater strength is required.

In all other respects it shall conform to specifications for brickwork (General) in section 4.3 above.

4.6 Brickwork in Coping

Unless otherwise specified, the top courses of all plinths, parapets, steps etc. shall be built in brick on edge. In case of parapet walls the outside half of the brick shall be weathered and throated. The corners shall be made by cutting fine bricks or by special

bricks of 9" x 9" x 4-3/8" (225 mm x 225 mm x 110 mm) size to give a radiated and keyed joint.

In all other respects it shall conform to specifications for brickwork (General) in section 4.3 above.

4.7 Brickwork in Cornices

Unless otherwise specified or directed by the Engineer, all cornices shall be in line with the straight and parallel faces. All exposed cornices shall be weathered and rendered on top in specified mortar and throated underneath. The profile shall be checked constantly with the sheet iron templates.

- a. Cornices intended to be pointed shall be made with specially moulded bricks or bricks cut and rubbed so as to make mouldings true to drawings. In cornices to be plastered the bricks shall be roughly cut so as to allow the plaster to finish true to drawings and templates. Thickness of plaster shall not be less than 1/2" (12 mm) and more than 1 inch (25 mm).
- b. The cornices shall be measured by length. The unit of measurement shall be one running foot / per running meter.
- c. In all other respects it shall conform to specifications for brickwork (General) in section 6.4.3 above

4.8 Eave Brickwork

Eave bricks shall be laid flat or on edge as specified with a projection of 3 inches (75 mm) and chamfered 1/4 inch (38 mm) on the upper edge.

The eave brick work shall be measured by length. The unit of measurement shall be one running foot / per running meter.

In all other respects it shall conform to specifications for brickwork (General) in section 4.3 above

4.9 Brickwork in Window Sills

Unless otherwise specified, window sills shall be made by laying bricks on edge over 1 1/2 inch (38 mm) tile creasing to keep the joints in line. The bricks shall project 3" (75 mm) from the face of the wall and shall be weathered on upper edge and throated underneath up to 3" (75 mm) from either end.

The sills shall be measured by length. The unit of measurement shall be one running foot / per running meter.

In all other respects it shall conform to specifications for brickwork (General) in section 4.3 above

4.10 Brickwork in Drip Course

Brickwork in drip course when made of flat bricks shall conform to specifications for Eave Brickwork in section 6.4.8 above and measured and paid at the same rate. When

built in brick on edge it shall conform to specification for Window Sills ion section 6.4.9 above and measured and paid at the same rate.

4.11 Brickwork with Hoop Iron

4.11.1 When Used

In partition walls 3" (75 mm) or 4" (100 mm) thick a reinforcement of 1" (25 mm) width When Used 18 gauge hoop iron shall be placed in courses not more than 12 inches (300 mm) apart and continued for 9 inches (225 mm) into the main wall on which the partition wall abuts. If the partition wall exceeds 20 feet (6 m) in length or 15 feet (4.5 m) in height the hoop iron shall be introduced at courses not more than 6 inches (150 mm) apart.

4.11.2 Material and Construction

In respect of materials, workmanship, curing and protection, it shall conform to the specifications for brick work given in para 6.4.2 and 6.4.3 above.

4.12 Tolerances for Brickwork

- a. All brick work shall be erected plumb and true to line and level with maximum variation in any storey height or any length of wall being 1/8" (3 mm) in 10 ft (3 m). The maximum tolerance in the length, height or width of any single masonry unit shall be $\pm 1/8"$ (± 3 mm).
- b. Deviation in vertically in total height of any wall for building more than one storey in height shall not exceed 12.5 mm.
- c. Deviation from position shown on plan of any brick work shall not exceed 12.5 mm.
- d. Relative displacement between loads bearing wall in adjacent storeys in the ended to be vertical alignment shall not exceed 3 mm.
- e. If, after the completion of any brick masonry work, the brick is not in alignment or level, or does not conform to the lines and levels shown on the Drawings, or shows a defective surface, it shall be removed and replaced by the Contractor at his own expense unless the Engineer grants permission, in writing, to patch or replace the defective works.

5 MORTAR

5.1 Cement

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

5.2 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

TABLE 4A-2

Sieve Sizes	Percent Passing
-------------	-----------------

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

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

5.3 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 Plain and Reinforced Concrete.

5.4 Surkhi

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

6.1 Mortar Composition

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 six 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. 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.

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 the manufacturer.

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

8. BRICKS

8.1 Brick Materials

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

8.2 Brick Manufacture

All bricks shall be manufactured by the Trench Kiln Method or other standard method approved by the Engineer. The moulds to be used in the manufacture of bricks shall be thoroughly sanded before each use and shall be sufficiently larger than the size of the bricks being manufactured to allow for shrinkage in drying and burning. Each finished brick shall be a nominal 230x115x75 mm in size, shall weigh between 3.2 and 4.1 kilograms and shall have a "frog" 6 millimeter deep on the upper face. The bricks shall be thoroughly burnt but without being vitrified. The bricks used shall be well burnt, uniform in shape, size, texture, colour 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 colour 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.

8.3 Stacking and Sampling

The bricks shall be sorted and arranged in stacks of one or two thousands or as directed by the Engineer. Each stack shall be 10 courses high and two bricks thick so that at least 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 5 bricks be taken.

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

9 SCCAFFOLDING

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

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

10 EXECUTION

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 10mm in thickness completely filled with cement mortar as specified herein, and each brick shall be bedded by firmly tapping with the handle of the trowel. All horizontal joints shall be parallel and all vertical joints in alternate courses shall be directly over one another. Excess mortar at the outer edges shall be removed and joints drawn straight with the edge of a trowel and a straight edge. All anchors and similar work required to be embedded in the brick masonry shall be installed as the work progresses. At the completion of the work all holes or defective mortar joints shall be cut out and repointed.

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

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

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

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 requirements for water used in the manufacture of bricks.

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.

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 parts of sand by volume and sufficient water to produce the proper consistency for the intended use. The surface on which mortar is to be applied shall be rough, clean and damp. The first layer of mortar, about 6 mm thick shall be forcibly dashed onto the surface so as to bond more tightly. The full thickness of the cement coating shall be 12mm except where otherwise shown on the Drawings or directed by the Engineer.

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.

11 REPAIRING BRICKWORK

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

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

12 HORIZONTAL DAMP PROOF COURSE

All Horizontal damp proof courses unless otherwise specified in the drawings shall consists of cement concrete (210 kg/cm²) 38mm thick, mixed with approved quality water proofing chemical as per manufacturer's specifications and shall be laid at required levels as per drawings and instructions of the Engineer. The D.P.C shall be tamped, consolidated, leveled and edges corners made to the requirements of the relevant drawings including finishing and curing complete. Including two float coat of hot bitumen.

13 VERTICAL DAMP PROOF COURSE

All vertical damp proof courses unless otherwise specified in the drawings shall consists 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 as per drawings and instructions by the Engineer.

14 MEASUREMENT & PAYMENT

14.1 General

- 14.1.1 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.
- 14.1.2 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.
- 14.1.3 Except otherwise specified herein or elsewhere in the Contract Documents, no measurement and payment will be made for the under mentioned specified works related to the relevant items of the Bills of Quantities. The cost thereof shall be deemed to have been included in the quoted unit rate of the respective items of the Bills of Quantities.
 - 14.1.3.1 Cutting & chiselling of masonry wherever required.
 - 14.1.3.2 Cement sand mortar used in laying bricks including wastage.
 - 14.1.3.3 Curing and repairing the masonry work.
 - 14.1.3.4 All joint reinforcing bars, reinforcing anchor bars or hoop iron
 - 14.1.3.5 Scaffolding for masonry work.
 - 14.1.3.6 75mm long steel nails to be fixed in brick masonry after every 5th course at a distance 150mm c/c for fair face brick cladding.
 - 14.1.3.7 Cement sand mortar in 1:4 at the back of the fair face brick (Gutka) cladding to make it in plumb if required.
- 14.1.4 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/cm² 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.

14.2 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.

14.3 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).

SECTION – 6411

INSULATION, DAMP PROOFING/ WATER PROOFING & BUILT-UP ROOFING

1 SCOPE

The work under this section of the Specifications consists of furnishing all plant, labour, equipment, appliances and materials and in performing all operations in connection with installation of insulation, surface water-proofing, integral waterproofing and built-up roofing, including water proofing treatment to foundations, toilets floor and walls complete in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and Conditions of the Contract.

2 CODES AND STANDARDS

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

PS 208	Common building clay bricks.
ASTM C67-81	Standard method for sampling and testing brick and structural clay tile.
BS 8102	Primer for use with asphalt in damp proofing and water proofing.
ASTM D2103-81	Polyethylene film and sheeting
ASTM D 140-70	Standard methods of sampling bituminous (1981) materials.
DOE 77	Bitumen used in damp proofing and water proofing
	Specifications for roofing felt.
BS 1521-72	Water proof building papers.
BS 2972-75	Methods of test for inorganic thermal insulating (1984) materials.
BS 4016-72	Building paper (breather type).
ASTM D-2240	Highly Flexible Cementitious Waterproofing Membrane for Horizontal and Vertical surfaces of Polyacrylate Styrene.
ASTM C-412	
ASTM D-4541	
ASTM C-836	
ASTM C494-81	Water Reducing Plasticising and Retarding Concrete Admixture (For Concrete in normal ambient temperature)
BS5057:Part 1	
BS5075:Part 1	
BS:EN934-2:1998	
ASTM C1017 Type 1 and Type 2	
CRD 48-73	Integral Water Proofing Admixture by Crystallization
ASTM C 39	
ASTM C666	
ASTM C 109	High – Strength Concrete Floor Hardener

ASTM C 944

ASTM C494
 BSEN 934-2 1998
 ASTM C260-81

High Range Water Reducing Superplasticiser (For Concrete in Cold Weather)
 Air Entraining Concrete Admixture (For Concrete in Cold Weather)

3 SUBMITTAL

3.1 Shop Drawings:

Shop drawings shall be submitted showing layout and all the details for construction.

3.2 Samples:

Samples of all materials proposed for use under this section, shall be submitted to the Engineer for approval.

4 MATERIALS

4.1 Polystyrene

4.1.1 Expanded polystyrene (thermopore) shall be of the type as approved by the Engineer for insulating the roof and shall conform to BS 7972. The adhesive for expanded polystyrene shall be as specified by the manufacturer or as approved by the Engineer.

4.1.2 Extruded polystyrene for insulating the roof shall be of following properties:

Density	32-38 Kg/m ³	BS 4370 (Method 2)
Thermal conductivity	0.18 BTU in/ft ² hr °F	ASTM C-518
Compressive strength	300-400 kPa	ASTM D 1621

4.2 Bitumen

4.2.1 Hot Applied

Special industrial asphalt shall be of 10/20 penetration, or any other approved by the Engineer conforming to the following limits:

Specific gravity	1.01/ at 25°C
Penetration, 100 gm	10/20 at 25°C
Working temperature	+50C /55°C

Primer shall be bitumen of 10/20 penetration of approved manufacturer or any other approved by the Engineer conforming to B.S 8102.

4.2.2 Cold Applied

It shall be a water based synthetic rubberized bitumen modified emulsion. It cures to form a highly elastic seamless waterproof membrane as supplied by the approved manufacturer with characteristics values not less than given below:

Elongation	> 1000%
Sp. Gravity	1.09 – 1.11
Flash Point	Non-flammable
Drying Time	1-3 hours (Depending on humidity)
Tensile Strength	0.7 N/mm ²
Heat Resistance	120°C no flow
Water permeability	2.5 gm/m ² /24 hours

The application shall be in 2- coats over a primer coat over well prepared surfaces with respective application rates as recommended by the approved manufacturer.

4.3 Water Proofing Polymer

It shall be 2-part acrylic polymer (Polyacrylate Styrene) modified highly flexible cementitious membrane as manufactured and supplied by the approved manufacturer with characteristics values not less than given below:

Elongation	> 200%
Density	1.5 Kg/l
Resistance to Water	No water penetration (DIN 1048 pt 5:199)
Coverage	approximately 1.5 Kg/m ² /mm

4.4 Epoxy Based Floor Topping

It shall be 3-part self smoothing / leveling epoxy certified as food grade for its intended use. The epoxy floor topping shall be rendered in 2 mm thickness as specified and shall essentially be of following properties:-

- Compressive Strength (BS 6319) at 20°C 60N/mm²
- Flexural Strength (BS 6319) 30N/mm²

The floor topping shall be applied after priming the surface @ 5m² / Litre in 2-coats whereby it is essential that the primer is tack free prior to the application of the topping. The topping shall then be poured on to the tack free primed surface and floated with a steel trowel to produce a seamless surface of desired thickness with the coverage rate of 27kg/7.5m². Within 20-minutes the material should then be rolled with a spike roller in opposite directions to remove all entrapped air and trowel marks.

The application temperature range shall be as given below:-

- Minimum 5°C
- Maximum 35°C

Notwithstanding to above, the entire work shall be carried-out in strict conformance with the recommendations of the approved manufacturer.

4.5 Membranes

4.5.1 Felt

The felt shall be an asphalt impregnated type 1C fiber base as per BS 747. The number of ply shall be as specified in the Drawings. The felt shall be smooth and stout building paper having water proofing qualities conforming to BS 4016. Weight of 3 ply standard roll of 20 x 1 metre should not be less than 54 Kilograms.

4.5.2 Polyethylene Sheet

Isolation membrane shall be polyethylene sheet conforming to ASTM D 2103 in specified gauges

4.6 Thermofoam

Thermofoam / Insulite shall be as procured and used in-conformance with the recommendations of approved manufacturers or equivalent approved by the Engineer Incharge.

4.7 Expansion Joints Sealants

It shall be fully bonded 2-parts Polysulphide which cures to form resilient elastomeric seal. This shall be applied on both sides of horizontal and vertical joints over non-porous becker rod and / or in-conformance with the recommendations of the approved manufacturer.

4.8 Earth

Clay shall be plastic and obtained from sources approved by the Engineer and shall have fine sand in the range of 20% to 30%. It shall not contain more than 0.50% soluble salts, more than 0.2% sulphate, more than 4% organic contents and shall not contain any gravel, coarse sand, roots of grass and plants.

4.9 Brick Tiles

Brick tiles shall be either hard mould or machine moulded having a nominal size of 230 x 115 x 37 mm, without frog on any side and weighing 1.6 Kg to 2.0 Kg. The tiles shall conform to PS 208 or ASTM C 67 and shall have same qualities as of bricks specified in Section "Brick Masonry".

4.10 Glazed/ Unglazed Khaprail Tiles for Sloping Roof.

The Khaprail tiles made of burnt clay (terra cotta), best quality, glazed or unglazed for sloping roof as shown on the drawing or as approved by the Engineer laid over a bedding mortar of specified thickness and grades

5 PREPARATORY WORK

All scuppers and roof drains shall be placed and metal flashing flanges etc. shall be provided in time to be installed alongwith the roofing assembly.

All surfaces, to be treated shall be dust free and dry. Application of roof finishes shall not start unless the preparatory work has been inspected and approved by the Engineer.

6 INSTALLATION

6.1 Surface Waterproofing Treatment

The selection and combination of various water proofing and damp- proofing materials for different locations shall be as shown on the Drawings or as directed by the Engineer. Unless otherwise directed or approved by the Engineer, the procedures given in this sub-section shall be adopted.

All surface treatments shall be executed after thorough surface preparations in each case of laying felts, membranes and / or applying hot/cold bitumen:

- i) Cleaning surfaces off cement laitance, removing arises, stains and washing all parts of surfaces to be damp/water proofed before the application of primer coat in conformance with manufacturer's recommendations.
- ii) In no case the treatment shall be applied during rain or while surfaces are damp;
- iii) Bond coats for the felts shall be at the rate recommended by the manufacturer. During execution, at no point shall the felt touches the underlying concrete and the rate of application shall be such that the asphalt mopping shall not be more than one metre ahead of the roll of felt. All asphalt shall be applied with mops except that the hot surfacing application shall be poured from a dipper.
- iv) Felt shall be laid with each sheet lapping the preceding one. Each sheet shall be lapped with an exposed lap of 12 inch. All end laps shall be 4 inch minimum. The laying of felt shall, in general, be started at low points working upwards to high points of the surface. The roofing felt shall be rolled while mopping, rubbing and pressing the felt sheets as it spreads on to the surface, so as to ensure thorough sticking and a smooth firm surface, free from wrinkles or bubbles. Roofing felt shall be extended to points and position as shown on the Drawings.

6.2 Integral Waterproofing & Plasticizing

The selection and combination of various water proofing and plasticizing polymers various factors related with (a) method of concreting (b) handling and (c) ambient temperature conditions prevalent between the time of placing concrete and final set time (d) adaptability of the polymer with the quality of other materials consumed in concrete and (e) the designed purpose of the structural component.

All polymers that are to be admixed in the concrete shall pertain only to the recommendations of the approved manufacturer and / or as directed by the Engineer.

Unless otherwise directed or approved by the Engineer, the polymers / admixtures and their respective application rates as given in this sub-section shall be adopted.

6.2.1 For Normal Ambient Temperatures

- i) Water reducing plasticizers (for pile concreting) @ 0.20-0.80% by weight of cement.
- ii) Integral water proofing and retarding concrete plasticizers (for retaining wall) @ 0.90% by weight of cement.
- iii) High range water reducing and retarding concrete admixture (for slab, beams, columns, raft, parapets) @ 1.20% by weight of cement.
- iv) High strength concrete floor hardener 5-6 Kg/ Sqm for parking area driveways and ramps.

6.2.2 For Cold Ambient Temperatures

- i) High range water reducing super plasticizers @ 0.5-3.0% by weight of cement mixed with air entraining concrete admixture @ 0.03 - 0.20% by weight of cement.

6.2.3 Execution

The polymers/ admixtures that have been select pertaining to the respective usage and the ambient conditions and thereto approved manufacturers shall strictly be used in terms of dosage as recommended by the manufacturer and/ or as approved by the Engineer.

All polymers/ admixtures shall be used by ensuring the following:

- i) The storage/ shelf life of the product is not expired.
- ii) The dosage shall be ascertained through trial mixes.
- iii) There should be no direct addition of it in the cement.
- iv) These should be added to concrete mixes during the mixing process at the same time as the water or the aggregates.

7 MEASUREMENT AND PAYMENT

7.1 General

7.1.1 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.

7.1.2 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.

7.1.3 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.

- 7.1.3.1 All preparatory work, scrapping, cleaning and primer coat.
- 7.1.3.2 Formwork.
- 7.1.3.3 Tapered cantt made at the interface of roof slab & parapet wall.
- 7.1.3.4 Terrazzo / brick tiles in roof treatment.
- 7.1.3.5 Priming of surface
- 7.1.3.6 Waterproofing Polymer.
- 7.1.3.7 Cement sand mortar for sloping roof.
- 7.1.3.8 Polystyrene layer.
- 7.1.3.9 Cement sand plaster if rendered any where.
- 7.1.3.10 Polyethylene sheet

7.2 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.

7.3 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).

SECTION – 6521

CEMENT PLASTER AND POINTING

1 SCOPE

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

2 APPLICABLE STANDARDS

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

Pakistan Standard

P.S 232 Ordinary Portland Cement

ISO (International Organization for Standardisation)

R.597	Definitions and terminology of cement.
R.679	Method of testing strength of cements, compressive and flexural strength of plastic mortar (Rilem - (embureau method).
R.680	Chemical analysis of cement & main constituents of Portland Cement.
R.681	Chemical analysis of cements-mixer Constituents of portland cement.
R.682	Chemical analysis of cements - determination of sulphur as sulphide.

ASTM (American Society for Testing and Material)

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

BSI (British Standards Institution)

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

3 GENERAL

- 3.1 Except as may be otherwise shown on drawing specified, all plaster work, both internal and external shall be ordinary Portland Cement plaster of the required thickness as shown on the drawings.
- 3.2 Plastering shall not commence until all electric conduits, drainage and sanitary pipes, inlets to tanks, brackets, clamps, doors and window frames and all sorts of inserts and embedded items are fixed in position. It shall be the responsibility of the Contractor to make sure that all such work is carried out by other contractors before starting of plaster work. Pointing work, chiselling and repairing of cement plaster shall not be permitted without the approval of the Engineer.
- 3.3 Sample of materials shall be submitted to the Engineer for his approval prior to use in the works.

4 MATERIALS

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

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

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

5 PROPORTIONING AND MIXING

- 5.1 Measurement of materials by volume shall be by containers of known capacity to maintain consistent proportions. No lumpy or caked material shall be used. Mixing equipment boxes and tools shall be clean. Materials shall be proportioned as specified on the Drawings, in the Bill of Quantities or as directed by the Engineer. Plaster ingredients shall be thoroughly mixed either by hand on a clean cement concrete platform or by a mechanical mixer.
- 5.2 Quick lime shall be slaked by stirring it into excess of water in a tank where it will hydrate and generate heat. Slaking shall be complete in about 12 hours

when temperature shall cease to rise. Lime shall then be sieved through 1.4 mm mesh and stored under water and left to mature. Maturing period shall be from one to three weeks as directed by the Engineer. Matured material known as lime putty, shall then be ready for use in plastering.

- 5.3 Only limited water shall be added for proper workability and such quantity of mortar shall be prepared which can be consumed in thirty minutes after preparation. Preparation of mortar in bulk quantity for use during the entire day or for any other time more than that stipulated above is expressly prohibited. Retempering shall not be permitted and all mortar which has begun to stiffen shall be discarded.
- 5.4 For cement, lime and sand plaster, normal procedure shall be to prepare a day's supply of coarse materials by mixing one part of lime putty with six parts of sand. Plaster mortar shall be prepared by mixing one part of Portland cement with six parts of coarse material and adjusting the water content to give adequate workability. After adding the Portland cement the plaster shall be used within two hours.

6 PREPARATION OF SURFACE TO BE PLASTERED

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

7 APPLICATION OF PLASTER

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

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

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

8 METAL LATH OVER REINFORCED CONCRETE AND MASONRY JOINT

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

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

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

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

9 BEADS

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

10 INTERNAL / EXTERNAL PLASTER OVER CONC / BRICK SURFACES

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

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

11 POINTING

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.

11.2 Flush Pointing

After preparing the surface of brick or stone masonry all horizontal and vertical joints shall be raked in upto a depth of 12mm in brick and ashlar (stone) masonry and upto a depth of 20mm in rubble (stone) masonry. The joints should be cleaned with a wire brush and the cement sand mortar shall be pressed in all joints. The mortar shall be made flush with the surface with a steel trowel.

11.3 Struck Pointing

For struck pointing, all the vertical and horizontal joints after raking upto a depth of 12mm in brick and ashlar masonry and 20mm in rubble masonry and cleaning with a wire brush shall be filled with 1:3 cement sand mortar. All the joints shall be pressed and given a V-notch by striking with a tool. Striking shall be done when the mortar is partially set but still sufficiently plastic to bond. All striking shall be done with a tool which compacts the mortar, gives 6mm deep V-notch with a 70 degree apex. in order to give a well defined network of lines on the surface.

12 GYPSUM PLASTER

Gypsum Plaster shall be provided wherever shown on the Drawings or as directed by the Engineer. The Work shall be carried out strictly in accordance with the manufacturer's instructions.

13 CLEANING AND PROTECTION

- 13.1 Rubbish and debris shall be removed as necessary to make way for work of other trades and as directed by the Engineer. As each room or space is completed all rubbish, debris, scaffolding and tools should be removed to leave the room clean.
- 13.2 Prior to plastering all aluminium windows, finished metals should be covered by sheet of plastic or tarpaulin to protect it from damage.
- 13.3 Protect finished plaster from injury by any source. Contractor shall also protect walls, floors and work of other trades from plaster materials.

14 TOLERANCES

- 14.1 Surfaces of plaster work shall be finished with a true plane to correct line and level with all angle and corners to a right angle unless otherwise specified and with walls and reveals plumb and square.
- 14.2 Maximum permitted tolerances shall not exceed 3mm in 2M variation from plumb or level in any exposed line or surface and 1.5 mm variation between planes of abutting edges or ends.

15 MEASUREMENT & PAYMENT

15.1 General

- 15.1.1 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.
- 15.1.2 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.
- 15.1.3 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.
 - 15.1.3.1 Metal lath over reinforced concrete and masonry joint.
 - 15.1.3.2 Joints, junctions, corners, drip course edge, and roundings.
 - 15.1.3.3 More than one layer due to any unevenness in the finished works.
 - 15.1.3.4 Cutting & patching of all defective works.
 - 15.1.3.5 Surface preparation, cleaning and protection as specified.
 - 15.1.3.6 Curing of plastered/Pointed surfaces.
 - 15.1.3.7 Water proofing Admixture in plaster if specified on the Drawings.

15.2 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.

15.3 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).

SECTION - 6600

FLOOR AND WALL FINISHES

1 SCOPE

The work under this section of the Specification consists of furnishing all plant, labour, equipment, appliances and materials and performing all operations in any floor and at any height in connection with the installation of cement concrete floors and floor finishes including bases, skirting and external surface treatments, complete in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and conditions of the Contract.

2 APPLICABLE STANDARDS

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

Pakistan Standard

- 232 Ordinary Portland Cement
- 511 Terrazzo tiles
- 531 Cement Concrete Floor Tiles

ISO (International Organization for Standardization)

- R 680 Chemical analysis of cements Main constituents of Portland Cement.
- R 681 Chemical analysis of cements Minor constituents of Portland cement.

ASTM (American Society for Testing and Materials)

- C 482 Bond strength of ceramic tile to Portland cement.
- C 648 Breaking strength of ceramic tile.
- C 650 Resistance of ceramic tile to chemical substances.
- C 798 Colour permanency of glazed ceramic tile.
- D 2859 Flammability of finished materials vinyl-asbestos tile or flooring.
- D 3564 Application of floor polishes to maintain vinyl- asbestos tile or flooring.
- E 84 Surface burning characteristics of building materials
- F 141 Resilient floor coverings, definitions of terms.
- F 510 Resistance to abrasion of resilient floor coverings.

BSI (British Standards Institutions)

- 882 Pt.2 Course and fine aggregates from natural sources.
- 1199 Sands for external renderings, internal plastering with lime and Portland cement and floor screeds.
- 1201Pt.2 Aggregates for granolithic concrete floor finishes.
- 1281 Glazed ceramic tiles and tile fittings for internal walls.

1286	Clay tiles for flooring
3260	PVC (vinyl) asbestos floor tiles.
3261	Unpacked flexible PVC flooring.
5385	Internal Ceramic wall tilling and mosaics in normal conditions.
5442	Classification of adhesives for use in Construction pt-1 Adhesives for use.
203	Sheet and Tile flooring
204	In-situ Floor Finishes.
209 Pt.1	Care and Maintenance of floor surface, wooden flooring.

3 SUBMITTALS

Contractor shall submit at least 3 range samples of all the items/each type of stone/tile to be provided under this section showing colour, grade, finishing and texture to the Engineer for approval. Contractor shall provide samples from each specified manufacturer and in sufficient variation for each type of item. The Engineer shall make his selection only when all related samples have been submitted and he is satisfied that the samples submitted are the maximum range available against any item.

4 MATERIAL

4.1 Cement

Cement shall be ordinary Portland cement conforming to B.S. 12 or PS 232.

4.2 Sand

All fine sand shall be obtained from sources approved by the Engineer. The grading shall conform to B.S 882 Grading Zone 1 and 2 of which the gradation limits are as follows:

Percentage (by weight) passing

B.S. Sieve	Grading Zone 1	Grading Zone 2
3/8" (9.53 mm)	100	100
3/16" (4.765 mm)	90-100	90-100
No. 7	60-95	75-100
No. 14	30-70	55-90
No. 25	15-34	35-59
No. 52	5-20	8-30
No. 100	0-10	0-10

4.3 Coarse Aggregate

Coarse aggregate shall be crushed or uncrushed gravel or crushed stone, angular or rounded in shape and shall have granular, crystalline or smooth surface free from friable, flaky and laminated pieces, mica and shale. It shall not contain matters injurious to concrete. All coarse aggregate shall conform to BSS NO.882 and shall be graded as follows:

B.S. Sieve	% Passing by weight
1" (25.40 mm)	100
3/4" (19.05 mm)	90-100
3/8" (9.53 mm)	20-55
3/16"(4.765 mm)	0-10

The aggregate shall be stored on properly constructed paving or as directed by the Engineer.

There shall be a physical partition between the stockpiles of coarse and fine aggregate. If required, aggregates shall be washed and screened to the satisfaction of the Engineer. Sieve analysis of all the aggregates to be used in the works shall be carried out as and when required by the Engineer. All aggregate shall be subject to the approval of the Engineer.

Any aggregates not found to be of the specified/approved standard shall be rejected by the Engineer and all such rejected material shall be removed from site without delay.

Floors sub-base or base constructed with rejected aggregates shall be dismantled and rebuilt at the expense of the Contractor.

4.4 Brick Ballast

Brick Ballast as Sub base of floors shall be obtained from well burnt or over burnt bricks which are hard, durable and strong. Brick ballast shall be free from impurities, quarry sap, dust, dirt and solubility characteristics

The brick ballast shall be of specified gradation and which shall laid in position with excessive ramming, watering unless required thickness is achieved.

4.5 Water

Water used for mixing concrete, curing or any other operation of the works specified herein shall be fresh, clean and free from organic or inorganic matters in solutions or in suspension. Only water of the approved quality shall be used for all constructional purposes:

4.6 Cleaning Compound

The compound used for all cleaning of terrazzo shall be an approved neutral chemical cleaner free from acid and alkali or any other material that will affect the colour or otherwise damage the terrazzo and shall not affect the conductivity of terrazzo floors.

4.7 Division Strips

Division strips shall be of marble as approved by the Engineer. Standard division strips for floor finishes shall be not less than 5mm (3/16") in thickness and shall not be less than 1-3/4" in depth.

4.8 Marble Chips

Marble chips shall have an abrasive hardness of not less than 16, as determined by the test of wear resistance in National Bureau of Standards Reports MBS 98. Size shall vary from No. 0 to 8.

4.9 Preservative Material

Preservative treatment for terrazzo floor shall produce a water-proof finish which will not be impaired by immersion in water at room temperature for a period of 2-1/2 hours, approximately 18 hours after the floor is finished by buffing, as specified. The preservative material shall not discolour the terrazzo nor leave a tacky or sticky finished film on the surface after buffing.

4.10 Vinyl Tiles

4.10.1 PVC Tiles (Static): PVC tiles / sheet of requisite thickness shall be of best quality available in the Country. Size, colour, shade and adhesive shall be as per the sample which shall be submitted by the Contractor and approved by the Engineer.

4.10.2 PVC Tiles (Anti-static): PVC tiles / sheet of requisite thickness shall be of best quality available in the Country. Size, colour, shade, import quality copper strips and conductive adhesive shall be as per the sample which shall be submitted by the Contractor and approved by the Engineer.

Following shall be the technical requirements;

- For new floors between two dry contact electrodes no individual reading shall be greater than $5 \times 10^6 \Omega$ than $2 \times 10^4 \Omega$. The average of all readings shall remain between $2 \times 10^6 \Omega$ and $5 \times 10^4 \Omega$
- For existing floors between two dry contact electrodes no individual reading shall be greater than $5 \times 10^7 \Omega$. The average of all readings shall be $2 \times 10^7 \Omega$.

4.11 Terrazzo Tiles

Terrazzo tiles shall be first grade, mechanically compressed type conforming to PS-531. Tiles shall be 12" x 12" and shall be 1" in thickness (minimum) with a minimum terrazzo topping of 1/2" thickness composed of 1:2 cement marble chips of approved size and colour over 1/2" thick substrate of 1:3 cement sand mortar.

4.12 Ceramic Tiles / Pre-Polished Porcelain Tiles

Ceramic tiles shall be local, premium quality, plain white/coloured or printed from one of the approved manufacturer. The tiles shall be of sizes as specified on the drawings and shall conform to BS 1281 as per samples. Pre-polished porcelain tiles shall be best quality, plain coloured/textured from one of the approved manufacturer of sizes as specified on the drawings

4.13 Cement Concrete Tile/ Interlocking Pavers

Cement Concrete tiles/ Interlocking Pavers (minimum 7000 psi) shall be of approved shade, shape and size, checkered, mechanically vibrated and compressed type conforming to PS-531, as shown on the drawings and approved by the Engineer. Manufacturer of concrete tiles and pavers shall be subject to the approval of the Engineer.

4.14 Granite Slab/Tiles

All Granite stone types are to be selected and approved by the Engineer for quality, colour and texture. All approved granite for tile work shall be obtained from a single quarry and the Contractor shall ensure consistency in colour range and texture throughout the work. All granite tiles to be installed/ laid shall be factory polished.

4.15 Acrylic Resin Coating (Graffiato)

Acrylic based Resin Coating (Graffiato) on surfaces (straight or swirl) shall be of approved shade, colour, texture and size. Manufacturer of Acrylic Resin Coating shall be subject to the approval of the Engineer.

4.16 Stucco Work

It shall be cement based rendering over plaster work and which shall be prepared by mixing white cement with marble powder and marble chips in ratio and sizes as per the direction of the Engineer. Subsequently this surface rendering shall be cut/ chiseled and painted to the desired grades and texture shown in the drawings.

4.17 Colour Crete Work

It shall be cement based rendering over plaster work and shall be prepared by mixing white cement with Karachi (special) sand and special Construction Chemicals in ratio as per the direction of the Engineer. These special construction chemicals improve its workability and water proofing property.

Colour crete on surfaces shall be of approved shade, colour, texture and size. Manufacturer of colour crete shall be subject to the approval of the Engineer.

5. EXECUTION

5.1 Cement Concrete Flooring

The materials for C.C flooring shall be same as already specified under clause 3, "Materials".

5.1.1 Composition of Concrete

Concrete shall be composed of Portland cement, sand, coarse, aggregate and water, all well mixed and brought to the proper consistency. The Contractor shall mix the ingredients as indicated on the Drawings. The proportions of

the various ingredients shall be determined from time to time during the progress of the work and tests shall be made of samples of the aggregates and the resulting concrete. The mix proportions and appropriate water-cement ratio will be determined on the basis of the production of concrete having required workability, density, impermeability, durability and required strength.

5.1.2 Mixing Concrete

The concrete ingredients shall be mixed in a batch mixer for not less than 1-1/2 minutes after all ingredients, except the full amount of water, are in the mixer. The Engineer reserves the right to increase the mixing time when the charging and mixing operations fail to produce a concrete batch in which the ingredients are uniformly distributed and the consistency is not uniform. The concrete shall be uniform in composition and consistency from batch to batch except when changes in composition or consistency are required. Water shall be added prior to, during and following the mixer charge. Excessive over-mixing requiring addition of water to preserve the required concrete consistency will not be permitted. The concrete ingredients shall be mixed by volumetric measurement in purpose made boxes approved by the Engineer.

5.1.3 Construction

The base course of the floor shall comprise of stone ballast of 2 inches (approx: 50 mm) mesh size. The base course shall be thoroughly compacted by suitable power rammers to the total consolidated thickness as shown on the Drawings and as approved by the Engineer. The interstices shall be filled with smaller size stones. The base course shall be blinded with sand and the whole surface watered. Over the well-compacted base course, a layer of concrete of the required grade and thickness shall be laid, in panels of the sizes as indicated on the Drawing and as approved by the Engineer.

After the C.C bed has been cured, as directed by the Engineer, it shall be roughened and well watered before floor finishing is laid. The floor finish shall comprise of cement concrete of required grade and shall be laid in panels to the required thickness as shown on the Drawings or as directed by the Engineer. The concrete after laying will be thoroughly rammed and mortar worked up to the top and smoothed with a steel trowel. The edge of each section into which the floor is divided should be defined by wooden screeds of the approved width and of a depth equal to the depth of the floor concrete.

Freshly placed concrete floor and completed floor portions as finished shall be protected to prevent loss of water by covering with damp hessian, water proof paper, damp sand or other approved material, and shall be kept constantly damp for a period of four days or longer after concreting as directed by the Engineer. The concrete shall be allowed to dry out slowly over a period of three days after wet curing is completed.

The expansion joints shall be filled in with hot bitumen, of the approved grade, as directed by the engineer.

5.2 Terrazzo Flooring

5.2.1 Mix

The terrazzo mixes shall be composed by weight as follows:

Plain terrazzo for all floors and bases indicated as terrazzo and not otherwise specified, shall be composed of one part cement, white or grey, and 2 parts of marble chips of the sizes and colours hereinafter specified.

5.2.2 Preparation for Terrazzo

The grade and thickness of concrete as shown on the Drawings shall be laid as under bed to receive terrazzo. The surface of the bed shall be roughened for bounding with the terrazzo finish. If the surface is too smooth it shall be roughened with a toothed chisel and, prior to laying the terrazzo the bed shall be cleaned of all dirt, oil grease and extra loose material.

5.2.3 Division Strips

Terrazzo floors and bases shall be divided up by marble strips of specified thickness and depth. The division strips between field work and borders shall have exposed tops in full width of the strips. The division strips shall be set immediately after the spreading of the under bed, the strips being partially embedded therein, securely anchored to the sub-floor and grouted solid.

All division strips shall be set, straight to lines and to the proper level to ensure that the tops of the strips will show uniformly after grinding and smoothing operations are completed and joints and intersections shall be fitted tight. Strips shall be braced to prevent bulging during the placing of terrazzo.

Unless otherwise shown on the drawings, the divisions in field work of large areas shall not exceed 4 feet x 4 feet and in small areas shall not exceed 2 feet x 2 feet.

Edging strips shall be placed at door ways between terrazzo and other types of flooring and along the edges of all terrazzo bases or borders and adjoining other types of floor finishes or floor covering. The edging strips at doorways shall be placed in line with the step face of doors. All edging strips shall be anchored and grouted solid in the under bed or to the concrete sub-floor and braced to prevent bulging as specified for division strip.

5.2.4 Laying Terrazzo

The sub-surface shall be swept clean, thoroughly moistened, but not saturated, and slushed with a coating of neat cement grout approximately

1/8" in thickness. The under bed consisting of class 'C' cement concrete screed shall be spread and brought to a level not less than 3/4" below the finished floor level. The dividing strips shall be installed in the green under bed. The terrazzo mix shall be spread, tamped and rolled into a compact mass not less than 3/4" thick. After rolling, additional aggregate mix shall be sprinkled over the surface to fill up all depressions, to take up excess moisture and to permit the terrazzo to be trowelled to a level, dense and even surface, slightly above the finish line of floor. This level, shall allow for the surface grinding necessary to expose the specified area of aggregate, and to produce smooth, level floors free of waves and depressions.

5.2.5 Seasoning

The completed terrazzo shall be allowed to season for 6 days during which time it shall be kept moist by (1) covering with approximately 1" thickness of sand; or (2) covering with building paper or mats; or (3) sprinkling with water at every 10 hour interval.

5.2.6 Surface

Following the curing period, the terrazzo shall be machine ground to a true, even surface using a No. 24 grit followed by a No. 80 grit or finer abrasive stone. After the first grinding, the floors shall be thoroughly grouted with the same cement and colour composition as specified for the matrix of the terrazzo mix. The grout shall be of the consistency of thick cream, and shall be brushed over the floor to eliminate all pits and thoroughly fill the surface for final grinding.

5.2.7 Finishing

Not less than 72 hours after application, the grouting coat shall be removed by grinding. In the later stages of grinding, the grit stones or other abrasive used in the grinding machine shall be of a grain or fineness that will give the surface smooth finish. Small areas, inaccessible portions and corners which cannot be reached by the grinding machine shall be ground and rubbed by hand.

5.2.8 Protection

The walls and all surfaces of the finished work of other trades shall be properly protected from damage and spoiling during the process of grinding and washing of the terrazzo. After the finish grinding has been completed and the surface treatment applied, the terrazzo work shall be covered and protected with material approved by the Engineer until completion of the work of all other trades.

5.2.9 Cleaning and Coating

Prior to placing the protective covering, the terrazzo floor shall be approved by the Engineer. After the work of all other trades has been completed and the protective covering removed, all terrazzo work shall be washed with cleaning compound, mixed with warm water and using a fine abrasive where necessary to remove any stains or cement smears. The terrazzo shall be allowed to dry thoroughly and shall be given a sealing application of

preservative material. The sealing material shall be applied in accordance with the manufacturer's directions, leaving all terrazzo work in clean condition as approved by the Engineer.

5.2.10 Dado/Skirting

The ingredients of dado/skirting shall be one part of cement and two parts of marble chips varying from Nos. zero to 2. Striking shall be laid over a base of plaster of specified thickness. The thickness of dado/skirting layer shall be as specified. The surface shall be grinded and polished to the satisfaction of the Engineer.

5.3 Installation of Tile Flooring

When setting out the tiles, care shall be taken to establish the correct elevation for the floor. A gauge rod shall be used, indicating the overall measurement of a given number of tiles with specified joint width to reduce cutting.

After the floor has been machine finished, it should be covered with white, non-staining sand or rags to protect it while other work is being done. After removal, the floor shall be thoroughly scrubbed.

5.3.1 General

The base shall be prepared by laying cement concrete of specified grade and of thickness as shown on the drawings, or specified in the Bill of Quantities.

The curing period of the setting bed shall be as directed by the Engineer. As large an area of setting bed shall be spread at one time as can be covered with tiles before the mortar has set. Surplus mortar shall be removed. The thickness of setting bed in any space shall not be less than 1/2".

Floor and wall surfaces to receive the tiles shall be thoroughly cleaned of all dirt, dust, oil and other objectionable matters. Tiles shall be laid out from the centre line of each space in an outward direction and the pattern should be made symmetrical with a minimum number of cut tiles as directed by the engineer.

Joints between the tiles shall be of uniform width. Tiles shall be cut with a suitable cutting tool and rough edges shall be rubbed smooth. Tiles shall be laid to the straight edges.

5.3.2 Ceramic Tiles/Porcelain Tiles

The ceramic tiles/porcelain tiles shall be laid to the required lines, levels and grades over a setting bed of cement sand mortar comprising of 1-part of cement and 2-parts of sand by volume and the joints filled with neat white/pigmented cement including vertical and horizontal covers. The tile floor shall be kept wet for at least 72 hours and no traffic should be allowed on the tiles during curing period.

5.3.3 Cement Concrete Tiles

The cement concrete tiles shall be laid to the required lines, levels and grades over a setting bed of cement sand mortar.

The sides shall be buttered with cement mortar and adjacent tiles laid in the same manner in the required pattern, with a thin joint in proper level and line. The joints shall then be thoroughly cleaned with wire brush and pointed with neat cement of the same colour as the tile.

Care shall be taken to see that full tiles are used as far as possible. Where this is not possible, the edge tiles shall be neatly cut with an electric saw and the edges rubbed smooth. In case of patterned tiles, the tiles shall be laid in such a way that the pattern ends symmetrically on two sides.

Cement concrete tiles shall be cured for 7 days with water and then thoroughly cleaned and dried. Notwithstanding anything written above, the manufacturer's printed instructions regarding laying shall be strictly followed.

5.3.4 Concrete Interlocking Pavers

Concrete Interlocking pavers shall be laid in accordance with the instructions of the manufacturer over a cushion of sand. The pavers will be laid as per the instructions of the Engineer.

5.3.5 Terrazzo Tiles Flooring

Apply cement slurry coat over surfaces of concrete substrate immediately prior to placing setting bed which shall comprise cement sand mortar 1:2 and shall be 1" thick and shall be spread uniformly. Limit area of application to avoid premature drying out. Set tiles before initial set occurs. Apply a thin layer of cement paste to bottom of each unit. Set tamp and level units immediately so that cement mortar slurry rises up in the joint. Set units in required pattern as specified and as per the instructions of the Engineer with uniform joint widths. The levels and lines shall be checked with very fine twine and the defects removed immediately. After the tiles have initially set, the joints shall be raked out and coloured cement of required shade shall be spread in the form of slurry to fill all joints. Force grout into joints, strike flush and tool slightly concave. Remove mortar and grout from surfaces while still moist and as the work progresses. The surface after drying (minimum of seven days) shall be machine grinded to a true even surface using various grades of abrasive stones as required and directed by the Engineer. After the first grinding the floor shall be grouted with the same colour composition as used for its manufacture, to a consistency of thick cream and shall be brushed over the floor to fill in the joints and after 72 hours the grouting coat shall be removed by grinding till a smooth and even surface is obtained. .and chemically polished.

The tiles shall be cut wherever required with a suitable cutting tool and rough edges shall be rubbed smooth. The finished surface shall not show any depressions in individual tiles or any undulations in the floor.

Do not permit traffic on finished surface for a minimum of 72 hours.

5.3.6 PVC Tiles

The base shall be prepared as per thickness shown on drawings keeping the margin of tile thickness. After the base is cured, any irregularities found on the base shall be filled in and leveled before the application of tiles. Surface to receive tiles shall be thoroughly cleaned of all dirt, dust, oil and other objectionable matter. Approved manufacturer's recommended adhesive shall be applied as per specifications and in quantities recommended by him. Tiles shall be laid starting from one side of the room or as per the instructions of the Engineer and shall be so pressed that complete adhesion takes place.

Tiles shall be cut where required with suitable cutting tool and rough edges shall be rubbed smooth. Tiles shall be laid to straight edges as per approved pattern.

5.3.7 PVC Tiles (Anti static)

5.3.7.1 Preparation of Base

The base shall be prepared as per thickness shown on drawings keeping the margin of tile thickness and network of Copper Strips. After the base is cured, any irregularities found on the base shall be filled in and leveled before the application of tiles. Surface to receive tiles shall be thoroughly cleaned-off all dirt, dust, oil and other objectionable matter. Approved manufacturer's recommended adhesive shall be applied as per specifications and in quantities recommended by him. Tiles shall be laid starting from one side of the room or as per the instructions of the Engineer and shall be so pressed that complete adhesion is ensured. Tiles shall be cut where required with suitable cutting tool and rough edges shall be rubbed smooth. Tiles shall be laid to straight edges as per approved pattern.

5.3.7.2 Fitting the Copper Mesh

Lay the full lengths of copper strips across the room on both sides cutting each other. Each strip must be at a distance of 12" from each other and 24" from the other. The joints of these sheets must be properly acid welded. Keep as many points of the copper strip as you require out from the ends for earthing purpose. Similarly the whole copper grid must be properly earthed. To do so one part of this grid shall be attached to the earthing point of the room. The non-static tiles shall then be laid on the floor. This grid shall only be necessary for assuring the continuity. The strip shall pass beneath of the tile to give proper resistance.

5.3.7.3 Fixing PVC Floor Tiles (Anti-Static)

- Mark out the room area with chalk lines across length and width, positioned to allow for reasonably sized tile cuts on all sides.
- The new trowel blade enclosed with the adhesive shall be fitted when starting the pack and used for spreading one pack only.
- Stir the adhesive before use.
- Spread the adhesive evenly holding the blade at an angle of about 60 degrees.
- Good transfer is essential; the area spread with adhesive at any time shall be limited to ensure that all the tiles and cuts can be laid while the adhesive is still wet. Commence tiles laying at the point first spread so that the adhesive has been left open for approximately 15 minutes. The actual area spread and the open time shall depend on the absorbency of the sub-floor and ambient conditions. Do not spread more than one pack at a time.
- Ensure electrical conductivity by overlapping adjacent areas of adhesive application.
- Put tiles closely and press them firmly to the floor to give good contact over the whole tile area.
- Approximately 1-hour after laying the tiles apply suitable pressure on them to ensure overall good contact. Care shall be taken that adhesive shall not squeeze up between the tiles, and if it happens then immediate cleaning of it shall be necessary.
- Dried adhesive residue shall be removed with a slightly abrasive cloth.

5.3.7.4 Traffic

Foot traffic shall only be allowed after 24 hours after completing tile fixing and heavy traffic shall be allowed after 2-days (e.g. mobile operating tables)

5.3.7.5 Testing

Electrical testing shall be carried out until at least 21-hours after completing the installation. The method shall be as laid down or as specified. The following summarizes the procedure recommended in NHS technical memorandum No. 2 (1977).

5.3.7.6 Equipment:

An insulation testing ohm meter having an approximate open circuit voltage of 500 volts DC and capable of measuring resistance values of between 10^4 and $5 \times 10^7 \Omega$

5.3.7.7 Method

The finished surface of concrete screed as floor base shall be washed thoroughly and then be allowed to dry (no test shall be carried out within 2-hours of floor being wetted) with subsequent wiping over it with a dry cloth. Place the electrodes approximately 12" apart and measure the resistance between them. In order to check the actual resistance the black bottom layer shall have to be checked, to do this either puncture a tiny hole on the surface of the tile or check the resistance from the left out copper strips on the ends of the floor.

5.4 Washed Terrazzo

5.4.1 Mix

The terrazzo mixes shall be composed by weight as follows:

Terrazzo for all surfaces indicated as Wash Terrazzo and not otherwise specified, shall be composed of one part white cement and 2 parts of marble chips of the sizes and colour as approved by the Engineer with admixtures of approved imported pigments to achieve the desired colour and shade.

5.4.2 Preparation for Terrazzo

The grade and thickness of 1:2 cement sand plaster as shown on the Drawings shall be laid as base to receive terrazzo. The surface of the base shall be roughened for bonding with the terrazzo finish. If the surface is too smooth it shall be roughened with a toothed chisel and, prior to laying the terrazzo the base shall be cleaned of all dirt, oil grease and extra loose material.

5.4.3 Division Strips

Terrazzo shall be divided by aluminum U and Y channels. The division strips shall be set immediately after the application of base plaster, the strips being grouted solid to the base plaster.

All division strips shall be set, straight to lines and to the proper level to ensure that the tops of the strips will show uniformly after washing operations are completed and joints and intersections shall be fitted tight.

Edging strips or aluminum Y sections shall be placed along the edges of all corners. All edging strips shall be grouted solid in the base plaster.

5.4.4 Laying Terrazzo Topping

The sub-surface shall be swept clean, thoroughly moistened, but not saturated, and applied with a coating of neat cement slurry. The terrazzo mixed shall be spread to a thickness as specified on the drawings, and trowelled to a level, dense and even surface.

5.4.5 Finishing

Before the terrazzo topping is hardened the exposed surface shall be brushed down, plenty of water being used in this process. The brushing shall continue till the matrix is removed and each piece of the marble stone is clearly exposed to the desired level as approved by the Engineer. After whole of the area is evenly exposed the surface shall be sprayed with water and lightly brushed down cleaning away all the adhering mortar and revealing the true colour of the marble pieces.

5.4.6 Protection

The wall and all surfaces of the finished work of other trades shall be properly protected from damage and spoiling during the process of washing.

5.4.7 Cleaning and Coating

All cement bloom left on the exposed surface shall be removed and cleaned with a weak solution of commercial hydrochloric acid.

5.5 Granite Slab/Tiles

Granite Slab/Tiles on floor and wall shall be executed in accordance with CP.298 and the approved shop Drawings and as per direction of the Engineer.

The granite stone of the specified size shall be fixed using brass dowels, brackets, expansion bolt anchors and plugs or with approved adhesive and $\frac{3}{4}$ " thick cement sand reinforced plaster in 1:3 with 22 SWG for wall cladding only. The dowels, anchors or ties must not be subjected to any loading until complete hardness has taken place. Holes and mortises shall be carefully drilled or cut to avoid fracture of the tile. Patching will not be permitted and any damaged tiles shall be removed and replaced at the cost of the Contractor.

External claddings shall be designed by means of proper structural design calculation. The structural design shall take account of the suitability of both the cladding units and the fixing dowels, anchors and each cladding unit shall be fixed with at least two brass dowels. Static proof shall be provided by the Contractor for the spacing and number of fixings to be used.

5.5.1 Repair and Cleaning

Remove and replace stone units which are broken, chipped, stained or otherwise damaged. Where directed remove and replace units which do not

match adjoining stonework or is not in line and levels as shown on Drawings. Provide new matching units, install and point joints to eliminate evidence of replacement. Re-point defective and unsatisfactory joints to provide neat, uniform appearance.

Clean stonework not less than 6 days after completion of work, using clean water and bristle brushes. Do not use wire brushes, acid or caustic type cleaning agents or other cleaning compounds which may be detrimental to the stone finish or joint grout.

5.5.2 Protection

Provide covers, boards, supports and all other necessary materials to protect finished work from collapse, deterioration, discolouration or damage during installation and until contract completion.

5.6 Acrylic Resin Coatings (Graffiato / Sandtex)

Acrylic based resin coating (Graffiato / Sandtex) on surfaces (straight or swirl) shall be laid in-accordance with the instructions of the Manufacturer over ½” thick cement sand plaster. This shall be laid as per the instructions of the Engineer.

6 MEASUREMENT AND PAYMENT

6.1 General

- 6.1.1 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.
- 6.1.2 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.
- 6.1.3 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.
 - 6.1.3.1 Loss and wastage of material due to consolidation, erosion and settlement.
 - 6.1.3.2 All type of joints (expansion, contraction and construction joint etc.).
 - 6.1.3.3 Cement concrete screed base of specified ratio/ strength & class and cement sand bedding mortar under terrazzo tiles/ brick on edge floor and skirting/ dado etc.

- 6.1.3.4 Finishing/grinding, washing & polishing works of ceramic, concrete, terrazzo tile, terrazzo floors and marble tiles.
- 6.1.3.5 Marble strips in terrazzo floors
- 6.1.3.6 1:2 and 1:4 cement sand rough cast plaster.
- 6.1.3.7 Sand cushion under concrete interlocking pavers
- 6.1.3.8 Adhesives used in the laying of PVC flooring and Granite etc.
- 6.1.3.9 1:3 reinforced cement sand plaster with 22 SWG under Granite for wall cladding.

6.2 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.

6.3 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).

SECTION - 6700a**PAINTING****1 SCOPE**

The work under this section of the Specifications consists of furnishing all materials, plant, labour, equipment, appliances and performing all operations in connection with surface preparation, mixing, painting concrete works, Metalworks, wood works, Structural steel, walls, ceilings, pipes ,valves and all such surfaces as shown on the Drawings and/or as directed by the Engineer. The scope of this section of specification is covered with detailed specifications as laid down herein.

2 APPLICABLE STANDARDS

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

BSI (British Standards Institution)

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

3 GENERAL

- 3.1 Except as otherwise specified, all painting shall be applied in conformity with BS CP 231 "Painting of Building" as applicable to the work.
- 3.2 The Contractor shall repair at his own expense all damaged or defective areas of shop-painted metal work and structural steelwork. Metal surfaces against which concrete is to be placed will be furnished shop-painted and shall be cleaned prior to being embedded in concrete.
- 3.3 Except as otherwise specified, all concrete and plastered surfaces are to be painted.
- 3.4 The Engineer will furnish a schedule of colours for each area and surface. All colours shall be mixed in accordance with the manufacturer's instructions.
- 3.5 Colours of priming coat (and body coat where specified, shall be lighter than those of finish coat. The Engineer shall have unlimited choice of colours.
- 3.6 Samples of all colours, and finishes shall be prepared in advance of requirement so as not to delay work and shall be submitted to the Engineer for approval before any work is commenced. Any work done without such approval shall be redone to the Engineer's satisfaction, without additional expense to the Employer. Samples of each type of paint shall be on separate 300 x 300 x 3 mm tempered hard board panels. Manufacturer's colour chart shall be submitted for colour specifications and selection.

4 MATERIALS

- 4.1 All materials shall be acceptable, proven, first grade products and shall meet or exceed the minimum standards of reputable manufacturers as approved by the Engineer.
- 4.2 Colours shall be pure, non-fading pigments, mildew-proof sun- proof, finely ground in approved medium. Colours used on- plaster and concrete surfaces shall be lime-proof. All materials shall be subject to the Engineer's approval.
- 4.3 All synthetic enamel paints and primers for structural steel works, metal work, will be the best available of its type and shall be approved by the Engineer prior to its procurement.
- 4.4 Unless otherwise specified on Drawings approved quality Durocem/snowcem paint or approved equivalent shall be used for painting the exteriors of the structures or other surfaces and/or as directed by the Engineer.
- 4.5 The plastic emulsion/weather shield/ vinyl emulsion paint or similar as approved by the Engineer shall be used for interior surfaces.
- 4.6 Approved quality plasticised Duco Hi Build paint or approved equivalent shall be used for painting the wooden doors or other wood surfaces as shown on the drawings or as directed by the Engineer.
- 4.7 Fire resistant painting shall be proprietary painting material to be applied in conformity with the recommendations and instructions of the manufacturers.
- 4.8 Where ever Multi-colour paint coating for interior is specified ZOLA COAT or equivalent as approved by the engineer is to be used. Painting shall be proprietary painting material to be applied in conformity with the recommendations and instructions of the manufacturers.
- 4.9 Where ever Textured roll on paint for interior is specified, ICI, Dulux or equivalent as approved by the Engineer to be used . Painting shall be proprietary painting material to be applied in conformity with the recommendations and instructions of the manufacturers.
- 4.10 All material shall be delivered to site in their original unbroken containers or packages and bear the manufacturer's name, label, brand and formula and will be mixed and applied in accordance with manufacturer's recommendations.
- 4.11 All sprit polish or wax polish shall be first grade of reputable manufacturer as approved by the Engineer.

5 DELIVERY STORAGE AND CONTAINER SIZES

Paints shall be delivered to the site in sealed containers which plainly show the type of paint, colour (formula or specifications number) batch number, quantity, date of manufacture, name of manufacturer and instructions for use. Pigmented paints shall be supplied in containers not larger than 20 liters. All materials shall be stored under cover in a clean storage space which should be accessible at all times to the Engineer. If storage is allowed inside the building, floors shall be kept clean and free from paint spillage.

6 SURFACE PREPARATION

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

7 APPLICATION

- 7.1 All paint and coating materials shall be in a thoroughly mixed condition at the time of application. All work shall be done in a workman like manner, leaving the finished surface free from drips, ridges, waves, laps, and brush marks. All paints shall be applied under dry and dust free conditions. Unless approved by the Engineer paint shall not be applied when the temperature of the metal or of the surrounding air is below 7 degrees centigrade. Surfaces shall be free from moisture at the time of painting.

All primary paint shall be applied by brushing. The first coat of paint shall be applied immediately after cleaning. When paint is applied by spraying, suitable measures shall be taken to prevent segregation of the paint in the container during painting operation.

Effective means shall be adopted for removing all free oil and moisture from the air supply lines of the spraying equipment.

Each coat of paint shall be allowed to dry or harden thoroughly before the succeeding coat is applied. Surfaces to be painted that will be inaccessible after installation shall be completely painted prior to installation.

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

Only as much material should be mixed as can be used up in one hour. Over-thinning will not be permitted. After the first coat the surfaces will be soaked evenly four or five times and the second coat shall be applied after leaving for at least overnight.

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

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

7.6.1 **Wax Polish:**

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

7.6.2 **Spirit Polish/French Polish:**

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

7.7 **White or Colour Washing**

- 7.7.1 Fresh white lime slaked at site of work should be mixed with sufficient water to make a thin cream. The approximate quantity of water required in making the cream is 5 litre of water to 1 kg of lime. It shall then be screened through a coarse cloth and gum (glue) in the proportion of 1'00 grams of gum to 16 litres (thre chattacks of gum to 6 gallon) of wash shall be added. The surface should be dry and thoroughly cleaned from dust and dirt. The wash shall be applied with 'moonj' or jute brush, vertically and horizontally allternatively, and fine wash kept stirred in the container while using. Two or three coats shall be applied as specified and each coat shall be perfectly dry before the succeeding coat is applied over it. After finishing, the surface shall be of uniform colour. The white wash should not splash on the floor and other surfaces. In old surface the surface should be cleaned and repaired with cement mortar where necessary and allowed to dry before white wash is applied. For final coat blue pigment powder should be mixed to the required quantity with the lime water to give a bright white surface.
- 7.7.2 Colour wash shall be prepared with fresh slaked white lime mixed with water to make thin cream adding the coloured pigment to the required quantity to give the required tint. Gum (glue) in the proportion of 100 gm of gum to 16 litre of wash shall be added. The colour wash may be applied one or two coats as specified. The method of application should be same as for white washing. For new work the priming coat shall be of white wash.

8 FINISHES

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

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

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

9 JOB CONDITIONS

- 9.1 Observe manufacturer's recommended minimum and maximum temperature but do not apply paint or finish to any surface unless ambient temperature is 10 degree C or above and less than 43 degree C. No painting shall be done above 90% relative humidity.
- 9.2 Place drop cloths to adequately protect all finished work.
- 9.3 Remove and replace all items of finish hardware, device plates, accessories, lighting fixtures or other removable items.
- 9.4 In no case shall any finish hardware or other finished item that is already fitted into place be painted, unless otherwise specified.

10 QUALITY ASSURANCE

All paint for any one surface shall be top quality, of one manufacturer and approved by the Engineer. Deep tone accent colours shall be used and the unavailability of final coat colours may be the basis for rejecting materials for any one surface.

11 SCHEDULE OF MEASUREMENT OF PAINT AREA :

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

12 MEASUREMENT AND PAYMENT

12.1 General

- 12.1.1 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.
- 12.1.2 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.
- 12.1.3 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.
 - 12.1.3.1 Preparatory works, including preparatory materials, scraping, scratching, sand blasting, cleaning, priming, protection of finished works etc.

12.2 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.

12.3 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).



GENERAL MANAGER ADMIN & HR
Quaid-e-Azam Thermal Power (Pvt.) Limited
Government of the Punjab

**First Floor, 7 C-1, Gulberg-III, Lahore
042-35750936-8**

Hiring of Contractor

for

**SHIFTING OF BOUNDARY WALL & MAIN
GATE AT BIKKI POWER PLANT**

TENDER DOCUMENTS

VOLUME-3
BILL OF QUANTITIES (BOQ)
NOTICE INVITING TENDER (NIT)

OCTOBER – 2022

Project Consultant



MASTER CONSULTING ENGINEERS PVT. LTD.

Architects, Engineers, Town Planners & GIS Experts

119-G, Commercial Area, Phase-I, DHA, Lahore Cantt.

Phone: +092 42 35728412, Fax: +092 42 35896395,

Email: maconsult@hotmail.com, Web: www.masterconsulting.com.pk

Bill Of Quantities

Shifting of Boundary Wall & Main Gate at Bhikki Power Plant

SUMMARY OF COST

S.No.	Description	Amount (Rs.)
1	Civil Works Boundary Wall	
2	Watch Towers	
3	Main Gate	

Total Amount:

4	Deduct credit of old material (Existing Boundary Wall) <i>after deducting labour cost for demolishing</i>	
---	--	--

Net Total

a.	PRA Tax 16%	
----	-------------	--

Total Amount after Tax:

Total Amount (Million):

**Shifting of Boundary Wall & Main Gate at Bhikki Power Plant
(Boundary Wall)
Bill Of Quantities**

S.N.	Description	Quantity	Unit	Rate	Amount
1	Excavation in foundation of ordinary soil, including, dressing, refilling around structure with excavated earth, watering and ramming lead upto one chain (30 m) and lift upto 5 ft. (1.5 m) as approved by Engineer Incharge.	12,993	1000 Cft		
2	Earthwork in ordinary soil with dressing slope for Green Belt including lead, complete in all respects as approved by Engineer Incharge.	20,363	1000 Cft		
3	Cement concrete plain including placing, compacting, finishing and curing complete. Ratio 1: 4: 8 as approved by Engineer Incharge.	1,268	100 Cft		
4	Cement concrete plain including placing, compacting, finishing and curing complete ratio 1: 2: 4 complete in all respects as approved by Engineer Incharge.	31	100Cft		
5	Providing and laying reinforced cement concrete, in strip foundation, using coarse sand, chanab sand, and screened graded aggregate, in required shape and design, including lifting, compacting, curing, rendering and finishing exposed surface, complete (but excluding the cost of steel reinforcement, its fabrication and placing in position complete in all respect as approved by Engineer Incharge. (nominal mix 1: 2: 4)	4,922	Per Cft		
6	Providing and laying damp proof course (2" thick) of cement concrete 1:2: 4 (using cement, sand and shingle), including one coat of bitumen and one coat polythene sheet (500gauge) as approved by Engineer Incharge.	42	100 Sft		
7	Providing and laying reinforced cement concrete in slab of rafts using coarse sand, chanab sand, and screened graded aggregate, in required shape and design, including, lifting, compacting, curing, rendering and finishing exposed surface, complete (but excluding the cost of steel reinforcement, its fabrication and placing in position other than those mentioned in complete in all respects as approved by Engineer Incharge. (nominal mix 1: 1½: 3)	566	Per Cft		
8	Two coats of bitumen laid hot using 34 lbs. per 100Sft. over Plinth beam and blinded with sand as approved by Engineer Incharge.	2,350	100 Sft		
9	Pacca brick work of ratio 1:4 complete in all respects as approved by Engineer Incharge.	23,711	100 Cft		
10	Providing and laying reinforced cement concrete in ,columns and beams, Slab using coarse sand, chanab sand, and screened graded 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, complete in all respects as approved by the engineer incharge. (nominal mix 1: 1½: 3)	3,085	Cft		
11	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 : Deformed bars (Grade-60) As approved by the engineer incharge.	38,077	100 kg		

S.N.	Description	Quantity	Unit	Rate	Amount
12	Cement plaster using coarse sand and chanab sand 1:3 (1/2" thick) complete in all respects As approved by the engineer incharge.	32,396	100 Sft		
13	Cement plaster using coarse sand and chanab sand (1:3) 3/8" thick under soffit of R.C.C. roof slabs only, complete in all respects as approved by Engineer Incharge.	234	100 Sft		
14	Priming coat under distemper complete in all respects as approved by Engineer Incharge.	1,328	100 Sft		
15	Providing and applying weather shield paint of approved quality on external surface of building including preparation of surface, complete in all respect as approved by Engineer Incharge: 2 Coats	1,612	100 Sft		
16	Distempering complete in all respects as approved by Engineer Incharge:- 3 Coats	781	100 Sft		
17	Mosaic dado with one part of cement and marble powder in the ratio of 3:1 and two parts of marble chips, laid over 1/2"(13 mm) thick cement plaster 1:3, complete with finishing & complete in all respects as approved by Engineer Incharge. (Without Rubbing & polishing)	13,906	100 Sft		
18	Providing and fixing barbed wire fencing on boundary wall, consisting of 1 1/2"x1 1/2"x3/16" (40x40x5 mm), Y angle iron post 7.5 ft. (1524 mm) long, 8 to 13 ft. centre to centre, and three rows of barbed wire, painting posts, etc complete in all respects as approved by Engineer Incharge.	1,230	Rft		
19	Supply and Installation of Razor Cut Fence having 24" dia (SWG 10) followed by international standards of Installation. Each circle clipped independently with 2 No.3/8 plane bars attached with (already provided) Y angle. Ring to ring distance is 4" as approved by Engineer Incharge. (8 to 13 Feet distance between Y angles already provided).	1,230	Rft		
20	Drilling holes in RCC column upto 3" deep for providing the dowel to joint the masonry and column. as approved by Engineer Incharge.	1,096	No's		
21	Providing and fixing steel stair 13' high consisting of 4 No. angles Size 1 1/2" x 1 1/2" x 1/4" for main frame. Steps of size 27"x10" consisting of angle iron frame 1 1/4" x 1 1/4" x 1/8" with M.S patty 1/2"x 1/8" to be fixed at 7" vertically M.S pipe 1 1/4" & railing two rows on both sides of stairs supported with vertical posts of same size at 5' apart 33" high. It also includes fixing at site with suitable arrangements, cost of foundation, light blue color painting, carriage charges but excluding PRA. Complete job in all respects as approved by the Engineer Incharge.	2	Jobs		
22	Fixing Gate, including chowkats, as approved by Engineer Incharge.	4	Each		
23	Fabrication of heavy steel work, including cutting, drilling, revitting, handling, assembling and fixing, including erection in position,as approved by Engineer Incharge.	164.453	100 Kg		
24	Preparing surface and Painting of Main Gate complete in all respect as approved by Engineer Incharge.	606.85	100 Sft		

S.N.	Description	Quantity	Unit	Rate	Amount
25	Plain galvanized iron sheet flashing, 22 gauge complete in all respect as approved by Engineer Incharge.	303.425	Per Sft		
26	Preparing surface and Painting of Plain galvanized iron sheet complete in all respect as approved by Engineer Incharge.	606.85	100 Sft		
Dismantling of Old Boundary Wall					
1	Dismantling all type of wire fencing, as approved by Engineer Incharge.	1,810.00	Per 100 Rft		
2	Dismantling iron work (Angles of Barbed Wire), as approved by Engineer Incharge.	1,764.314	100 Kg		
3	Dismantling brick work of cement mortar, as approved by Engineer Incharge.	12,385	100Cft		
4	Removing Door with chowkat, as approved by Engineer Incharge.	4	No.s		
5	Dismantling cement concrete reinforcement, as approved by Engineer Incharge.	36	100 Cft		
Credit of Old Material					
1	Bricks	100,320.00	1000 No.s		
2	Brick Ballast	4,954.000	100 Cft		
3	Steel	2,495	Per Kg		
Total Amount					
Amount in Million					



GENERAL MANAGER ADMIN & HR
Quaid-e-Azam Thermal Power (Pvt.) Limited, Government of the Punjab

First Floor, 7 C-1, Gulberg-III, Lahore
042-35750936-8

Hiring of Contractor

for

SHIFTING OF BOUNDARY WALL & MAIN GATE AT BIKKI POWER PLANT

TENDER DOCUMENTS

VOLUME-4
TENDER DRAWINGS

OCTOBER – 2022

Project Consultant



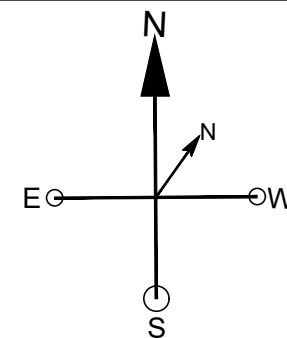
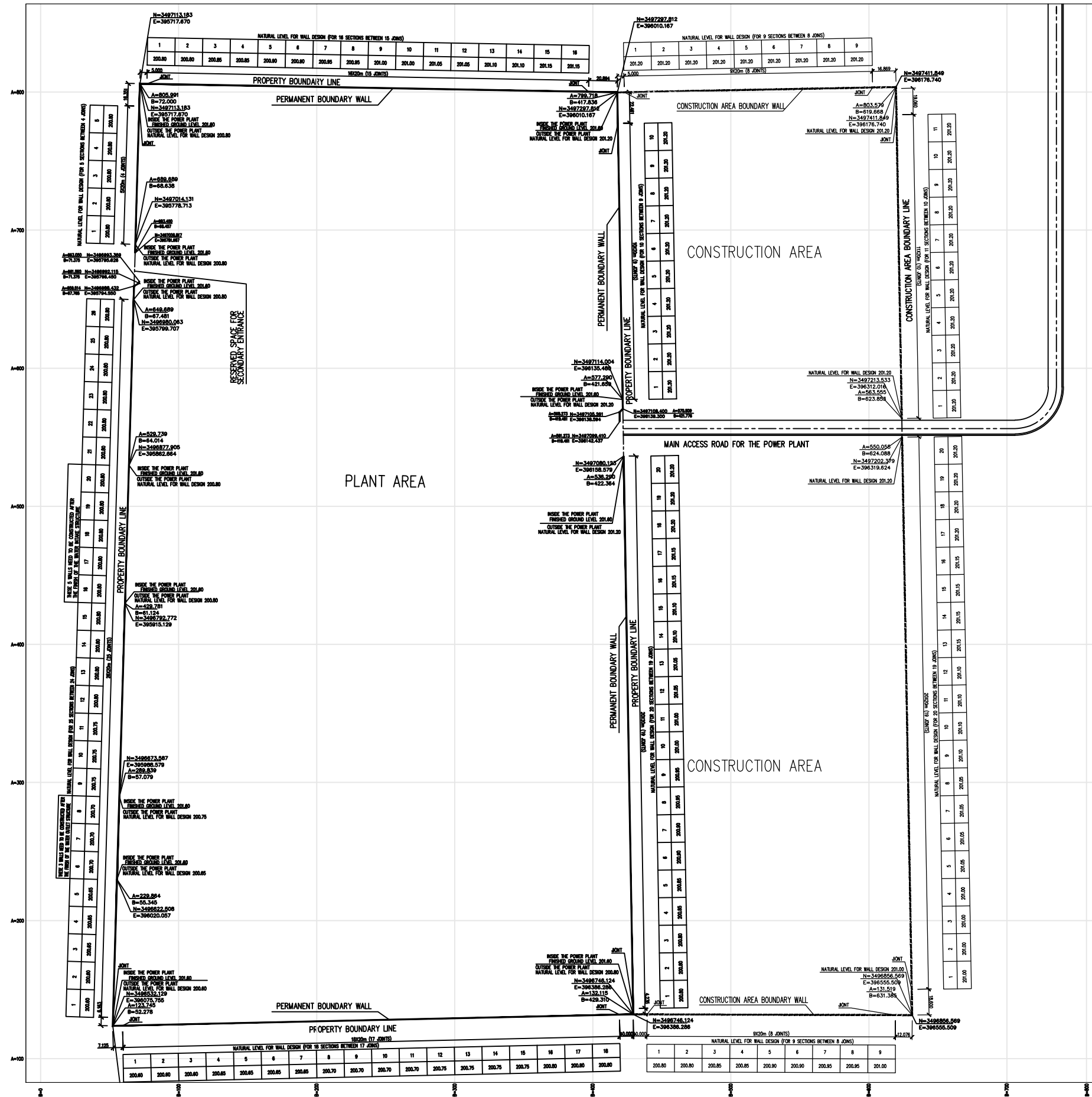
MASTER CONSULTING ENGINEERS PVT. LTD.

Architects, Engineers, Town Planners & GIS Experts

119-G, Commercial Area, Phase-I, DHA, Lahore Cantt.

Phone: +092 42 35728412, Fax: +092 42 35896395,

Email: macconsult@hotmail.com, Web: www.masterconsulting.com.pk



NOTE:
1. ALL DIMENSIONS ARE FEET-
INCHES UNLESS OTHERWISE
MENTIONED

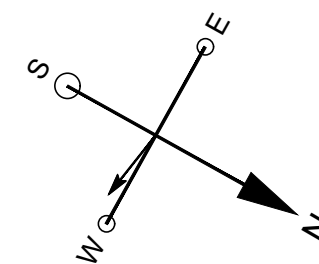
SHEET: MCE/BW/BPP/001
PROJECT TITLE: SHIFTING OF BOUNDARY WALL & MAIN GATE AT BHIKKI POWER PLANT
DRAWING TITLE: TOPOGRAPHIC SURVEY MAP
CLIENT: QAUID-E-AZAM THERMAL POWER (PVT.) LTD.
FIRST FLOOR, 7 C-1, GULBERG III, LAHORE

CONSULTANT:

MACONSULT
MASTER CONSULTING ENGINEERS (PVT.) LTD
ARCHITECTS, ENGINEERS, PLANNERS & GIS EXPERT
119-G (COMMERCIAL), Phase-I D.H.A. Lahore Cantt. Pakistan
Ph: 042-35728412, 35896394. Fax:-042-35896395.
email: macconsult@hotmail.com

SIGNATURE:
(OWNER/ATTORNEY)

SIGNATURE:
(ARCHITECT)



NOTE:

1. ALL DIMENSIONS ARE FEET-INCHES UNLESS OTHERWISE MENTIONED

SHEET:

MCE/BW/BPP/002

PROJECT TITLE:

SHIFTING OF BOUNDARY WALL & MAIN GATE AT BHIKKI POWER PLANT

DRAWING TITLE:

BOUNDARY WALL & LAYOUT PALN

CLIENT:

QUAID-E-AZAM THERMAL POWER (PVT.) LTD.
FIRST FLOOR, 7 C-1, GULBERG III, LAHORE

CONSULTANT:



MACONSULT

MASTER CONSULTING ENGINEERS (PVT.) LTD
ARCHITECTS, ENGINEERS, PLANNERS & GIS EXPERT

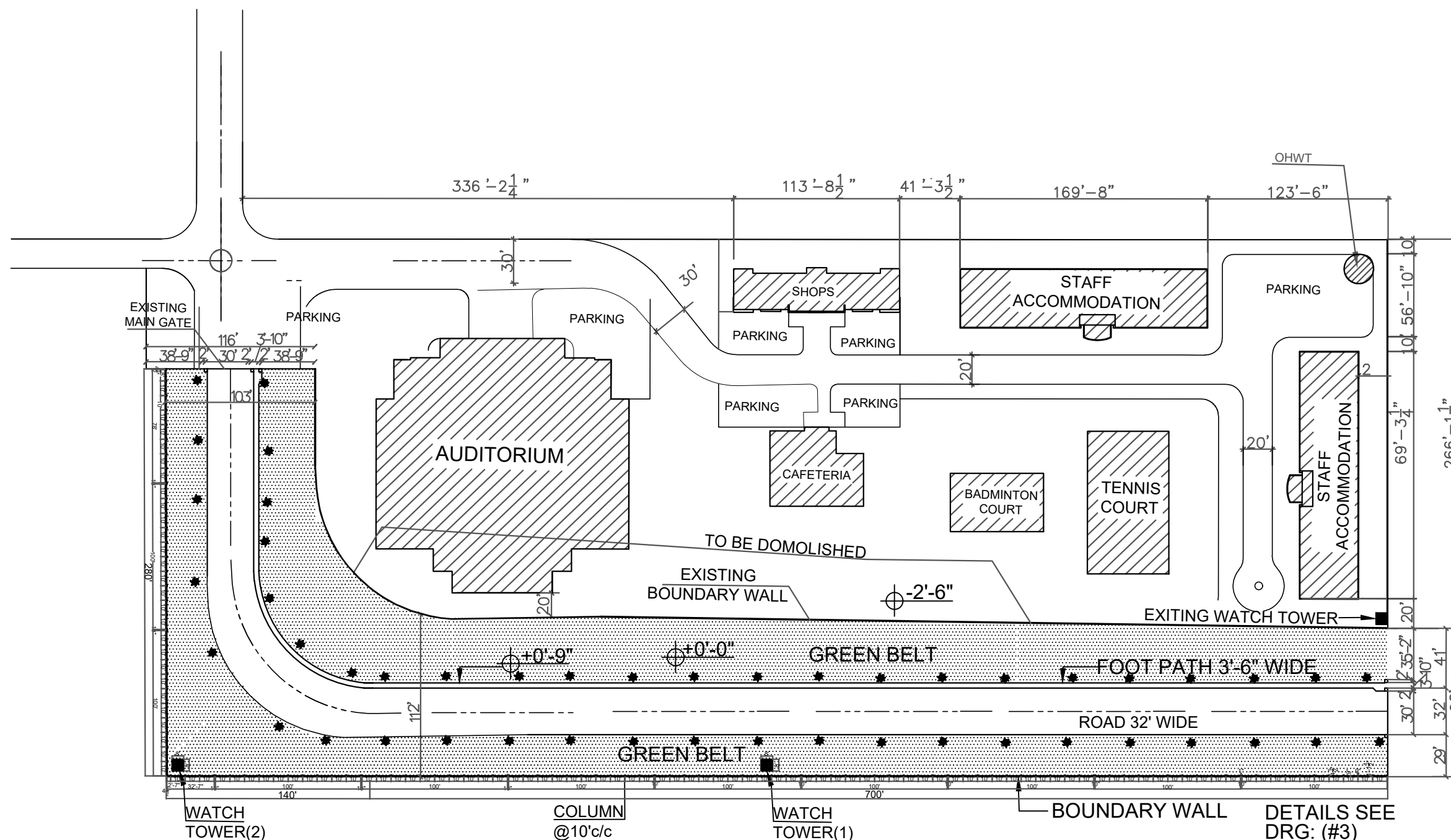
119-G (COMMERCIAL), Phase-I D.H.A. Lahore Cantt. Pakistan
Ph: 042-35728412, 35896394 Fax: 042-35896395.
email: macconsult@hotmail.com

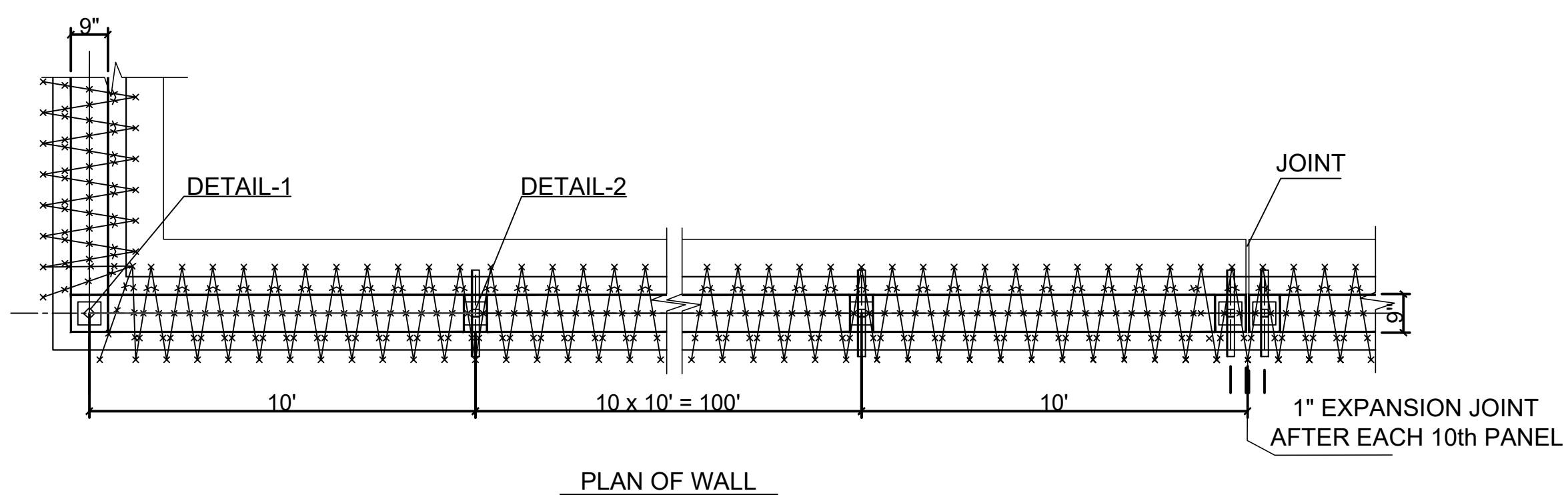
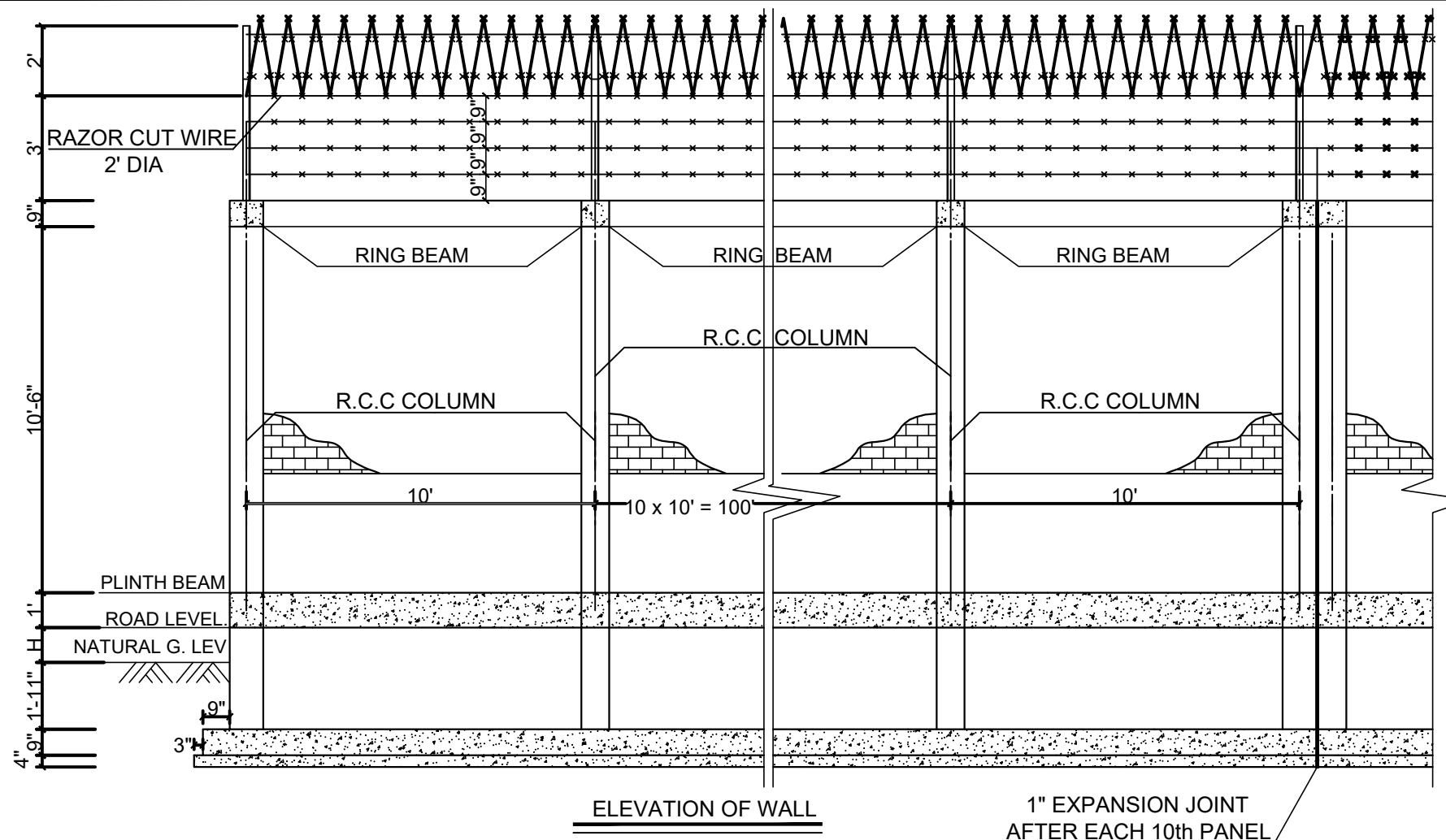
SIGNATURE:

(OWNER/ATTORNEY)

SIGNATURE:

(ARCHITECT)





NOTE :
1. THE DIMENSIONS IN THIS DRAWING ARE IN FEET/INCHES.
2. THERE IS A EXPANSION JOINT EVERY 5TH PANEL. THE WIDTH OF EXPANSION POINT IS 1 INCH.
3. AS WITHOUT DETAIL GEOLOGIC DATE, CAPACITY BEARING IS SUPPOSED NOT LESS THAN 70kPa.


IF THERE IS WEAK SOIL UNDER THE WALL, FOUNDATION SHOULD BE TREATED.
1. THE BRICK SHOULD BE LAID WITH 1:3 CEMENT SAND MORTAR.
2. REIN-BAR: BS4449/250, ASTM 615 GR60.
STEEL PLATE: ASTM A36
CONCRETE: ACI 318 f_c'= 3000psi.
3. NATURAL GROUND LEVEL, SEE DRAWING,

SHEET: MCE/BW/BPP/004

PROJECT TITLE: SHIFTING OF BOUNDARY WALL & MAIN GATE AT BHIKKI POWER PLANT

DRAWING TITLE: BOUNDARY WALL PLAN & ELVATION

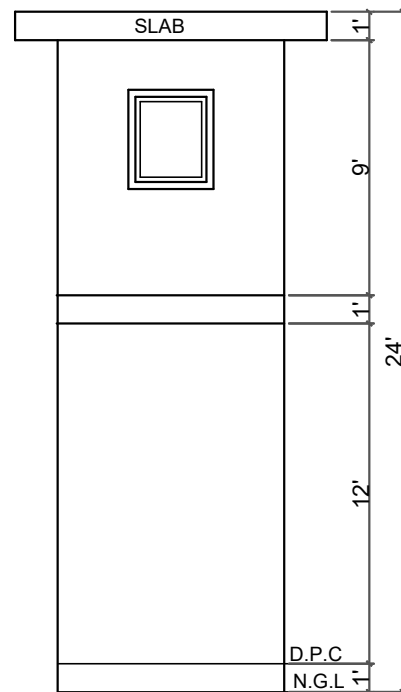
CLIENT: QUAID-E-AZAM THERMAL POWER (PVT.) LTD.
FIRST FLOOR, 7 C-1, GULBERG III, LAHORE

CONSULTANT:  **MACONSULT**
MASTER CONSULTING ENGINEERS (PVT.) LTD
ARCHITECTS, ENGINEERS, PLANNERS & GIS EXPERT
119-G (COMMERCIAL), Phase-I D.H.A.Lahore Cantt. Pakistan
Ph: 042-35728412, 35896394. Fax:-042-35896395.
email: macconsult@hotmail.com

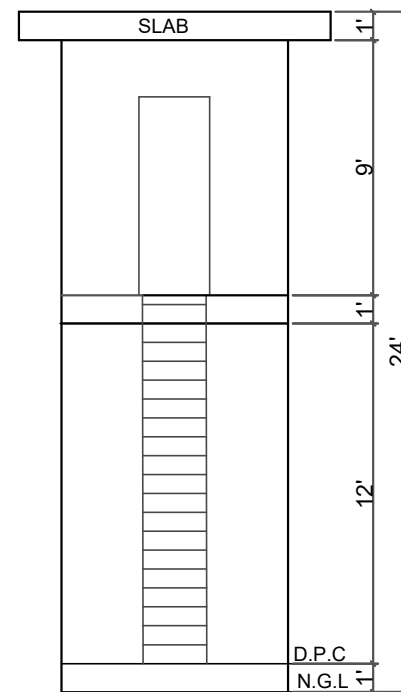
SIGNATURE:
(OWNER/ATTORNEY)

SIGNATURE:
(CONSULTING)

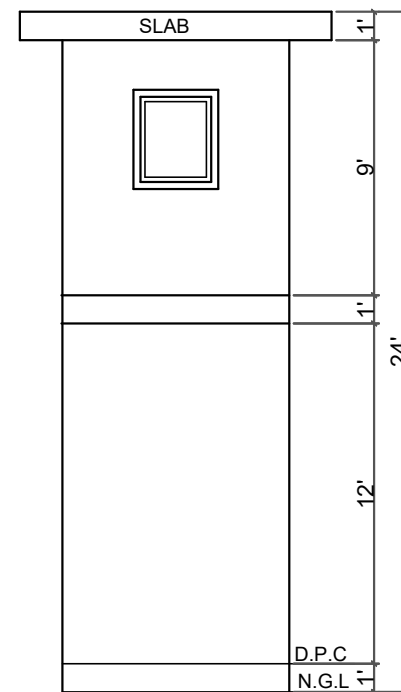
SIGNATURE:
(CONSULTING)



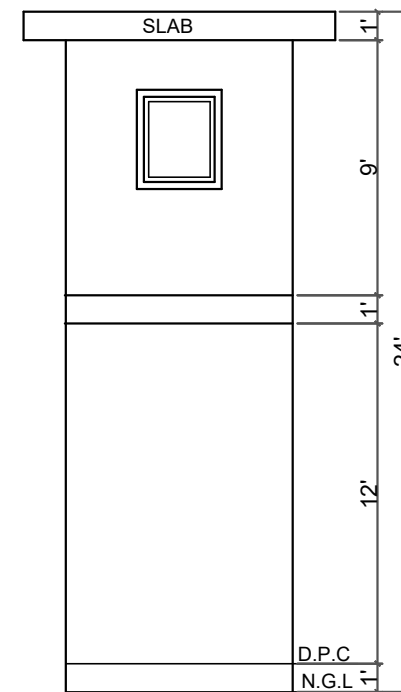
FRONT ELEVATION
WATCH TOWER (1)



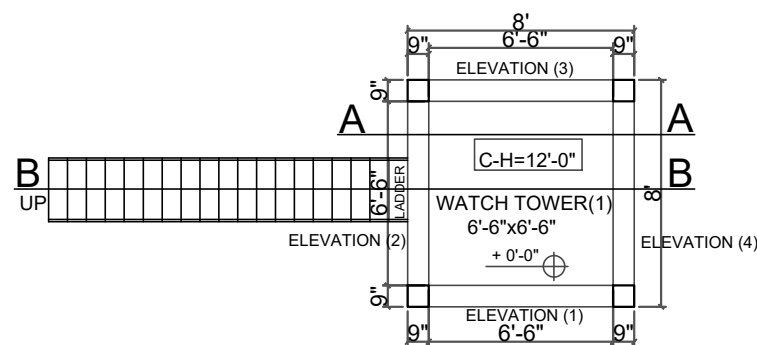
LEFT ELEVATION
WATCH TOWER (1)



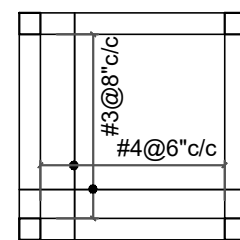
REAR ELEVATION
WATCH TOWER (1)



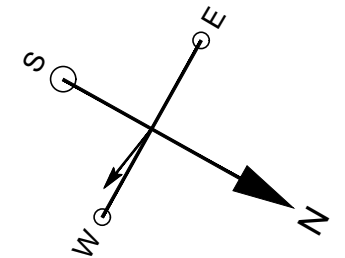
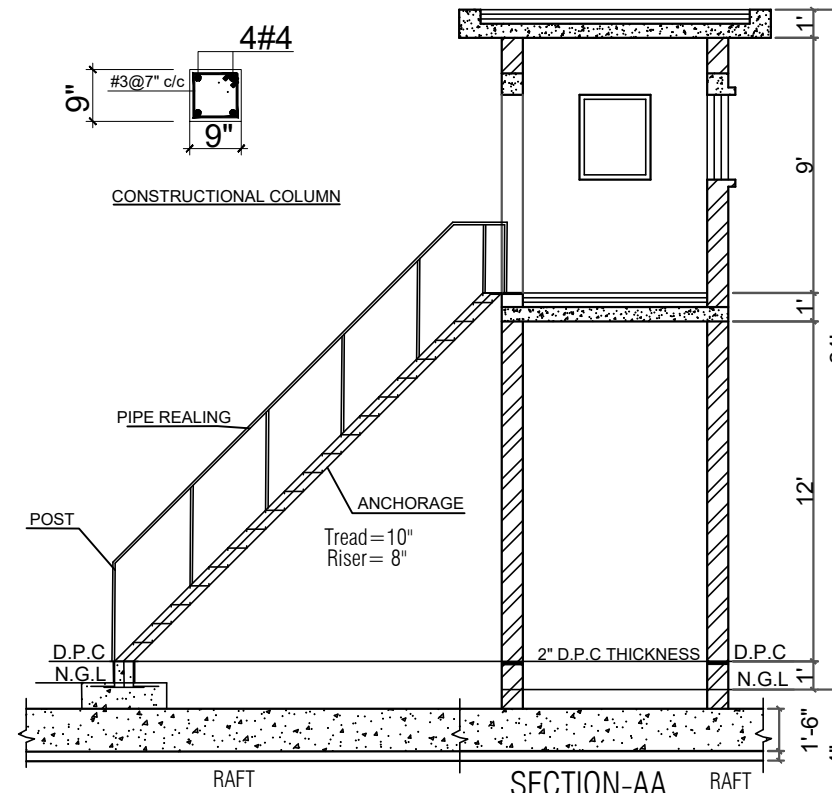
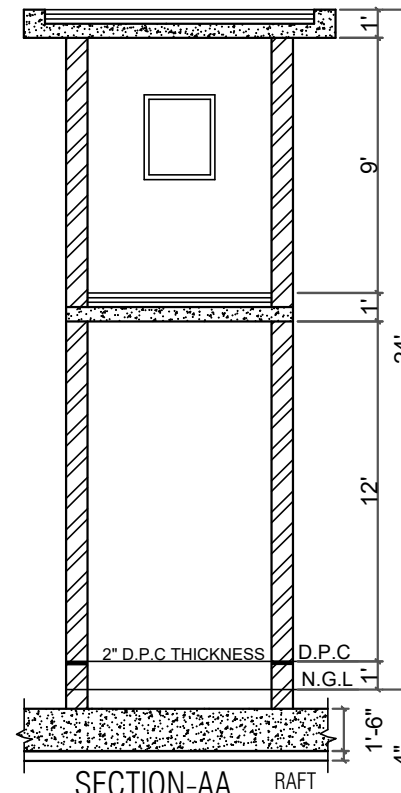
RIGHT ELEVATION
WATCH TOWER (1)



GROUND FLOOR WORKING
SCALE: 1/8" = 1'-0"
COVERED AREA=64.00 SFT



GROUND FLOOR SLAB
ALL SLAB 6" THICKNESS NOTED



NOTE:

1. ALL DIMENSIONS ARE FEET-INCHES UNLESS OTHERWISE MENTIONED

SHEET:

MCE/BW/BPP/006

PROJECT TITLE:

SHIFTING OF BOUNDARY WALL & MAIN GATE AT BHIKKI POWER PLANT

DRAWING TITLE:

WATCH TOWER (1) WORKING PLAN ELEVATION & SECTION

CLIENT:

QUAID-E-AZAM THERMAL POWER (PVT.) LTD.
FIRST FLOOR, 7 C-1, GULBERG III, LAHORE

CONSULTANT:



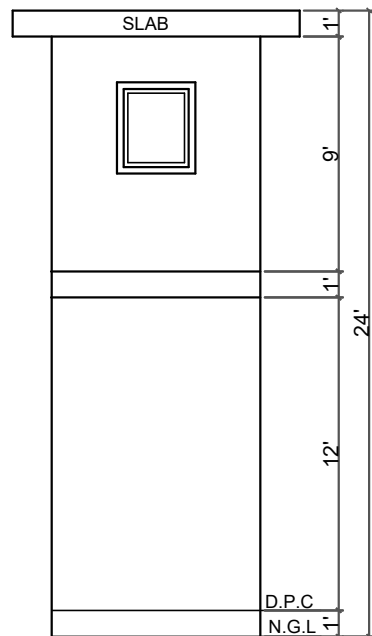
MASTER CONSULTING ENGINEERS (PVT.) LTD
ARCHITECTS, ENGINEERS, PLANNERS & GIS EXPERT
119-G (COMMERCIAL), Phase-I D.H.A.Lahore Cantt. Pakistan
Ph: 042-35728412, 35896394. Fax:-042-35896395.
email: maconsult@hotmail.com

SIGNATURE:

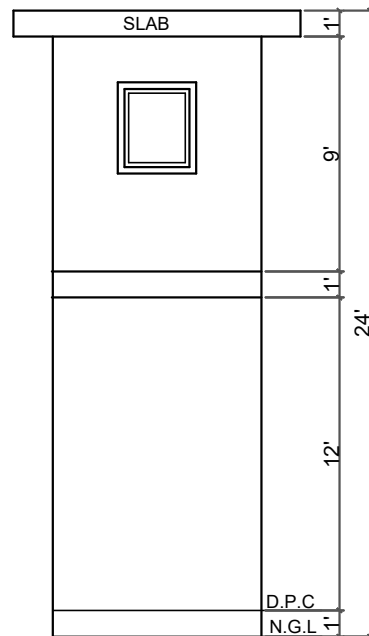
(OWNER/ATTORNEY)

SIGNATURE:

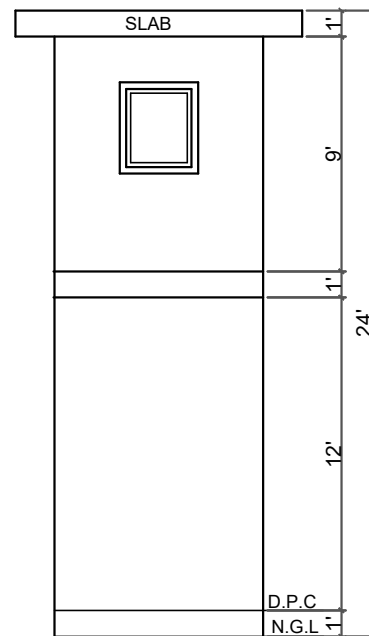
(ARCHITECT)



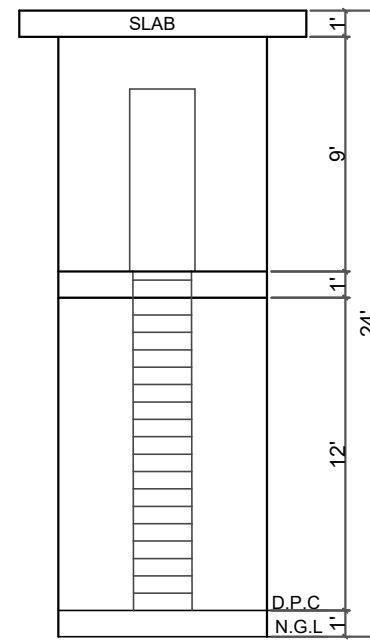
FRONT ELEVATION
WATCH TOWER (2)



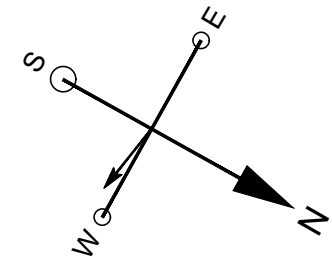
LEFT ELEVATION
WATCH TOWER (2)



REAR ELEVATION
WATCH TOWER (2)



RIGHT ELEVATION
WATCH TOWER (2)



NOTE:

1. ALL DIMENSIONS ARE FEET-INCHES UNLESS OTHERWISE MENTIONED

SHEET:

MCE/BW/BPP/007

PROJECT TITLE:

SHIFTING OF BOUNDARY WALL & MAIN GATE AT BHIKKI POWER PLANT

DRAWING TITLE:

WATCH TOWER (2) WORKING PLAN
ELEVATION & SECTION

CLIENT:

QUAID-E-AZAM THERMAL POWER (PVT.) LTD.
FIRST FLOOR, 7 C-1, GULBERG III, LAHORE

CONSULTANT:



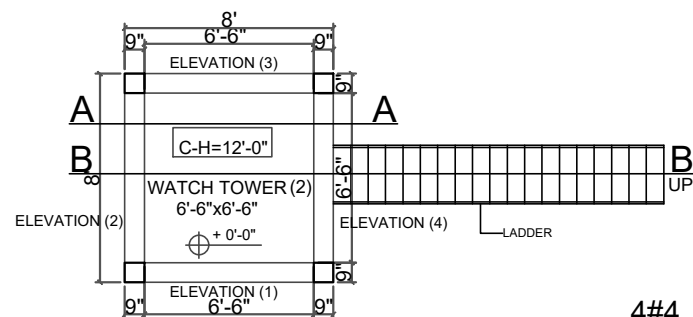
MASTER CONSULTING ENGINEERS (PVT.) LTD
ARCHITECTS, ENGINEERS, PLANNERS & GIS EXPERT
119-G (COMMERCIAL), Phase-I D.H.A.Lahore Cantt. Pakistan
Ph: 042-35728412, 35896394. Fax:-042-35896395.
email: maconsult@hotmail.com

SIGNATURE:

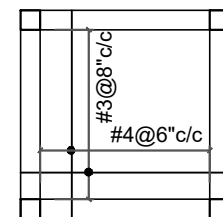
(OWNER/ATTORNEY)

SIGNATURE:

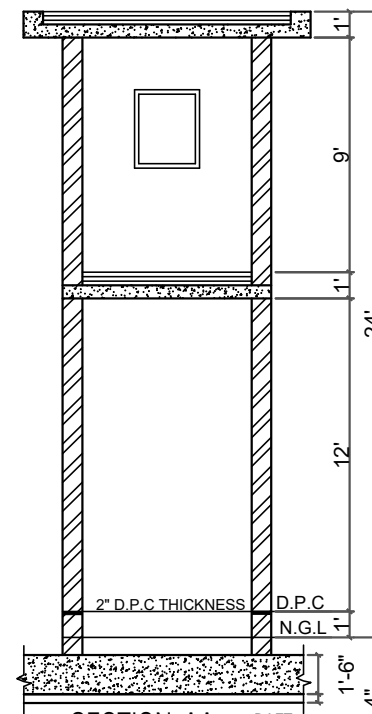
(ARCHITECT)



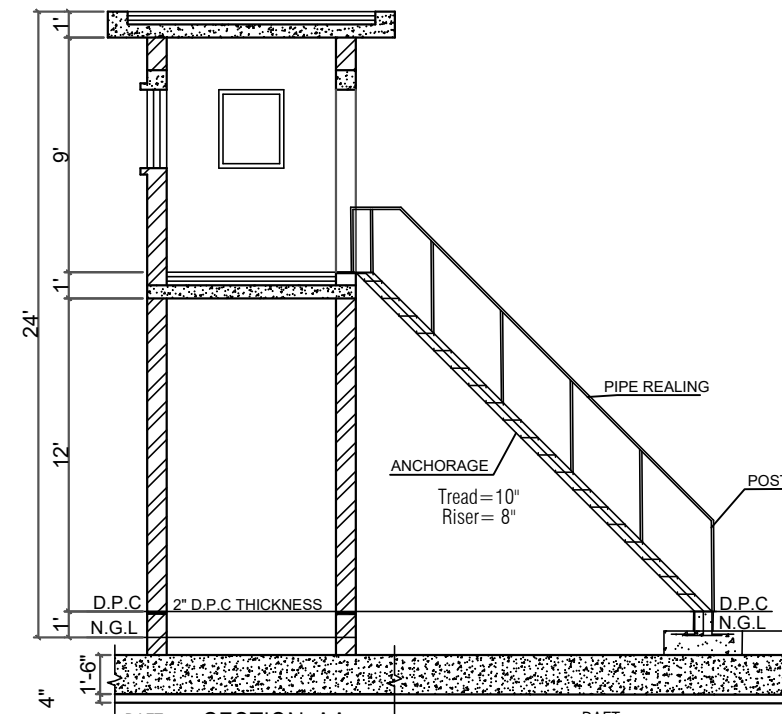
GROUND FLOOR WORKING
COVERED AREA=64.00 SFT



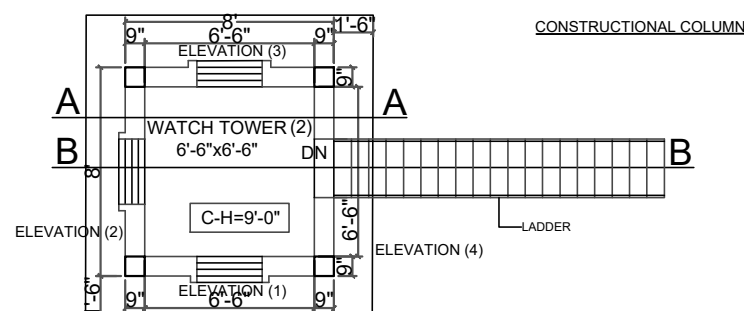
GROUND FLOOR SLAB
ALL SLAB 6" THICKNESS NOTED



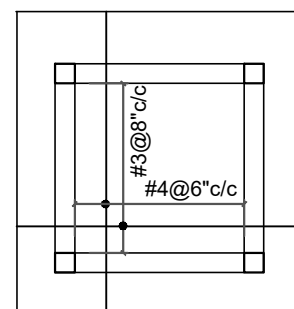
SECTION-AA
RAFT



SECTION-AA
RAFT



FIRST FLOOR WORKING
COVERED AREA=64.00 SFT



FIRST FLOOR SLAB
ALL SLAB 6" THICKNESS NOTED