Issued to M/s: _____

Date : _____

Issued By : _____

MALIR DEVELOPMENT AUTHORITY

NAME OF PROJECT:
INFRASTRUCTURE DEVELOPMENT WORKS AT SHAH LATIF TOWN SCHEME 25-A, MDA, KARACHI

NAME OF WORK:
CONSTRUCTION OF ROAD, DRAIN, SEWERAGE NETWORK AND WATER SUPPLY IN SECTOR 20-D IN SHAH LATIF TOWN SCHEME 25-A

CONTRACT NO. SLT - 115

BIDDING DOCUMENTS

SEPTEMBER 2015

CONSULTANT

OSMANI عثماني

Engineering - Architecture - Planning - Mapping - Technology

OSMANI & COMPANY (PVT.) LTD.

Consulting Engineering - Architects - Planners
Osmani House, 245/2-K, Block-6, PECHS, Karachi
Tel: (92-21) 34536007-08, 34546541-42, Fax: (92-21) 34534691
E-mail: ocl-khi@osmani.com Web: www.osmani.com

MALIR DEVELOPMENT AUTHORITY

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INVITATION TO BIDDERS

MALIR DEVELOPMENT AUTHORITY

MDA Head Office, Bungalow No. G-4/B Block 17, Gulshan-e-Iqbal, Karachi

No. _____ Dated: _____

To,
M/s. _____

INVITATION FOR BIDS

SUBJECT: CONSTRUCTION OF ROAD, DRAIN, SEWERAGE NETWORK AND WATER SUPPLY IN SECTOR 20-D IN SHAH LATIF TOWN SCHEME 25-A. CONTRACT NO. SLT-115

1. The Employer, Malir Development Authority, invites sealed bids, as per SPPRA Rule 2010, from eligible firms licensed by the Pakistan Engineering Council valid for the year 2014 in Category C-5 and above with documentary evidence for renewal upto 2015.

2. Eligible Bidders may obtain further information, inspect and acquire the Bidding Documents from the Office of the Accounts, M.D.A. Bungalow No. G-4/B, Block-17, Gulshan-e-Iqbal, Karachi.

3. A Complete Set of Bidding Documents may be purchased by interested bidders on submission of a written application to the above office and upon payment of a non-refundable fee of **Rs. 3,000/- (Rupees Three Thousands)** only per set during _____ to _____ hours upto _____.

4. All bids must be accompanied by a Bid Security in an amount equivalent to not less than of **2% (Two Percent) of Bid Amount** valid for a period 28 days beyond the Bid validity date in the form of Pay-order/ Bank Draft/ deposit at call from a Schedule/ Commercial Bank in Pakistan in favour of Employer and must be delivered to the office of the Executive Engineer (P & D), M.D.A. Bungalow No. G-4/B, Block-17, Gulshan-e-Iqbal, Karachi at or before _____ hours, on _____.

5. Any bid received by the Employer after the deadline for submission of bids will be returned unopened to such bidder, as per Clause IB 20.1(a) “Instruction to Bidders”.

6. Any bid not accompanied by an acceptable Bid Security shall be rejected by the Employer as non-responsive, as per Clause IB 15.3 “Instruction to Bidders”.

7. Bids will be opened at _____ hours on the same day, in the presence of bidder’s representatives who choose to attend at the same address.

Executive Engineer (P&D)
Malir Development Authority

INSTRUCTIONS TO BIDDERS

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INSTRUCTIONS TO BIDDERS

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

A. GENERAL

IB.1 Scope of Bid

1.1 The Employer as defined in the Bidding Data hereinafter called "the Employer" wishes to receive bids for the construction and completion of works as described in these Bidding Documents, and summarised 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.

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
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 alongwith 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 Bond from 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 therefore 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.

31.4 Upon furnishing by the successful bidder of a Performance Security the Employer will promptly notify the other bidders that their Bids have been unsuccessful and return their bid securities.

IB.32 Performance Security

32.1. The successful bidder shall furnish to the Employer a Performance Security in the form and the amount stipulated in the Bidding Data 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

BD - 2

BIDDING DATA

The following specific data for the Works to be Bid shall complement, amend, or supplement the provisions in the Instructions to Bidders. Wherever there is a conflict, the provisions herein shall prevail over those in the Instructions to Bidders.
Instructions to Bidders
Clause Reference

1.1. Name of the Project & Summary of the Works

The work in this bid is for:-
CONSTRUCTION OF ROAD, DRAIN, SEWERAGE NETWORK AND WATER SUPPLY IN SECTOR 20-D IN SHAH LATIF TOWN SCHEME 25-A.
CONTRACT NO. SLT-115

1.1. Name and address of the Employer

MALIR DEVELOPMENT AUTHORITY
Bungalow No. G-4/B
Block-17, Gulshan-e-Iqbal,
Karachi.

2.1. Name of the Borrower / Source of Financing / Funding Agency

The Employer has arranged funds from its own sources

2.1. Amount and type of financing

Not used

3.1 Eligible Bidders

Bidders should have Licence from Pakistan Engineering Council valid for the year 2014 in Category C-5 and above with documentary evidence for renewal upto 2015.

8.1. Time limit for clarification

The Employer, will respond to any request for clarification which he receives earlier than 07 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.

10.1. Bid Language

The same language in which the bidding documents are written i.e. English language.

11.1 (A) The Bidder shall submit with its Technical Bid the following documents

a). Documentary evidence regarding lawful ownership of the bidding firm/ company (IB 11.3)
b). Letter of Technical Bid
c). Bid Security (IB.15)
d). Written confirmation authorizing the signatory of the Bid to commit the Bidder (IB.18.5)
e). Pending litigation information

f). Special Stipulations (as filled by the Employer) (Appendix - A)
g). Proposed Construction Schedule (Appendix - E)
h). Method of Performing the Work (Appendix - F)
i). Availability of Critical Equipment (Appendix - G)
j). Construction Camp and Housing Facilities (Appendix - H)
k). List of Sub-contractors (as required) (Appendix - I)
l). Organization Chart for Supervisory Staff (Separately for Construction & O & M Period) (Appendix - K)
m). Integrity Pact (Appendix - L)
n). Financial Competence and Access to financial Resources (appendix - M)
o). Past Performance, Current Commitment, Qualification and Experience (Appendix - N)

11.1 (B) The Bidder shall submit with its Price Bid the following documents

a). Letter of Price Bid
b). Foreign Currency Requirements (Not Applicable) (Appendix - B)
c). Price Adjustment under Clause 70 (Appendix - C)
d). Bill of Quantities (duly filled on original Bidding Documents) (Appendix - D)
e). Estimated Progress Payments (Appendix - J)

13.1. Currency of Bid and Payment

The unit rates and prices shall be quoted by the Bidder entirely in Pak. Rupees. The payment shall be made in Pak Rupees.

14.1. Period of Bid Validity

Ninety (90) days

15.1. Amount of Bid Security

Bid security in the form of Pay Order/ Bank Draft / Deposit at Call issued by a Scheduled/ Commercial Bank of Pakistan in favour of Employer in the amount of not less than two percent (2%) of the total bid price valid for a period 28 days beyond the Bid validity date.

18.4. Number of copies of the Bid to be completed and returned

One original and two copies

19.2. Employer's address for the purpose of Bid Submission

Executive Engineer (P & D)
Malir Development Authority
Bungalow No. G-4/B
Block-17, Gulshan-e-Iqbal,
Karachi

19.2 (b). Name and identification number of the Contract

CONSTRUCTION OF ROAD, DRAIN, SEWERAGE NETWORK AND WATER SUPPLY IN SECTOR 20-D IN SHAH LATIF TOWN SCHEME 25-A.
CONTRACT NO. SLT-115

19.2. (c). Warning

DO NOT OPEN BEFORE _____ HOURS ON _____

20.1. Deadline for submission of bids

_____ HOURS ON _____

23.1. Venue, time and date of bid opening

Venue : *Office of the Executive Engineer (P & D)*
Malir Development Authority
Bungalow No. G-4/B
Block-17, Gulshan-e-Iqbal,
Karachi

Time : _____

Date : _____

32.1 Standard form and amount of Performance Security acceptable to the Employer

Amount of Performance Security shall be per Clause 10.1 of Part II Conditions of Particulars Application.

33.1 Signing of Agreement

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 Bid Documents, incorporating all agreements between the parties.

The Contract Agreement shall be made on stamp paper of appropriate value and all the costs (stamp duty, stamp paper etc.) shall be borne by the Contractor.

PART I –
GENERAL CONDITIONS OF CONTRACT

FEDERATION INTERNATIONAL DES INGENIEURS-CONSEILS

CONDITIONS OF CONTRACT FOR WORKS OF CIVIL ENGINEERING CONSTRUCTION

PART I GENERAL CONDITIONS
WITH FORMS OF TENDER AND AGREEMENT

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

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PART I - 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.

1.2 **Headings and Marginal Notes**

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.

1.3 **Interpretation**

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

1.4 **Singular and Plural**

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

1.5 **Notices, Consents, Approvals, Certificates and Determinations**

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

2.1 Engineer's Duties and Authority

(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.

2.2 Engineer's Representative

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.

2.3 Engineer's Authority to Delegate

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.

2.4 Appointment of Assistants

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.

2.5 **Instructions in Writing**

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 instructions 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.

2.6 **Engineer to Act Impartially**

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

3.1 **Assignment of Contract**

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 thereunder, 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.

4.1 **Subcontracting**

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.

4.2 Assignment of Subcontractors' Obligations

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

5.1 Language/s and Law

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".

5.2 Priority of Contract Documents

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.

6.1 **Custody and Supply of Drawings and Documents**

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.

6.2 **One Copy of Drawings to be Kept on Site**

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 authorised by the Engineer in writing.

6.3 **Disruption of Progress**

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.

6.4 **Delay and Cost of Delay of Drawings**

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.

6.5 **Failure by Contractor to Submit Drawings**

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.

7.1 Supplementary Drawings and Instructions

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.

7.2 Permanent Works Designed by Contractor

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.

7.3 Responsibility Unaffected by Approval

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

8.1 Contractor's General Responsibilities

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 superintendance, 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.

8.2 Site Operations and Methods of Construction

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.

9.1 **Contract Agreement**

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.

10.1 **Performance Security**

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.

10.2 **Period of Validity of Performance Security**

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.

10.3 **Claims under Performance Security**

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.

11.1 **Inspection of Site**

The Employer shall have made available to the Contractor, before the submission by the Contractor of the Tender, such data on hydrological and sub-surface 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.

12.1 **Sufficiency of Tender**

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.

12.2 **Not Foreseeable Physical Obstructions or Conditions**

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.

13.1 **Work to be in Accordance with Contract**

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).

14.1 **Programme to be Submitted**

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 programme, 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.

14.2 **Revised Programme**

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

14.3 **Cash Flow Estimate to be Submitted**

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.

14.4 **Contractor not Relieved of Duties or Responsibilities**

The submission to and consent by the Engineer of such programmes 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.

15.1 **Contractor's Superintendence**

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 authorised 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 authorised 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.

16.1 **Contractor's Employees**

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.

16.2 **Engineer at Liberty to Object**

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.

17.1 **Setting-out**

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.

18.1 **Boreholes and Exploratory Excavation**

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.

19.1 **Safety, Security and Protection of the Environment**

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.

19.2 **Employer's Responsibilities**

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.

20.1 **Care of Works**

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.

20.2 **Responsibility to Rectify Loss or Damage**

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.

20.3 **Loss or Damage Due to Employer's Risks**

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.

20.4 **Employer's Risks**

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) ionising radiations, or contamination by radio-activity from any nuclear fuel, or from any nuclear waste from the combustion of nuclear fuel, radio-active 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 travelling 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.

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

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.

21.2 **Scope of Cover**

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, form 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.

21.3 **Responsibility for Amounts not Recovered**

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.

21.4 **Exclusions**

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) ionising, radiations, or contamination by radio-activity from any nuclear fuel, or from any nuclear waste from the combustion of nuclear fuel, radio-active 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 travelling at sonic or

supersonic speeds.

22.1 **Damage to Persons and Property**

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.

22.2 **Exceptions**

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.

22.3 **Indemnity by Employer**

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

23.1 **Third Party Insurance (including Employer's Property)**

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.

23.2 **Minimum Amount of Insurance**

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

23.3 **Cross Liabilities**

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.

24.1 **Accident or Injury to Workmen**

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.

24.2 **Insurance Against Accident to Workmen**

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.

25.1 **Evidence and Terms of Insurances**

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.

25.2 **Adequacy of Insurances**

The Contractor shall notify the insurers of changes in the nature, extent or programme 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.

25.3 **Remedy on Contractor's Failure to Insure**

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.

25.4 **Compliance with Policy Conditions**

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.

26.1 **Compliance with Statutes, Regulations**

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.

27.1 **Fossil**

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.

28.1 **Patent Rights**

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.

28.2 **Royalties**

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.

29.1 **Interference with Traffic and Adjoining Properties**

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 therefor.

30.1 **Avoidance of Damage to Roads**

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.

30.2 **Transport of Contractor's Equipment or Temporary Works**

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.

30.3 **Transport of Materials or Plant**

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 haulier 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.

30.4 **Waterborne Traffic**

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.

31.1 **Opportunities for Other Contractors**

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.

31.2 **Facilities for Other Contractors**

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.

32.1 **Contractor to Keep Site Clear**

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.

33.1 **Clearance of Site on Completion**

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

34.1 **Engagement of Staffs and Labour**

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.

35.1 **Returns of Labour and Contractor's Equipment**

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

36.1 **Quality of Materials, Plant and Workmanship**

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.

36.2 **Cost of Samples**

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.

36.3 **Cost of Tests**

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) particularised 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 fulfil) in sufficient detail to enable the Contractor to price or allow for the same in his Tender.

36.4 **Cost of Tests not Provided for**

If any test required by the Engineer which is:

(a) not intended by or provided for,

(b) (in the cases above mentioned) not so particularised, 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.

36.5 **Engineer's Determination where Tests not Provided for**

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.

37.1 **Inspection of Operations**

The Engineer, and any person authorised 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.

37.2 **Inspection and Testing**

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.

37.3 **Dates for Inspection and Testing**

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 authorised 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.

37.4 **Rejection**

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.

37.5 **Independent Inspection**

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.

38.1 **Examination of Work before Covering up**

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.

38.2 **Uncovering and Making Openings**

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.

39.1 **Removal of Improper Work, Materials or Plant**

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 therefor, of any work which, in respect of

(i) materials, Plant or workmenship, 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.

39.2 **Default of Contractor in Compliance**

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

40.1 **Suspension of Work**

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.

40.2 **Engineer's Determination following Suspension**

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.

40.3 **Suspension lasting more than 84 Days**

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

41.1 **Commencement of Works**

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 proceeded with the Works with due expedition and without delay.

42.1 **Possession of Site and Access Thereto**

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 programme 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 programme or proposals, as the case may be.

42.2 **Failure to Give Possession**

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.

42.3 **Rights of Way and Facilities**

The Contractor shall bear all costs and charges for special or temporary wayleaves 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.

43.1 **Time for Completion**

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.

44.1 **Extension of Time for Completion**

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.

44.2 **Contractor to Provide Notification and Detailed Particulars**

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.

44.3 **Interim Determination of Extension**

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.

45.1 **Restriction on Working Hours**

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

recognised 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.

46.1 **Rate of Progress**

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 recognised 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.

47.1 **Liquidated Damages for Delay**

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.

47.2 **Reduction of Liquidated Damages**

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.

48.1 **Taking-Over Certificate**

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 Woks 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.

48.2 **Taking Over of Sections or Parts**

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).

48.3 **Substantial Completion of Parts**

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.

48.4 **Surfaces Requiring Reinstatement**

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

49.1 Defects Liability Period

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.

49.2 Completion of Outstanding Work and Remedying Defects

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.

49.3 Cost of Remedying Defects

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 i n 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.

49.4 Contractor's Failure to Carry Out Instructions

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.

50.1 **Contractor to Search**

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

51.1 **Variations**

The Engineer shall make any variation of the form, qualify 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.

51.2 **Instructions for Variations**

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.

52.1 **Valuation of Variations**

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.

52.2 **Power of Engineer to Fix Rates**

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.

52.3 **Variations Exceeding 15 per cent**

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, dayworks 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 dayworks, 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.

52.4 **Daywork**

The Engineer may, if in his opinion it is necessary or desirable, issue an instruction that any varied work shall be executed on a daywork basis. The Contractor shall then be paid for such varied work under the terms set out in the daywork 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 daywork 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 therefor other than Contractor's Equipment which is included in the percentage addition in accordance with such daywork 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 authorise payment for such work, either as daywork, on being satisfied as to the time employed and the labour, materials and Contractor’s Equipment used on such work, or at such value therefor 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.

53.2 **Contemporary Records**

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.

53.3 **Substantiation of Claims**

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.

53.4 **Failure to Comply**

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).

53.5 **Payment of Claims**

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

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

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.

54.2 Employer not Liable for Damage

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.

54.3 Customs Clearance

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

54.4 Re-export of Contractor's Equipment

In respect of any Contractor's Equipment which the Contractor has imported for the purposes of the Works, the Employer will use his best endeavours 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.

54.5 Conditions of Hire of Contractor's Equipment

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.

54.6 Costs for the Purpose of Clause 63

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.

54.7 **Incorporation of Clause in Subcontracts**

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.

54.8 **Approval of Materials not Implied**

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 prevent the rejection of any such materials at any time by the Engineer.

Measurement

55.1 **Quantities**

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.

56.1 **Works to be Measured**

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 authorised 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.

57.1 **Method of Measurement**

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

57.2 **Breakdown of Lump Sum Items**

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

58.1 **Definition of "Provisional Sum"**

"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.

58.2 **Use of Provisional Sums**

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 therefor 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

59.1 **Definition of "Nominated Subcontractors"**

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".

59.2 **Nominated Subcontractors; Objection to Nomination**

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 indemnity 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.

59.3 **Design Requirements to be Expressly Stated**

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.

59.4 **Payments to Nominated Subcontractors**

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.

59.5 **Certification of Payments to Nominated Subcontractors**

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

60.1 **Monthly Statements**

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, dayworks 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.

60.2 **Monthly Payments**

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.

60.3 **Payment of Retention Money**

(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.

60.4 **Correction of Certificates**

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.

60.5 **Statement at Completion**

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.

60.6 **Final Statement**

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.

60.7 **Discharge**

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.

60.8 **Final Payment Certificate**

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.

60.9 **Cessation of Employer's Liability**

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.

60.10 **Time for Payment**

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.

61.1 **Approval only by Defects Liability Certificate**

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

62.1 **Defects Liability Certificate**

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.

62.2 **Unfulfilled Obligations**

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

63.1 **Default of Contractor**

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.

63.2 **Valuation at Date of Termination**

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.

63.3 **Payment after Termination**

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.

63.4 **Assignment of Benefit of Agreement**

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.

64.1 **Urgent Remedial Work**

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

65.1 **No Liability for Special Risks**

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.

65.2 **Special Risks**

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.

65.3 **Damage to Works by Special Risks**

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.

65.4 **Projectile, Missile**

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, munition, or explosive of war, shall be deemed to be a consequence of the said special risks.

65.5 **Increased Costs arising from Special Risks**

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.

65.6 **Outbreak of War**

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 untill 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.

65.7 **Removal of Contractor's Equipment on Termination**

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.

65.8 **Payment if Contract Terminated**

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

66.1 **Payment in Event of Release from Performance**

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

67.1 **Engineer's Decision**

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.

67.2 **Amicable Settlement**

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.

67.3 **Arbitration**

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.

67.4 **Failure to Comply with Engineer's Decision**

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

68.1 **Notice to Contractor**

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, 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.

68.2 **Notice to Employer and Engineer**

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.

68.3 **Change of Address**

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

69.1 **Default of Employer**

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.

69.2 **Removal of Contractor's Equipment**

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 despatch, remove from the Site all Contractor's Equipment brought by him thereon.

69.3 **Payment on Termination**

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.

69.4 **Contractor's Entitlement to Suspend Work**

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.

69.5 **Resumption of Work**

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

70.1 **Increase or Decrease of Cost**

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.

70.2 **Subsequent Legislation**

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

71.1 **Currency Restrictions**

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 therefrom, without prejudice to the right of the Contractor to exercise any other rights or remedies to which he is entitled in such event.

72.1 **Rates of Exchange**

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.

72.2 **Currency Proportions**

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.

72.3 **Currencies of Payment for Provisional Sums**

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 utilised in whole or in part in accordance with the provisions of Clauses 58 and 59.

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PART II
CONDITIONS OF PARTICULAR APPLICATION

PART II - PARTICULAR CONDITIONS OF CONTRACT

1.1 DEFINITIONS AND INTERPRETATIONS

(a)(i) The Employer is **MALIR DEVELOPMENT AUTHORITY**. Wherever the term Client or Owner appears in the Tender Document, it shall mean the "Employer".

(a)(iv) The Engineer is **M/S. OSMANI & COMPANY (PVT.) LTD.**
Consulting Engineers, Osmani House, 245/2K, Block-6, PECHS, Karachi
Phones: 021-34536007 / 008, 34546541 / 42, Fax: 021-34534691
Email: ocl-khi@osmani.com Web: www.osmani.com

or any other competent person appointed by the Employer, and notified to the Contractor, to act in replacement of the Engineer. Provided always that except in cases of professional misconduct, the outgoing Engineer to formulate his certifications / recommendations in relation to all outstanding matter, disputes and claims relating to the execution of the Works during his tenure.

Wherever the term Consultant or Consultants appears in the Bidding Documents, it shall mean the "Engineer" and vice-versa.

(a)(v) Engineer's Representative

In second line after word Engineer add with the approval of the Employer

(a)(vi) Employer's Representative

Any person appointed by the Employer from time to time shall be deemed the Employer's Representative, who shall have the authority to enter in to work site, inspect the work for insuring the quality.

(a)(vii) **Labourers/Workmen** mean such labourers/ workmen and staff as may be employed by the Contractor for the purpose of carrying out the works specified in the Contract.

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

(b)(v) Add the following at the end of the paragraph:

The word "Tender" is synonymous with "Bid" and the word "Tender Documents" with "Bidding Document".

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

(b)(x) FIDIC means FEDERATION INTERNATIONAL DES INGENIEURS CONSEILS (International Federation of Consulting Engineers)

(e)(i) Delete the text and substitutes:
"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.

(h) Approved/ Approval means approved/ approval in writing by Engineer / Employer or their representative specified in "Conditions of Contract".

(i) When the terms **acceptable, satisfactory, proper** or other such general qualifying terms are used in the Contract it shall be understood that reference is made to the sole ruling and the sole judgment of the Employer representative or his Engineer.

(j) The Word **Equivalent or Equal** where used in these documents in the general sense shall not mean similar but shall mean "**Conforming to, of Like Kind Quality and Function Proprietary Items**" and "**Trade Name**" are used for the purposes of establishing a standard of "**Kind Quality and Function**" and "**Equivalent**" items, articles, things or materials will be approved if held to be "**Equivalent**" by the Engineer.

2.1 Engineer's Duties and Authority

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

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

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

(ii) Certifying additional cost determined under Sub-Clause 12.2 "Not Foreseeable Physical Obstructions or Conditions".

(iii) Any action under Clause 10 "Performance Security" and Clauses 21, 23, 24 & 25 "Insurance" of sorts.

(iv) Any action under Clause 40 "Suspension".

(v) Any action under Clause 44 "Extension of Time for Completion".

(vi) Any action under Clause 47 "Liquidated Damages for Delay" or Payment of Bonus for Early Completion of Works (PCC Sub-Clause 47.3).

(vii) Issuance of "Taking Over Certificate" under Clause 48.

(viii) Issuing a Variation Order under Clause 51,except:
a) in an emergency* situation, as stated herebelow, or

b) if such variation would increase the Contract Price by less than the amount stated in the Appendix-A to Bid.

(ix) Fixing rates or prices under Clause 52.

(x) Extra payment as a result of Contractor's claims under Clause 53.

(xi) Release of Retention Money to the Contractor under Sub-Clause 60.3 "Payment of Retention Money".

(xii) Issuance of "Final Payment Certificate" under Sub-Clause 60.8.

(xiii) Issuance of "Defect Liability Certificate" under Sub-Clause 62.1.

(xiv) Any change in the ratios of Contract currency proportions and payments thereof under Clause 72 "Currency and Rate of Exchange".

* (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

In line one of Clause 2.2 General Condition of Contract Part-I after word "by" add "Engineer with the consent of Employer". In last line after word "Sub-Clause 2.3" add "the Engineer shall ensure that Engineer's representative is a professional Engineer as defined in the Pakistan Engineering Counsel act 1975 (v of 1976)"

The following Sub-Clauses 2.5(a) & (b), 2.7 and 2.8 are added:

2.5 (a) Employer's Instructions

The Employer/ Engineer through its representative may in absolute discretion and from time to time issue written instructions, details, directions and explanations which are hereafter collectively referred to as "Employer's Instructions". The Employer/Engineer shall have the right to reject any materials, workmanship or equipment, which does not conform to the Contract and to suspend any work that is being improperly done. The Engineer's decision as to the construction and meaning of the drawings and specifications shall be final. Precedent or opinion as to what is useful or standard practice shall not be held to affect the status of the Engineer decision in any way or to relieve the Contractor from full responsibility and compliance with all requirements of the specification and plans.

(b) The Employer/ Engineer shall have the right to inspect and supervise the work. The inspection and supervision of the work by the Engineer shall not relieve the Contractor of his full responsibility and liability of careful and faultless execution of the work.

2.7 Engineer not Liable

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

2.8 Replacement of the Engineer

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

5.1 Language(s) and Law

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

5.2 Priority of Contract Documents

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

(1) The Contract Agreement;
(2) The Letter of Acceptance;
(3) The completed Form of Bid;
(4) Special Stipulations (Appendix-A to Bid);
(5) Specification - Special Provision
(6) The Particular Conditions of Contract - Part II;
(7) The General Conditions - Part I;
(8) Specifications - Technical Provisions
(9) The priced Bill of Quantities (Appendix-D to Bid);
(10) The Drawings;
(11) The completed Appendices to Bid (C, E to L);
(12) _____ (any other)

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

5.3 Contract Documents are Mutually Complementary

The Contract Documents are complementary and what is called for by any one shall be as binding as if called for by all. The intention of the documents is to include all labour and materials. Equipment and transportation necessary for the proper execution and maintenance of the work.

5.5 Marginal Headlines, Titles

The table of contents/ index, titles, headings, running headlines and marginal notes contained therein and/ or in said documents are solely to facilitate reference to the various provisions of Contract document and in no way shall affect limit or cast light upon the interpretation of provisions to which they refer in case of doubt, conflict in respect of interpretation of General Condition of Contract, shall prevail.

6.1 Custody and Supply of Drawings and Documents

In line seven of Clause 6.1 General Condition of Contract Part-I after word “Certificate” add “or earlier completion / cancellation of contract”.

The 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.

8.1 Contractor's General Responsibilities

In line two of Clause 8.1 General Condition of Contract Part-I after word "Works" add "mentioned in the contract and all other work if offered by him complimentary after award of tender and formed part of contract agreement however design of such work before execution shall be vetted by the Engineer".

9.1 Contract Agreement

In line two of Clause 9.1 General Condition of Contract Part-I replace the words "at the cost of the Employer" with "at the cost of the Contractor" and add the following sub paragraphs at the end:

The Contract Agreement would be made on stamp paper of an appropriate value liveable under the law. Cost of stamp duty would be born by the Contractor.

The Contractor shall at his own cost submit to the Employer photocopies of Four (4) sets and to the Engineer two (2) sets of the Contract Documents in bound form, duly initialled and stamped by the Employer, and the Contractor for the use of the Employer and the Engineer. Such submission shall be made within seven (7) days of signing of the Contract Agreement by the Employer and Contractor.

10.1 Performance Security

The text is deleted and substituted with the following:

The contractor shall provide Performance Security to the procuring agency in the prescribed form. The Performance Security shall be 5% of the Contract Price stated in the Letter of Acceptance.

Besides obtaining 5% as Performance Security, the Security Deposit at rate of 5% will also be deducted from running bills, thus amount equal to 10% of the Contract Price is obtained from contractor i.e. 5% as performance security and 5% security deposit as retention money. Deductions from interim/running bills will be made from successful bidder after the bidder has furnished the required performance security and signed the contract agreement.

The cost of complying with requirements of this Sub-Clause (performance security) shall be borne by the contractor.

The following Sub-Clause10.4 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.

13.1 Works to be in accordance with contract

Add the following para in the end of this clause:-

The Employer/ Engineer shall have the right to retain and / or deduct from contractor's bill an adequate amount of money, if the contractor fails to perform his obligations in terms and conditions of this clause.

14.1 Programme to be submitted

In line two of Clause 14.1 General Condition of Contract Part-I after the word "consent" add "oblique approval of Employer" and in the third line the text "as the Engineer shall reasonably prescribe" is substituted by "as acceptable to the Engineer".

Add the following sub paras:-

(a) The contractor shall submit two copies of the program prepared on Project Management Software Primavera P3 or MS Project with in 14 days from the date of receipt of letter of Acceptance/ commencement shown in first written work schedule for labour employment and material procurement.

(b) The time schedule may be adjusted from time to time but the contractual/ completion date shall remain unchanged unless extension of time is approved by the Employer in accordance with the contract conditions.

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.

Add the following Sub-Clause:

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.

15.1 Contractor's Superintendence

Replace Clause 15.1 of General Conditions of Contract Part-I by following

The Contractor shall be responsible to give or provide all necessary superintendence and efficient supervision during the execution of the work using his best skill and attention and as long thereafter as the Engineer may consider necessary for the proper fulfilling of the Contractor's obligations under the Contractor. A competent Agent / Project Manager, registered with Pakistan Engineering Council as Professional Engineer and duly authorized through a power of attorney (whose qualification and appointment shall be approved in writing by the Engineer / Employer which approval may at any time be withdrawn) is to be constantly posted on the works and shall give his whole time to superintendence of the same.

If such approval shall be withdrawn by the Engineer/Employer the Contractor shall as soon as is practicable (having regard to the requirement of replacing him as hereinafter mentioned) after receiving written notice of such withdrawal, remove the Agent from the site and shall not thereafter employ him again on the site in any capacity and shall promptly replace him by another agent approved by the Engineer with consent of Employer.

The Agent shall receive on behalf of the Contractor, directions or instructions from the Engineer or (subject to the limitations of Clause 2 hereof) the representative of the Engineer. The approval by the Engineer of the qualifications and appointment of Contractor, his agent or representatives for superintendence of the Work shall not relive the Contractor of any of his duties or responsibilities under the Contract. The Engineer shall have the right to remove from the site any of the Contractor's or his sub-contractor's personnel because of misconduct and/ or incompetence of which the Engineer shall be the sole judge.

In addition to the Contractor's Agent, the contractor shall employ reasonable number of Engineers. The number of Engineers employed should be in accordance with quantum of work and should be approved by the Engineer. The manpower schedule shall be submitted by the contractor alongwith work schedule for the approval of the Engineer. The Employer / Engineer shall have the right to retain and / or deduct from contractor's bills an adequate amount of money, if the contractor fails to perform his obligations in terms and conditions of this clause.

15.2 Language Ability of Contractor's Representative

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

15.3 Contractor's Representative

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

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

The following Sub-Clauses 16.3 and 16.4 are added:

16.3 Language Ability of Superintending Staff of Contractor

A reasonable proportion of the Contractor's superintending staff shall have a working

knowledge of the English language. If the Contractor's superintending staff is 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.

19.1 Safety, Security and Protection of Environment

Add in Sub Clause (c) of clause 19.1 General Conditions of Contract Part-I, after word "Operation" The contractor shall stand liable for any loss to property, or life and shall indemnify the Employer against such claim, charges and proceedings if any.

Add Sub Clause (d):-

In order to minimize the negative impacts during construction stage proper planning to mitigate adverse impacts is, therefore, imperative. The Contractor shall carry out the mitigation measures according to the guidelines and satisfaction of the client. Mitigation measures to be taken to minimize negative impacts due to vehicular emissions, noise, vibrations, dust and exhaust gases. Mitigation measures against damage to utilities and traffic arrangement during construction are the contractor's responsibility. Contractor should combat the problem of inadequate backfilling of trenches/ excavations. Environmental monitoring is to be performed as per environmental Monitoring Plan.

The works carried out as above shall not be measured for payment under this section directly and the cost of such works will be considered to be included in other items of work given in the Bill of Quantities.

19.1.1 Safety of Engineers and Works

The Contractor shall throughout the execution and completion be responsible to take all necessary precautions for the safety of Employees on the work, and shall comply with all applicable safety laws and building codes to prevent accident or injury to persons on, about or adjacent to the places where the work is being performed. The Contractor shall provide at works site before commencement of work, sufficient and in good working condition life saving equipments, first aid kit etc.

19.1.2 Watching and Lighting

The Contractor shall in connection with the works provide and maintain at his own cost all lights, guards fencing and watching when and where necessary as required by the Engineer or the Representative of 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.

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 Works 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.

20.1 Care of Works

Add Sub Para (c) & (d) at the end

(c) The Contractor shall in addition to the requirement indicated herein protect any utility and work of any kind against damage or interruption of services except as specifically directed or authorized by the Engineer. In case of any damages the same shall be repaired and or restored promptly by or at the expense of the Contractor without cost to the Employer.

(d) The Employer/Engineer shall have the right to retain and / or deduct from contractor's bill an adequate amount of money due to the contractor if the contractor fails to perform his obligations in terms and conditions of this clause.

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 r 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 traveling 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.

21.4 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).

Add the following after 22.1(b)

22.1 The Contractor to Protect Utilities

(c) The Contractor shall conduct his operations, make necessary arrangements, take suitable precautions and perform all required work incident to the protection of and avoidance of interference with power transmission, telegraph, telephone and natural 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.

(d) The Contractor shall make good, at his own cost, all damages to telephone, telegraph and electric cables or wires, sewer, 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 injury to the surface of the land, to the beds of water courses, Protecting Banks, riverbeds, etc. Where disturbed by the works (other than where specifically ordered by the Employer), shall be repaired by the Contractor or the Authorities concerned, at the Contractor's expense. All such making good shall be to the satisfaction of the Employer.

22.4 Indemnity by Contractor

The contractor shall pay and indemnify the employer against liability in respect of all claims proceedings, damages, cost, charges, fee and expenses incurred for no fault of employer and resulting from any act, omission or neglect of contractor, subcontractor, his agents or servants. These indemnifications, obligations shall be limited to claims, damages, loses and expenses which are attributable to bodily injury, sickness, disease or death or injury to or destruction of physical property (other than work), including consequential loss of use. Such obligation shall also be limited to the extent that such claims, damages, loses or expenses are caused in whole or in part by a breach of duty of care imposed by law on the contractor or any one directly or indirectly employed by the contractor.

25.1 Evidence and Terms of Insurance

In line three of Clause 25.1 General Conditions of Contract Part-I substitute "84 days" by "28 days".

The following Sub-Clause 25.5 is added:

25.5 Insurance Company

The Contractor shall be obliged to place all insurance 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 having atleast AA rating from PACRA/ JCR.

The cost of complying with requirements of this Clause shall be borne by the Contractor. The Contractor shall be liable for deductible losses not covered by insurance. The Insurance Policy shall state:-

(1) The Employer shall receive at least 30 calendar days written notice of Intended Cancellation or change effect in coverage.

(2) The Contractor is fully responsible to provide full indemnity to Employer in respect of liability against loss or damage.

26.1 Compliance with Statutes Regulations, etc.

Add Sub Paras (c) and (d) at the end of 26.1 of General Conditions of Contract Part-I

(c) The Employer presupposes that the Contractor has cognizance of all laws of Pakistan pertaining to the execution of the work. The Contractor shall confirm in all respects with the provisions of any such statute, ordinance or law as aforesaid and the regulations or by-laws of any local or other duly constituted authority which may be applicable to the works or public bodies and companies as aforesaid and shall keep the Employer indemnified against all penalties and liability of every kind for breach of any such statute, ordinance, law regulation or by-law. If the Contractor observes that the drawings and specifications are at variance therewith, he shall promptly notify the Employer/ Engineer in writing and any necessary changes shall be adjusted as provided in the Contract for changes in the work. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations and without such notice to the Employer, he shall bear all costs arising there from.

(d) The Contractor and his sub-contractors shall convey, store and make use of all explosives, dangerous petroleum acetylene, carbide of calcium and other similar material provided by them for use in or on the works in strict accordance with the provision of all laws, orders and regulations that are in force at the Site or may be issued from time to time by the Government.

29.2 Notices to Adjoining Property Owners

The Contractor shall send or cause to be sent written notices to Owners of property adjacent to the Site or which may be affected in any way by the performance of the work contemplate notifying them as to the extent of the work included in so far as it affect surrounding property and complying with local ordinance and laws.

29.3 Giving of Notices and Payment of Fees

The Contractor shall give all notices and pay all fees and charges required to be given or paid be any national or state statute, ordinance or other law or any regulation or by-law of any local or other duly constituted authority in relation to the execution of the work or of any temporary works and by the rule and regulations of all public bodies and companies whose property of rights are affected or may be affected in any way by the works or any temporary works.

30.2 Transport of Contractor's Equipment or Temporary Work,

In line six of Clause 30.2 General Conditions of Contract Part-I, after word "bridge" add "or gas line or any kind of utility lines".

30.3 Transport of Material or Plant

In line one of Clause 30.3 General Conditions of Contract Part-I after word “bridge” add “gas line, or any kind of utility lines”.

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.

33.1 Clearance of Site on Completion

At the end of Clause 33.1 General Conditions of Contract Part-I add following:-

The Employer/ Engineer shall have the right to retain an adequate amount of money due to the Contractor until the site is cleaned up and all damages made good.

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, unless otherwise agreed with the Employer, 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, 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.

Add the following Sub-Clauses:

34.13 Day and Night Work and Work on Sundays or Holidays

Unless otherwise stated in the Contract, the Works shall be executed in the day only within normal working hours. No work shall be carried out on Site on Sundays (locally recognised as day of rest) and on gazetted holidays, without the consent in writing of the Engineer except if the 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. The Engineer shall not unreasonably withhold any such consent save in exceptional circumstances, nor do so if work on rest days or on gazetted holidays is considered by the Contractor to be necessary to meet the Time for Completion.

In case the contractor needs to work after normal working hours or on Sunday or holidays, he shall get specific approval before hand from the Engineer giving at least 2 days advance written notice. In such case, the contractor undertakes his liability to pay the Engineer for such extra working hours (beyond normal working hours) calculated on the basis of actual extra hours at the rate of 1.5 times of approved man-month rate of the Engineer’s staff on duty on overtime payable to the Engineer through the Employer

by the 15th day of next month.

If the contractor works in night then he will have sufficient lighting arrangement at site of work and at way leaves also. He will also take necessary measures to avoid any accident.

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.

46.1 Rate of Progress

Add following at the end

In case of Contractor's failure to take necessary steps within the notified period to expedite the work progress, the Employer/ Engineer may carry out the work by purchasing material, deploying manpower, engaging equipment and by taking other necessary measures. Cost of all such work including indirect costs (Employer overheads, handling charges etc., @ 15% of the cost of such work) would be borne by the Contractor either directly or the Employer/ Engineer shall deduct such costs from any payment due to the Contractor.

Add the following sub-clause: -

48.2 Taking over of Sections or Parts

At the end add;

"Taking over of sections or parts may be considered at the sole discretion of Employer / Engineer".

51.2 Instructions for Variations

In second line of Clause 51.2 General Conditions of Contract, after the word "Engineer", add the words "in writing".

52.1 Valuation of Variations

In the thirteenth line of Clause 52.1 General Conditions of Contract, after the words “Engineer shall” the following is added:

“Within a period not exceeding one-eight of the completion time subject to a minimum of 56 days from the date of disagreement whichever is later”.
Add following;

“If the rates and prices in the contract shall not be applicable in the opinion of the Engineer new rates shall be fixed by the Engineer on twenty percent (20%) as contractor’s overhead and profit on the basic cost plus applicable taxes.

52.4 Day work

In line one of Clause 52.4 General Conditions of Contract Part-I after word “Engineer” add with “consent of Employer”.

53.3 Substantiation of Claims

In line one of Clause 53.3 General Conditions of Contract Part-I after the word “Engineer” add “and approved by the Employer”.

In line eleven delete the text “if required by the Engineer to do so“.

53.4 Failure to Comply

Delete this Sub-Clause in its entirety and substituted with the following

“If the Contractor fails to comply with any of the provisions of this Clause i.e. 53, the Contractor shall not be entitled to any additional payment, and the Employer shall be discharged from any liability in connection with the claim”.

54.5 Condition 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.

55.1 Quantities

Replace this Clause with the following: -

The quantities set out in the Bill of Quantities are estimated quantities of the works and they are not to be taken as actual and correct quantities of the works to be executed by the Contractor in fulfillment of his obligation under the Contract. However, no claim shall be entertained on account of quantities of work executed being more or less than those entered in the tender estimate. Payment shall be made for the quantities actually executed at the agreed unit prices in the Contract.

56.1 Works to be Measured

In line two of Clause 56.1 General Conditions of Contract Part-I after word “Works” add “deviations / amendments”.

59.2 Nominated Subcontractors Objection to Nomination

Replace this clause with the following:-

a. The Employer may invite offer for performance by sub-contractor of any works in satisfaction of prime cost sums included in the bidding documents. In the exercise of his options, offer will be made in writing to the accepting authority (Employer) who shall select the firm to do the work and inform the contractor who will be required to conclude the contract with the nominated sub-contractor for the execution of the work as specified by the Accepting Authority (Employer) to the Sub- Contractor. The Employer shall not nominate any sub-contractor. Against whom the Contractor shall make reasonable objection.

b. The Contractor shall be reasonable for any sub-contractor or contractor who may carryout any work or supply any material in connection with the contract, whether such person be selected by the Employer or by Contractor. The Contractor shall make good any loss or damage suffered by Employer by reason of default neglect or failure on the part of such person in relation to such work or material.

c. Nothing herein contained shall relieve the Contractor of his liability and obligation under the contract or in any way affect the contractor’s direct responsibilities to Employer nor shall it render Employer in any way responsible to such sub-contractor (s).

59.4 Payments to Nominated Sub-Contractors

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 Statement

Sub-Clause 60.1 of the General Conditions of Contract is deleted and is substituted with the following Sub-Clause.

The Contractor shall submit on the basis of the joint measurement of work done under clause 56.1, to the Engineer after the end of each month, Six (6) copies, each signed by the Contractor's representative approved by the Engineer in accordance with Sub-Clause 15.1, of a statement, in a tabulated form approved by the Engineer, showing the amounts to which the Contractor considers himself to be entitled. The statement shall include the following items, as applicable, which shall be taken into account in the sequence listed:

(a) The value of the works executed up to the end of the month in question.

(b) The actual value certified for payment for the works executed up to the end of the previous month.

(c) The value of the executed works for the month in question, obtained by deducting (b) from (a);

(d) The value of any variation executed up to the end of the month in question, less the amount certified in the previous Interim Payment Certificate;

(e) Any amount reflecting changes in cost and legislation, pursuant to Clause 70;

(f) any amount to be withheld for retention, determined by applying the percentage of retention stated in the Appendix A to Bid, to the amount due to the contractor, until the amount so retained by the Employer reaches the limit of Retention Money (if any) stated in the Appendix to Bid;

(g) Any other additions or deductions which may have become due in accordance with the Contract or otherwise.

After verification of monthly statement by the Engineer, the contractor shall make six (6) copies of the same on his own cost and submit the same to the Engineer.

60.2 Monthly Payments

Following paragraph is added at the end of the Clause.

"The Engineer shall not be bound to issue an Interim Payment Certificate if the Contractor has not submitted the progress reports in accordance with paragraph (b) of Clause 14.5 and such information as shall be mutually agreed in writing between the Employer and the Contractor".

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.

60.11 Secured Advance on Materials

Not included in this tender.

60.12 Financial Assistance to Contractor

Financial assistance shall be made available to the Contractor by the Employer as following:

(a) An interest-free Mobilization Advance of 10% of the Contract Price stated in the Letter of Acceptance shall be paid by the Employer to the Contractor in two equal parts upon submission by the Contractor of a Mobilization Advance Guarantee for the full amount of the Advance in the specified form from a Scheduled/ Commercial Bank in Pakistan acceptable to the Employer:

(1) First part within 14 days after signing of the Contract Agreement or date of receipt of Engineer's Notice to Commence, whichever is earlier; and

(2) Second part within 42 days from the date of payment of the first part, subject to the satisfaction of the Engineer as to the state of mobilization of the Contractor.

(b) This Advance shall be recovered in equal installments; first installment at the expiry of third month after the date of payment of first part of Advance and the last installment two months before the date of completion of the Works as per Clause 43 hereof.

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).

65.3 Damage to Work by Special Risks

In first line of Clause 65.3 General Conditions of Contract Part-I after word "on" delete the words" or near or in transit" and in line five after word "plant" add word "on site" and delete all words after "damaged".

65.8. Payment if Contract Terminated

Sub Para (b) of clause 65.8 is replaced with following:-

The cost of materials, plant or goods of the Contractor which has been delivered at site for execution of work, such material, plant or goods becoming property of the Employer upon such payment being made by him.

67.3 Arbitration

In the sixth to eighth lines of Clause 67.3 General Conditions of Contract Part-I, 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".

Add the following paragraph:

The place of arbitration shall be Karachi, Pakistan.

68.1 Notices to Contractor

Add the following paragraph:

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 Notices to Employer and Engineer

For the purpose of this Sub-Clause, the respective addresses are:

a) The Employer is **MALIR DEVELOPMENT AUTHORITY**.

b) The Engineer is **M/S. OSMANI & COMPANY (PVT.) LTD**. Consulting Engineers, Architects and Planners 245/2-K, Block-6, PECHS, Karachi-75400. Tel: (92-21) 34536007/ 08, 34546541/ 42 Fax: (92-21) 34534691,
Email : ocl-khi@osmani.com, Website : www.osmani.com

69.3 Payment on Termination

In line one of Clause 69.3 General Conditions of Contract Part-I after word "termination" add "except for clause 65 or no fault of contractor" and in line five word "any loss" is replaced with "work completed".

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:-

$$Pn = A + b\frac{Ln}{Lo} + c\frac{Mn}{Mo} + d\frac{En}{Eo} + \ldots\ldots\ldots\ldots\ldots$$

Where:

Pn 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;

Ln, Mn, En, 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

Lo, Mo, Eo, 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.

71.1 Currency Restrictions

Delete this Sub-Clause in its entirety:

Add the following Sub-Clause:

72.1 Rates of Exchange

Sub-Clause 72.1 is deleted in its entirety.

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.

Add the following Sub-Clause:

73.4 Adherence to Labour Laws

The contractor shall be responsible to adhere to all labour laws whether central or provincial and get themselves registered with the relevant department including but not limited to department of Sindh Employees Social Security Institution Karachi (S.E.S.S.I.) and EOBI department and shall be responsible to pay all dues in this regard to the concerned department. The employer reserves the right to ask the contractor to provide evidence of registration and payments if and when required. Further more the contractor shall indemnify the employer and the engineer for any claim/payments etc. in this regard.

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

Add the following Sub-Clause:

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.

Add the following Sub-Clause:

77.1 Joint and Several Liabilities

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 fulfillment 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.

Add the following Sub-Clause:

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.

79.1 New Clause 79.1 added
(SPPRA Rules Supersedes Other Rules)

Notwithstanding anything contained in the Bid documents, the Sindh Public Procurement Rules 2010 (SPPRA-2010), as prepared by the Government of Sindh, Services, General, Administration and Coordination Department (Regulation Wing) vide notification No. SROI(SGA&CD)2-30/2010 dated March 8, 2010, shall be applicable and shall supersede any clause contained in the Bid documents contrary to SPPRA-2010.

SPECIFICATION – SPECIAL PROVISION

SPECIFICATIONS - SPECIAL PROVISIONS

1. DESCRIPTION OF PROJECT

1.1. General

The Employer intends to construct Infrastructure Development Works at Shah Latif Town, Scheme 25-A, MDA, Karachi.

2. THE SITE

2.1. Site of Works

The Site of the Works is the area for construction lying within the right-of-way 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 comprised in the Site as defined in Clause 1 of the Conditions of Contract.

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. WORK UNDER THE CONTRACT

3.1. General Description

The Contract comprises the execution and completion of the Works, remedying of any defects therein, maintenance of utility services, and the provisions of all labour, materials, equipment, plant and everything whether of a temporary or permanent nature required in and for such execution, completion, remedying and maintenance so far as the necessity for providing the same is specified or can reasonably be inferred from the Contract.

The following description of the Works to be performed under this Contract is general in nature and is not intended to describe all of the facilities to be provided under this Contract.

CONSTRUCTION OF ROAD, DRAIN, SEWERAGE NETWORK AND WATER SUPPLY IN SECTOR 20-D IN SHAH LATIF TOWN SCHEME 25-A

4. GENERAL RULES OF SPECIFICATIONS

a) Specification or as Specified

Specification" or "as specified" refers to the specifications outlined in these Documents and where no specifications are available for any work or where the same are found not applicable then the relevant applicable ASTM or BSS specifications or equivalent standards shall apply in the same order.

Any item for which no specifications are outlined but which are identified on drawings, shall be completed according to the standards as per ASTM / BSS, these include items that may be added in the future. The Employer / Employer's Representative may supplement such specifications during the progress of work. All materials and processes used for these items shall be subjected to standard testing and, if found below the pertinent ASTM / BSS standards, shall be removed from the site immediately at Contractor's expense.

b) Standards and Codes

Wherever reference is made in the specifications to the respective standards and codes in accordance to which goods and materials are to be furnished, and work is to be performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise expressly set forth in the Contract.

c) Materials and Processes

All goods and materials to be incorporated in the Works shall be new, unused, of the most recent or current models and incorporate all recent improvements in design and materials unless provided otherwise in the Contract.

d) Equivalent Materials, Processes, etc.

Where specific materials, processes, etc. are specified and the same are not available other alternative materials and processes which ensure an equal or higher quality than those specified will be accepted subject to the Employer / Employer's Representative's prior review and written approval. The Contractor has to establish the non-availability of specified material prior to applying for equivalent differences between the those specified and the proposed alternatives must be fully described in writing by the Contractor and submitted to the Employer / Employer's Representative at least 30 days prior to the date when the Contractor desires the Employer / Employer's Representative's approval who may give such approval after determining that the alternative proposed ensures equal or higher quality.

e) Approved, Directed, Instructed

Approved, directed, instructed means the approval, etc. of the Employer / Employer's Representative unless otherwise stated.

f) Alternatives

Where alternative materials, processes etc., are specified the selection will depend on local conditions and discretion rests with the Employer / Employer's Representative whose decision shall be final and binding.

g) Catalogues / Standards / Manufacturer's Instructions, etc.

Wherever the manufacturer's/supplier's instructions, manuals, guarantees and ASTM/BSS Standards are referred to in the specifications and details of Bills of Quantities; all such literature shall be submitted by the Contractor to the Employer / Employer's Representative for due checking, approval and record.

h) Applicability

Unless stated or specified else-where to the contrary these General Rules shall apply to all sections of work irrespective of their sequence, location and description.

5. DRAWINGS

5.1. Bid Drawings

Bid Drawings issued with the Bid 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 5.2 hereof.

5.2. Construction Drawings, Supplementary Drawings

After award of Contract, the Contractor shall carry out "Joint Survey" at Site of Works in pursuance to Sub-Clause 6.4, Specifications – Special Provisions. The Contractor shall submit to the Engineer "Joint Survey", duly signed, dated and stamped by the representatives of the Employer, Consultant and Contractor.

Simultaneously, the Contractor shall submit to the Engineer detailed "Work Programme" in terms of Sub-Clause 14.1 Conditions of Contract.

After receipt of "Joint Survey" and "Work Programme" from the Contractor, the Engineer will start issuing Construction Drawings to the Contractor. 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 give notice to the Engineer regarding the part of the Drawings which in his opinion contain discrepancies or are not clear. The Engineer shall issue necessary clarifications or Supplementary Drawings in greater details as required to execute the Works. These Supplementary Drawings showing changes from the Bid Drawings, in the opinion of the Contractor, shall be reviewed by the Engineer for his determination of adjustment of the Contract Price under Clause 51 and 52 of the Conditions of Contract.

5.3. Definition of Term Drawings

The term Drawings as used in the Specifications means the Drawings referred in Clauses 5.1 and 5.2 hereof.

5.4. 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.

5.5. Copies of Drawings

Drawings will be issued to the Contractor as described below.

5.5.1. Bid Drawings

One (1) set of the Bid Drawings will be issued to the Contractor alongwith Bid Documents. Additional sets will be provided at cost of reproduction upon written request of the Contractor.

5.5.2. Construction Drawings / Supplementary Drawings

One (1) print of each Construction Drawings / Supplementary Drawing will be issued to the Contractor free of charge. Additional sets will be provided at cost of reproduction upon written request of the Contractor.

5.6. Drawings to be Furnished by the Contractor / As-Built Drawings

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

The Contractor shall, at all times, keep on Site a separate set of prints 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 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 six (6) complete sets of all As -Built Drawings as well as AutoCAD soft copy within thirty (30) days of receipt of drawings stated above, from the Engineer.

6. SETTING OUT OF WORK AND SURVEY

6.1. Reference Points, Lines

The Contractor shall establish bench marks and / or reference line at the Site in accordance with the instructions of the Engineer. The Contractor shall set out its work from these bench marks and / or lines.

6.2. 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.

6.3. Survey Instruments

The Contractor shall maintain at the Site the requisite surveying instruments in perfect working conditions for the use of the Engineer’s Representative to check levels and lines of the work at all times. These instruments shall include (but not limited to) One Total Station, Adequate nos. of Levels, theodolites, Tapes, etc.

6.4. No work without Joint Survey

The Contractor shall not start any physical work on site until the Joint Survey has been done to establish the existing ground levels.

7. APPROVAL OF MATERIALS AND PLANT

7.1. 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.

7.2. Submission of Samples and Data

As soon as practicable after award of Contract, the Contractor shall submit for the approval of the Engineer drawings, catalogues, diagrams and other descriptive data for all mechanical, electrical, architectural and such other materials and plant designated by the Engineer, which the Contractor proposes for use under this Contract. For certain materials and plant, data may be required to be submitted in accordance with a detail form furnished by the Engineer. Samples of materials (2 sets) shall be submitted by the Contractor to the Engineer at Contractor's cost for approval sufficiently in advance of the materials intended to be incorporated in the Works.

7.3. Testing

Testing, except as otherwise specified herein, shall be performed by a testing agency as proposed by the Contractor and approved by the Engineer, at no extra cost to the Employer. The Engineer may require all testing to be carried out under his supervision only.

The quality control testing shall be performed by the Contractor's competent personnel in accordance with a site testing as approved by the Engineer. The Contractor shall keep a complete record of all quality tests programme performed on Site.

7.4. 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.

7.5. 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, labour and materials reasonably needed for performing such inspection and testing as may be required by the Engineer.

7.6. 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.

7.7. Site Laboratory

The Contractor shall establish a Site laboratory for the purpose of necessary testing. The laboratory equipment shall remain the Contractor's property at all times.

8. CONSTRUCTION SCHEDULE

8.1. Submittal Date

The programme of Works submitted by the Contractor in accordance with Clause 14 "Programme to be Submitted", of the Conditions of Contract shall be submitted in the form of a detailed schedule based on a computerized network analysis covering all construction activities indicating critical activities with critical path, resource scheduling for Contractor's Equipment, material and labour, within the period stated in the Appendix A to Bid. All the milestone shall be clearly identified.

8.2. Requirements

The detailed submittal shall consist of schedules, network analysis tabulations and narrative descriptions of the proposed construction programme.

Each summary or detailed schedule shall consist of a bar chart and a time-scaled network. The scheduled start and finish times for all activities on the bar chart shall agree with those on the network. All inter-relationships and inter-dependencies between structures shall be clearly indicated on the schedules.

The network shall show the order and interdependence of activities planned by the Contractor, and shall be time-scaled according to calendar dates.

8.3. Monthly Reports

Each month, the Contractor shall submit a report consisting of:

- Copies of the bar charts for the current phase with both actual progress and scheduled progress shown.

- Network analysis tabulations as in Sub-Clause 8.3 above, reflecting actual start and finish dates where applicable.

- A narrative report discussing any significant deviations from the schedule and, if necessary, explaining the steps proposed to be taken to maintain the approved schedule.

In case of failure of submission the monthly progress reports in due time, the Payment of the monthly bill will be withheld till its submission.

9. NOT USED

10. SITE OFFICE AND TEMPORARY FACILITIES PROVIDED BY THE CONTRACTOR

10.1. 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 utilities services. The facilities shall, not be limited to, the Contractor's Site Office, labour camps, workyard and storage areas, temporary water supply, waste water disposal, temporary electricity, medical unit, temporary roads, fire protection and fire fighting equipment etc.

The Contractor shall be solely responsible for arranging the facilities. The Contractor shall arrange his labour camp, work yard, storage area, site office within the area available at the Site.

10.2. Notice Board

The Contractor shall erect and maintain at the Site in a location to be approved by the Engineer, 3 No. Sign Boards 4.45M height and 2 M wide for writing the name of Work, name of Employer, name of Consultants, name of Contractor and Project Cost. The notice board shall comprise of the following;

- Frame of 3" dia GI Pipe properly painted as per the direction of the Consultants/ Engineer and as per drawing.
- 2 Nos. Posts of 3" dia GI Pipe 4.45M above ground and 1M below ground embedded in 1:2:4 CC 2'x2'x4' with proper arrangements of anchorage and brasses. Pipes painted with anti-rust as directed by the Engineer.

- 4 Nos. Steel Sheets 0.6M high and 2M wide fixed on both sides with 50mm gap between each. The background of plates is of white color whereas the writing would be black or red color (as approved by the Engineer)
- White imported 3M sheet used as background. The color of monogram would be, green, red or black etc. (as approved by the Engineer)
- Alphabets of appropriate size as approved by the Engineer in 3M reflective sheet in blue/ black color.

The Contractor shall maintain the display of the notice boards at his own cost throughout the length of the project.

10.3 Engineer's Office

The Contractor shall provide, operate and maintain the following facilities within 1 week of the Engineer's Order to Commence the Works for the Engineer:-

a). The Contractor shall maintain the existing office accommodation of the Engineer including all costs of Electricity, telephone, water supply, sewerage, janitorial services, provision of stationery/consumable/supplies (as per the requirement of the Engineer), 01 No. tea boy (including tea making items) and 01 No. Security Guards etc. All appointments shall be made by the Engineer and Contractor shall be responsible for all salaries, benefits etc. of the appointed people.

b). The Contract Price shall be deemed to have included minimum but not limited to cost of Rupees Fifty Thousands (Rs. 50,000) per month pertaining to expenses on account of maintaining the above said office facilities in addition to salaries of the staff mentioned above.

c). The Contractor shall provide an average cost of Rupees Twenty thousand only (Rs. 20,000/-) per month pertaining to mobile telephone use in shape of Prepaid Mobile Cards.

In case of non-provision of above facilities, the Employer / Engineer shall deduct from any money due / becoming due to the Contractor by the Employer appropriate amount till these facilities are provided satisfactorily to the Engineer.

Cost of all above facilities are deemed to be included in the Contract Price and no additional payment shall be made by the Employer to the Contractor under any circumstances.

11. OTHER FACILITIES FOR ENGINEER'S PERSONNEL PROVIDED BY THE CONTRACTOR

11.1. Furnishing and Maintaining Transportation Facilities

The Contractor will provide suitable transport with driver and P.O.L on demand to the staff of Engineer for conducting inspection field tests & survey work etc. The expenditures on this account are to be borne by the contractor.

12. SAFETY

12.1. Accident Prevention, Protective Equipment

The Contractor shall comply and enforce compliance by all his Subcontractors with the highest standards of safety and accident prevention in compliance with all applicable laws, ordinance and statutory provisions.

Where overhead work is being carried out, warning signs shall be installed at ground level clearly warning of the overhead work.

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

13. PAYMENT FOR WORK REQUIRED BY SPECIAL PROVISIONS

Unless otherwise specifically stated in the Contract, the price of all work required by the Special Provisions shall be considered to be included in the Contract Price.

14. The Bided Rates shall be inclusive of all lead and lift and no additional payment for this item shall be admissible.

15. The Contractor's rates shall include all incidental charges in connection with the work such as the cost of removing trees, shrubs, grass, etc., which interfere with the execution of the work which will be carried out by the Contractor upto the satisfaction of the Engineer prior to the earthwork. No extra payment for these items will be paid by the Employer.

16. No alterations or additions shall be made by the Contractor in the Bill of Quantities and rates must be filled in ink or typed out both in figures and words clearly and legibly in the columns provided in the schedule of quantities. All corrections must be initialed by the contractors. Any Bid which does not comply with this condition will be liable to be summarily rejected and not taken into account when preparing comparative statement.

17. Materials obtained from excavations will be the property of the Employer. Serviceable materials are to be stacked in places pointed out by Engineer-in-charge. The Contractor undertakes to have the site clean and free from rubbish to the satisfaction of the Engineer. All surplus materials, rubbish, etc., will be removed to places to be fixed by the Engineer and nothing extra will be paid for this.

18. On completion of the work or earlier as directed by the Engineer, the Contractor shall remove all temporary structure (Godowns, 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. Cost of these works shall be deemed to be included in the Contract Price and no payment shall be made by the Employer on this accident.

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

20. The contractor shall inspect the site of works and acquaint himself with the nature and requirements of the work, facilities of access for materials, removal of rubbish, cost of carriage, nature of strata, etc., before submitting his Bid.

21. The contractor shall have to make temporary approach roads, etc., at his own cost to facilitate movement of materials, such approach roads shall be aligned in a manner approved by the Engineer.

22. The contractor shall have to make proper arrangements for road crossing barriers during working hours in the day time as well as in the night when danger lights will have to be provided on either ends at his own cost and no extra cost will be paid. Sufficient barricades and red lights will be provided by the Contractor where required to avoid the chances of accidents. In case an accident occurs for failure on the part of the contractor, he shall be entirely responsible for the consequences.

23. The Contractor shall have to make arrangements for diversions for traffic wherever necessary and shall have to provide diversion and caution boards as per directions of the Engineer at his own cost for which no extra cost will be paid. The diversion shall be watered and consolidated as per directions of the Engineer.

24. No material shall be removed from the site without the written permission of the Engineer.

25. Dewatering including shoring wherever so required pumping, bailing out water, drainage of water within plot areas if any shall be deemed to have been included in the rates quoted by the Bidders and no extra payment will be made. The rates shall be deemed inclusive of such incidental charges.

26. The Contractors shall execute all works at their own cost for diversion of water away from the plot as per site requirements to have full satisfaction of Engineer and no additional payment will be made on this account.

27. The Engineer reserves the right to select all materials and the type, grade, heating capacity and quantity of proportion of any or all materials as required for a particular work. The decision of Engineer in this respect shall be final and binding on the Contractor. The rejects on materials must be carted at his own cost. If the rejected materials are not removed within one month of its rejection the materials will become the property of the Employer or will be removed at Contractors cost.

28. ATTENDANCE OF MEETINGS

The Contractor shall attend and shall cause his Sub-Contractors to attend any or all meetings when called by the Employer or the Engineer or his Representative to discuss progress of the work and other matters related to the work and the Contract, without any compensation from the Employer.

a). The Contractor shall bear all expenses of the Employer and his agents and representatives and the Engineer, his agents and representatives if requested by the Contractor for any meetings, instructions and approvals away from the Site.

b). The proceedings of the meetings shall be recorded by the Engineer which shall be circulated to all the participants including those of the Contractor. All decisions taken in the meetings shall be binding on the Contractor and shall form part of the Contract.

29. 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 form of Bid 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 Bid 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 Bidder or his legally authorised representative.

30. PERSONAL LIABILITY OF PUBLIC OFFICIALS OR ENGINEER

In carrying out any of the provisions of these specifications, or in exercising any power of authority granted to them by or within the scope of the Contract, there shall be no liability upon the Employer or his authorized representatives or the Engineer or his authorized representatives their personally or in their official capacity, it being understood that in all matters they act solely as agents and representatives of the Employer.

31. ACCESS AND EXISTING ROADS

If the Contractor finds it necessary or elects to use existing roads, the Contractor shall make all necessary arrangements and obtain all permits from the relevant departments for travel over and use of such roads. The Contractor shall observe all rules regulations of the concerned department regarding the use of said roads. The cost of maintaining all necessary safety measures and temporary structures and making any necessary repairs, replacements or similar operations and all or any other costs required by reason of his use of such roads shall be borne by the Contractor and the Contractor shall save harmless and indemnify the Employer in respect of all claims, demands proceedings, damages, costs, charges and expenses whatsoever arising out of or in relation to any such operation or interference.

32. FIRST AID FACILITIES

The Contractor shall provide and maintain adequate First Aid Facilities at all times, convenient to the Site to the approval of the Employer.

33. FINAL HAND-OVER

At the end of the Period of Maintenance stipulated in the contract, the Employer 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 inspection of Work, if satisfied that there are no deficiencies or defects due to work of the Contractor shall certify the final hand-over, and the Employer will then issue a final Certificate of Completion of Work within thirty (30) calendar days thereafter.

34. EMPLOYER AND ENGINEER NOT PERSONALLY LIABLE

No member or officer of the Government or the Employer or the Employer's Representative or the Engineer or his representatives or any one of their respective staffs or their employees shall be in anyway personally bound or liable for the acts or obligations of the contractor under the contract or answerable for any default or omission in the observance or performance of any of the acts, matters or things which are herein, contained.

35. PROGRESS PHOTOGRAPHS

The contractor shall furnish to the Employer and to the Engineer every two weeks at least six photographs to clearly show the progress of construction. The photographs shall be submitted in 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 photographs. The set of photographs of the Engineer should accompany respective negatives.

36. SITE ORDER BOOK

The Contractor shall maintain site order book {of triplicate leaves} at the Site, for taking down instructions of the Engineer and/ or the Employers, with out any obligation and charges to the Employer / Engineer.

37. BAR BENDING SCHEDULES

The contractor shall be responsible for the preparation of all bar bending schedules at his own cost which shall be based on structural drawings supplied by the Engineer and shall get them approved before the actual execution of work.

38. REPORT ON PROGRESS OF WORK AND PHOTOGRAPHS

The Contractor shall, during the execution of the work, submit to the Employer (3 copies) and ENGINEER (2 copies) so as to reach them in the first week of every calendar month, a report on the actual progress of the works attained by him during the preceding month fully supported with colour photographs of (5”x7”) size, at least 15, depicting the complete stages of the works. Each photograph should be properly pasted on A-4 size paper, indicating the location and other relevant information of the area photographed. The report will be submitted on the standard format to be supplied later on. In case the Supervision Engineer are different from the Design Engineer, one copy each of photographs should be sent to both the Engineer.

The set of photographs for the Design Engineer should be submitted with respective negatives.

SPECIFICATION –
TECHNICAL PROVISIONS

SPECIFICATIONS - TECHNICAL PROVISIONS

All items to conform with Government of Sindh C & W Department latest specification (with their sub-sequent amendments) except where additional specifications are provided in this section and BOQ, with the following additional stipulations:-

i) No payment for extra lead and lift will be made.

ii) The rates being quoted by the Contractor shall include dewatering if required.

iii) Not with-standing any item of BOQ, **NO LEAD** or **LIFT** for supply of any material/ disposal of any item/ execution of any work would be given to the Contractor. The Contractor is supposed to investigates the source of all materials and ascertain their cost of cartage (including all incidental costs) which would be considered incorporated in the items rates.

iv) RCC pipes in items to conform to ASTM Specifications C-76.

v) Sea sand shall be used only for bedding and backfilling under PE Pipe and will not be allowed in any other activity.

vi) Sea water/ brackish water shall not be used in any construction activity including road construction.

vii) Any item (i) described in the Bill of Quantities or relevant Specifications but not shown on the Drawings, or (ii) shown on the Drawings but not described in the Bill of Quantities or relevant Specifications, shall be of like effect as it has been shown and mentioned in both. Similarly, if any item which is neither shown on the drawing not mentioned in the Bill of Quantities or Specification but is a pre-condition to carryout any item of the contract, it shall be considered to be included in the contract price, distributed among the rates and prices entered for the related items of works. The decision of the Engineer shall be final and binding on the Contractor, unless before the deadline for submission of Bids, such discrepancies are clarified by the Design Consultant as a result of an inquiry from bidders or on the initiative of the Design Consultant/ Employer. The clarification in either case would be sent to all bidders as an Addendum. However it shall be clearly understood that no extra cost whatsoever shall be paid in case such discrepancies if any, exist in the Bid documents.

viii) All diameters of pipes and fittings (MS, uPVC, RCC, FC etc.) as mentioned in BOQs shall be minimum clear inner diameters.

ix) In case of PE Pipe the diameter given in the BOQ shall refer to outer diameter.

x) Not withstanding anything contained in the Contract Documents, Employer/ Engineer reserves the right to ask for justification/ rate analysis from the contractor of any rate which in the opinion of the Employer/ Engineer is abnormally high or low. Furthermore, the quoted rates, once accepted will be valid only for the quantities mentioned in the BOQ with a variation of ± 15%. For any further variation, the Employer/ Engineer reserves the rights to reduce any abnormally high rate quoted by the contractor as per Clause 52.2 of the contract.

xi) The pament for earthwork for embankment shall be measured from NSL not withstandaing anything written in the Contract. The embankment earthwork between NGC and NSL, if any, shall be deemed to be included in the Contract Price and shall not be measured from payment under earthwork.

SPECIFICATIONS - TECHNICAL PROVISIONS

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EXCAVATION, TRENCHING AND BACKFILLING

1. SCOPE

The work covered by this section of the specifications consists of furnishing all plant, labour, equipment, appliances and materials and performing all operations in connection with excavation, trenching and back-filling for sewer and water supply lines and all other structures including all incidental works necessary for excavation to the required depth and dimensions in accordance with the applicable drawings, or as directed by the Engineer. The work shall be carried out in complete conformity with the specifications, set-forth hereunder.

2. SETTING OUT

Lines and levels will be set out by the Contractor who shall be responsible for maintaining all stakes and witness points set-up by the Engineer for the execution of work in strict accordance with them.

3. CLEARING AND GRUBBING

The sites of all excavations shall be cleared of all shrubs, plants, bushes, large roots, rubbish and other objectionable materials. All such materials shall be removed from site of work or otherwise disposed off at no extra cost in a manner satisfactory to the Engineer. All trees and shrubbery that are designated by the Engineer to remain shall be adequately protected and preserved in an approved manner.

4. EXCAVATION

4.1 General

The contractor shall remove the whole of the vegetation, top soil, concrete, flagging, paving, curbing, road metalling and other materials from the site of any excavation and shall keep separately and preserve the same for re-use where applicable. The ground shall be excavated for the permanent and temporary works to the required depths, width and levels so that the dimensions of the permanent work shall not be less than as shown on the Drawings, or as may be directed.

All rubbish, filth and matter of an offensive nature taken out of any excavation shall be disposed off at once and not left on the surface within the site.

4.2 Earth Excavation for Sewers

Unless otherwise directed or permitted by the Engineer not more than 500 ft of any trench in advance of the end of the pipeline already laid shall be opened at any time. Trenches shall be excavated to the dimensions and depths shown on the drawings or ordered by the Engineer or in such a position or to such dimensions and depths as shall allow for the proper construction of the relevant structure or construction or proper excavation of the relevant operation. For excavation the width of trench allowable for payment shall be the external diameter of pipes plus 12 inches on both sides, for pipes up to 15 inches diameter. For diameters exceeding 15 inches, the width of trenches shall be external diameter plus 18 inches on both sides. For depth exceeding 5 feet slope allowance of 1.5 inch per foot (in depth for each side of the trenches) shall be made in addition to the width specified to the full depth of trenches. The Contractor shall make allowance for the additional excavation required for making joints and, where necessary, for concrete bedding or surround in the price tendered for trench excavation. These shall not be separately measured or paid.

The banks of the pipe trench shall be as nearly vertical as practicable. Bell holes and depressions for joints shall be dug after the trench bottom has been prepared. The pipe, except for joints, shall rest on the prepared bottom for its full length. Bell holes and depressions shall be only of such length, depth, and width as required for properly making the particular type of joints stones shall be removed to avoid point bearing. Whenever wet or otherwise unstable material that is incapable of properly supporting the pipe as determined by the Engineer is encountered in the bottom of the trench, such material shall be removed to the depth required and the trench backfilled to the proper grade with coarse sand, or other suitable approved granular material.

Such replacement of unsuitable material will be paid for at the contract unit price for that item of work as shall be agreed upon, before execution of this work, with the Owner.

Where the Contractor has excavated to depths in excess of the requirements, from his neglect or from causes within his control, he shall refill and compact the excess excavation with suitable material approved by the Engineer, up to corrected level, at his own expense.

Excavation for appurtenances shall be sufficient to leave at least 12 inches but not more than 24 inches between the outer surface and the embankment or timber that may be used to hold and protect the banks. Any over-depth excavation below such appurtenances that has' not been directed by the Engineer, will be considered un-authorized and shall be refilled with compacted sand, gravel or concrete, as directed by the Engineer and at no additional cost to the Employer.

4.3 Earth Excavation for Water Supply Lines

For excavation the width of trench allowable for payment shall be the external diameter of pipes plus 18” for pipes up to 12” diameter. For depth exceeding 5 feet slope allowance of 1.5 inch per foot (in depth for each side of the trenches) shall be made in addition to the width specified to the full depth of trenches. The Contractor shall make allowance for the additional excavation required for making joints and, where necessary, for concrete bedding or surround in the price tendered for trench excavation. These shall not be separately measured or paid.

4.4 Excavations For Trenches / Drains

The Contractor shall excavate trenches / drains in straight lines between the tangent points of bends or changes of cross section and in smooth curves to the radius shown on the drawings or ordered by the Engineer. For depth exceeding 5 feet slope allowance of 1.5 inch per foot (in depth for each side of the trenches) shall be made in addition to the width specified to the full depth of trenches.

The side slopes and beds of trenches / drains shall be constructed and neatly trimmed equal to the best practicable finish. The area of the finished excavation at any cross-section shall not be less than that shown on the Drawings or ordered by the Engineer for that cross-section. For depth exceeding 5 feet slope allowance of 1.5 inch per foot (in depth for each side of the trenches) shall be made in addition to the width specified to the full depth of trenches.

4.5 Excavations for Reservoirs / Tanks and Foundations

The Contractor shall excavate tanks/ reservoirs and foundations to the lines and levels shown in the Drawings. As for as is practicable excavation shall be carried out in uniform layers over the full areas. The excavation shall be kept clear of water at all times. Bulk excavation may be carried out by machine or other approved methods to within 6 inches of the final surface. The final 6 inches of excavation shall be carefully carried out by hand. Embankment slopes shall be trimmed to the side slopes shown in the Drawings. For depth exceeding 5 feet slope allowance of 1.5 inch per foot (in depth for each side of the trenches) shall be made in addition to the width specified to the full depth of trenches.

4.6 For Pipelines

a) The excavation shall be carried out to the required alignment, levels, slopes or gradients as per drawings or described in the specifications and bill of quantities taking into account bedding required below pipes or to such other dimensions and slopes as the Engineer may direct in writing to facilitate laying of pipes for sewerage network (both shallow and deep). The Contractor shall provide masonry pillars of suitable size and fix temporary benchmarks at intervals to be determined by the Engineer or his representative(s). No trench excavations shall be commenced without prior approval of the Engineer. Excavation shall proceed at the same rate as laying, jointing, testing and backfilling.

b) The quantity of excavation shall be the volume of materials removed from below the original surface of the ground to the limits of excavation specified or shown on the drawings. For soft and unstable soils, the Contractor shall provide all necessary site supports including timbering or sheet piling to support the sides of trenches. The cost of supply of all material, plant and labour that may be necessary for site clearance, excavation, over break, timbering, sheet piling, shoring, strutting, refilling, watering and ramming, etc., shall be included in the

Contract Rates for excavation. In all cases, the quantity of excavation measured shall be the in- site volume of the undisturbed material with in allowable limits mentioned in the specification. In case sides or ends of any excavation collapse under self-weight or due to any other reason, the contractor shall at his own cost remove all disturbed material. Should sides or ends of any excavation give way, the contractor shall at his own cost remove all disturbed material. No additional payment due to side slopes of pipe trenches if carried out by Contractor shall be allowable.

c) Where the Contractor has excavated to depths in excess of the requirements, he shall refill and compact the excess excavation with 1:4:8 cement concrete upto the correct level at his own expense. Any excavation done in excess of specified width due to any reason, what so ever shall not be payable.

d) For excavation above ground water table, the width of the trench shall be equal to the external diameter of the pipe plus 18''dia. not exceeding 12'' dia. For sewers of internal diameter exceeding 12'' dia. The width of trench payable shall be equal to external diameter of pipe plus 30''dia. The depth shall be as per longitudinal section of sewers and shall include for sewer bedding, to give minimum 30''of the earth cushion over the pipe or to the depth of existing pipe where required to be connected.

e) For excavation below ground water table up to a depth of 10ft, the width of trench allowable for payment shall be the external diameter of pipes plus 24'' for pipes up to 12'' diameter. For diameters exceeding 12'', the width of trenches shall be external diameter plus 3ft.

f) For excavation below ground water table and depths exceeding 10ft, the width of trench allowable for payment shall be the external diameter of pipe plus 3'-6''.

g) Additional excavation will be necessary at all manholes, valve chambers and pipe joints to facilitate the making of joint. Additional excavation for construction of manholes, valve chambers and joint holes shall be of such dimensions, so as to give clear working space. The Contractor shall make allowance for the additional excavation required for the manholes and valve chambers in the price tendered for trench excavation. These shall not be separately measured or paid.

h) The length of the trench shall be measured along the centre line of the trench and the depth shall be measured vertically from original ground levels to the average bed level.

i) The maximum length of trench to be left open shall be the length between manholes or not more than 160ft of jointed pipe line, whichever is the lesser, and shall remain visible for the purpose of inspection and testing. In exceptional circumstances where the nature of the ground or locality renders it necessary to reduce this distance, the contractor shall inform the Engineer, immediately. In the case of pressure pipelines, partial backfilling shall be carried out before testing.

j) Where pipes are laid through rock or extra hard strata, the trench shall be excavated to depths below the barrel of the pipes specified in "Schedule for pipe bedding & surrounds". The space below the pipe barrel shall be refilled with specified granular bedding material.

4.7 Earth Excavation for Foundation, Footing etc.

The foundations, footings, etc. shall be taken out to the exact width and depth shown in the drawings or as directed by the Engineer. The bottom of the trench shall be at one uniform level throughout unless the site is on a slopping ground or if there is dip in the hard sub-soil on which the foundation is to rest, bottom be stepped for economy. The top surface of every stepped length shall also be horizontal. The sides of the trench shall be left plumb, unless otherwise directed by the Engineer. The foundation after being excavated shall be inspected and passed by the Engineer before any building work is commenced on it.

If suitable stratum is not found at the depth specified, the contractor will obtain sanction in writing from Engineer before proceeding further with the excavation.

4.8 Earth Excavation for Structures

All earth excavation under this contract, which is not included under the classification of “Earth excavation in Trenches” shall be classified and paid for as earth excavation for structures. The Contractor shall provide adequate timbering or shoring for excavations. Should the sides and ends of any excavations give way the contractor shall, at no extra cost, removal all disturbed ground. Any excavation carried outside the limits shown on drawings and specified herein as the payment limits, shall not be treated as excavated and shall not be paid for.

When foundation level is reached, the Engineer’s Representative will inspect the exposed ground and give directions as to what further excavation if any, he considers necessary. The excavation should be done in such a manner, as to ensure that the work rests on a solid and perfectly clean foundation. If the Contractor allows any portion of such foundations deteriorate due to exposure, he shall make good the foundations to the satisfaction of the Engineer without extra cost.

4.9 Trial / Test Pits

The Contractor may be required to excavate trial pits and trial trenches upto about 10% of the total quantity of excavation specified in the contract at appropriate locations to determine the actual level of the existing water table, and position of existing conduits, water mains, gas mains, cable ducts and sewers etc. This excavation work shall be done carefully with due precaution, so as not to damage any existing services. The Contractor may be precluded from carrying out any permanent work until this information is obtained and may have to adopt his programme in accordance with the information so obtained by the Contractor.

Trial test pits will be required to be dug before or during the execution of work at locations directed by the Engineer for determining the condition of soil, checking the location of utility services water levels etc. The size of individual trial pits may be kept 5ft x 5ft up to the required depth. The dimensions may be varied depending upon the site condition and as per instruction of the Engineer. The Contractor shall obtain prior permission from Engineer in writing before start of work on trial pits. No separate payment shall be made for trail pits required to be dug by the Contractor.

The cost incurred by the Contractor on the trial / test pits shall be deemed to be included by the Contractor in his rates for excavation.

4.10 Classification of Soils

Excavation shall include the removal of all materials in all kinds of soils or stratas of every name and nature. The sub- soil in the project area mostly comprises of clay with fine sand and silt and high sub-soil water level. A considerable amount of dewatering and supports for the sides of excavation will be essential including bore holes, well point system and side supports comprising of shuttering, bracing, strutting and sheet piling. However the Contractor shall make his own assessment after detailed study of the area and digging the required trial / test pits as required in this regard. No claim shall be allowed on account of any omission or error in such data trial / test pits.

If rock is encountered it shall be removed carefully and without excessive noise and vibration. Blasting shall not be allowable. The quantities of earthwork for each category of excavation i.e. soil, and rocks are provisional. The Engineer shall do the classification of soil during actual excavation. In case the Contractor meets rock during the excavation, the contractor shall request the Engineer in writing for a joint inspection for classification of soil. The Engineer shall visit the site during excavation and give his opinion in writing about classification of soil for the particular site or alignment.

The excavation payable shall be limited to the dimensions and elevations as indicated on the drawings. Foundations on made up ground shall be taken down to nascent soil as per direction and approval of the Engineer. Excavation shall extend to a sufficient distance away from walls and footings to allow for placing and removal of forms, installation of services and for inspection. No payment shall be made for this extra excavation. The Contractor's rate for excavation shall be deemed to include for such extra excavation.

In the event of any excavation being carried out deeper than specified, the same shall be filled in by the Contractor at his own cost to the required level with lean concrete if beneath footing or with proper compacted local river sand if beneath slab.

4.11 Mechanical Diggers and Other Appliances

The Contractor shall not use mechanical excavation in gardens or plantation areas unless approval in writing has been obtained from owners and tenants.

In addition to the above, if the Engineer shall reasonable consider it unsuitable that any excavator, mechanical digger or other machine or appliances employed, or proposed to be employed by the contractor should not be used or that any such machine or appliance as aforesaid is unsuitable for use on the works or on any part of the works, the Engineer may order the Contractor not to use and / or to immediately remove from the works such machine or appliance.

5. PRECAUTIONARY AND REMEDIAL MEASURES

5.1 Protection of Existing Facilities and Structures

The Contractor shall take every necessary precaution not to endanger the safety, occupation or operation of any property, structures, installations or services in the vicinity of his operations and shall observe any restrictions imposed by authority concerned / Engineer to this end. Should any such property, structures, installations or services be endangered or damaged as a result of the Contractor's operations, he shall immediately report any such danger or damage to the Engineer's Representative and any authority concerned and shall forthwith undertake remedial measures to the satisfaction of the Engineer or the appropriate authority.

5.2 Planking and Strutting

The Contractor shall provide, if required, at his own expense to the satisfaction of the Engineer all times support effectively the sides of the pipe trenches and other excavation by suitable timbering, sheet piling, sheeting, bracing, strutting etc. Where required the contractor shall use close timbering in all loose or sandy or unstable stratas both above or below ground level, if found necessary by the Engineer and accord approval. It is intend that all timbering and side supports for sewer trenches shall be removed as the work proceeds. The Contractor shall ensure that the removal of timbering and side supports is done gradually and carefully to avoid any damage to existing or new structures, roads, pavements or any other private or public property. All timbering, sheeting and their supports shall be of adequate strength and dimension and fully braced and strutted so that no collapse, subsidence or any damage to public or private property shall take place. The Contractor shall be solely responsible for the sufficiency of all timbering, sheet piling and their supports to be used and all damages to persons or property resulting from the improper quality, strength, placing, maintaining or removal of the same shall be payable by him under all circumstances.

In removing timbering, shoring and strutting and all other supports from excavation and trenches etc., special care shall be taken to avoid bringing pressure to beat on any concrete or other work until it has hardened sufficiently to resist such pressure.

5.3 Removal of Water

The Contractor shall build all drains and do ditching, pumping and all other work necessary to keep the excavation clear of sewage, storm water and water from any source during the progress of the work and until the finished work is safe from injury. All water pumped or drained from the work shall be disposed of in a manner satisfactory to the Engineer and necessary precautions against flooding shall be taken. The contractor should submit the Methodology of dewatering for approval. It may also be noted that any approval of the methodology will not relieve the contractor from any of his responsibilities / obligations.

The Contractor shall be required to arrange well point equipment and / or adequate number of tube wells or both and pumping machinery for dewatering and lowering the existing water table for construction purposes in the areas where sub- soil water or any sewage and water from any other sources are encountered. The system shall be capable of working non-stop 24 hours a day for the entire duration of the work without break during excavation, and for laying of sewer, pipes and bedding, construction of manhole, construction of structures, testing of sewers/ pipes and backfilling. The system of dewatering proposed to be adopted shall be submitted by the contractor with sufficient details along with the tender for approval of the Engineer. The Contractor is required to visit the site before submitting his tender and investigate the available

mean of disposal of pumped water including laying of temporary pipeline for transmission of water during the period of excavation providing bedding, laying & jointing of sewer, pipes and construction of any structure up to ground level. The cost of all such works required for pumping and disposal of water from trenches/ pits shall be considered to be included in the BOQ rates for excavation. **No extra cost whatsoever shall be payable to the Contractor.**

5.4 Maintenance of Excavation

All excavation shall be properly maintained with while they are opened land exposed. Sufficient suitable barricades, warning lights, flood lights, signs, and similar items shall be provided by the Contractor. The Contractor shall be responsible for any damage due to his negligence.

5.5 Surplus Materials

All surplus materials shall be disposed off at locations approved by the Engineer. The disposal of surplus material shall not interfere with other works and shall not damage or spoil other material. When it is necessary to haul earth or rock material over street or pavement, the Contractor shall prevent such materials from falling on the street or pavement.

5.6 Cutting Pavement

In cutting or breaking street surfacing, the Contractor shall not use equipment which will damage the adjacent pavement. Existing paved surface shall be cut back beyond the edge of trenches to form neat square cuts. The road ballast and other materials shall be placed on one side and shall be preserved for re-installment when the trench is filled. Wherever necessary or required for the convenience of the public or individual residents, at street crossings and at private driveways, the Contractor shall provide suitable temporary bridges over unfilled excavations. All such bridges shall be maintained in service until backfilling has been completed. The Contractor shall keep the road crossings manned 24 hours per day. During night time, enough red lights shall be provided to warn traffic. If detour is necessary, the Contractor shall make proper detour for the traffic and shall install- signs 3 ft x 4 ft in size indicating the detour.

6. TIMBERING SHORING & BRACING

6.1. General

As the sub-soil stratas are mostly clayey silt and fine sand with high ground water table, slush is likely to be formed if adequate dewatering is not done, and the sides are likely to collapse if not adequately supported. The Contractor shall provide where required all shoring, supports etc., to the sides of excavation to prevent sliding or any movement. The timbering, shoring and bracing shall be of adequate strength to with stand the pressure encountered and the Contractor shall be soley responsible for the losses due to collapse or failure of shuttering, bracing, shoring etc. Where formation of slush is unavoidable, the Contractor shall provide steel piling of adequate size and strength. The driving of sheet piling shall continue simultaneously as the work of excavation proceeds. No payment for side support including shoring, shuttering or bracing or sheet piling shall be made. The Contractor's rate for excavation shall be deemed to include the cost of providing and removing side supports timbering, sheet piling, shoring, strutting and bracing with all connected operations.

When directed by the Engineer, the contractor shall produce the calculations for the structural stability of any temporary works and method statement of proposed construction, but approval shall not relieve the contractor of his responsibility for adequately supporting the sides of any excavation.

In Subsoil conditions comprising sands, gravels, silts and soft clay materials full close sheeting of steel or timber shall be provided. Excavation support must be considered for depths of vertical sides exceeding 1200 mm. Half sheeting or quarter sheeting spacing shall be used only with the specific agreement of the Engineer. The contractor's Method statement shall detail such proposal in order that the Engineer may signify his approval or otherwise advise the contractor before construction commences.

6.2. For Pipe Line Trenches

A considerable amount of side supports is expected to be required in view of the unstable sub-soil strata likely to be met with. The clayey silt and fine sand with sub-soil water will have tendency to form slush which will need special measures including sheet pile. The work of driving sheet piling where required will continue simultaneously with excavation.

The Contractor shall at all times support effectively the sides of the pipe trenches and other excavation by suitable timbering, sheet piling, sheeting, bracing, strutting etc. Where required the contractor shall use close timbering in all loose or sandy or unstable stratas either above or below ground level, if found necessary by the Engineer and accord approval. It is intended that all timbering and side supports for sewer trenches shall be removed as the work proceeds. The Contractor shall ensure that the removal of timbering and side supports is done gradually and carefully to avoid any damage to existing or new structures, roads, pavements or any other private or public property. All timbering, sheeting and their supports shall be of adequate strength and dimension and fully braced and strutted so that no collapse, subsidence or any damage to public or private property shall take place. The Contractor shall be solely responsible for the sufficiency of all timbering, sheet piling and their supports to be used and all damages to persons or property resulting from the improper quality, strength, placing, maintaining or removal of the same shall be payable by him under all circumstances.

7. PUMPING, BAILING AND DEWATERING

The work covered by this section of Specifications consists of furnishing all plants, labour, materials, equipments and appliances for performing all operations for Pumping, Bailing, Dewatering and Draining water from the areas, excavated for trenches for sewers and construction of manholes, and all other works in this contract in accordance with this section of Specifications, and subject to terms and conditions of the contract.

a) The Contractor shall at all times during the progress of work remove any water which may accumulate, inflow or be found in the trenches and other excavations made under the contract, and shall keep them entirely free from water at all times while excavating, providing sewer bedding, laying of sewers or construction of manholes etc.

b) The water table shall be established through trial pits and joint inspection of Engineer and Contractor. In case of any dispute the Engineer shall decide the issue in writing which shall be final and binding upon the contractor. The earthwork below water table shall be considered as wet. The methods employed in all cases shall be agreed and approved by the Engineer. If any slush is formed this shall be removed and the space filled with lean concrete to the satisfaction of the Engineer at Contractor's own cost.

c) The Contractor shall keep excavations free from water at all time and provide adequate pumping plant including special dewatering equipment and means of disposing off the pumped water. The Contractor shall ensure to keep away un-desired water clear of excavation for permanent works and provide all necessary plant and equipment for dealing with any subsoil condition that may be encountered.

d) If necessary for the construction of the works, the contractor shall lay sub-drain where directed to convey the water to pumping sumps. The sub-drains shall be laid unjointed with the invert not less than 300 mm below formation level of the permanent works and shall be covered with gravel to formation level.

e) The Contractor shall be required to arrange well point equipment and / or adequate number of tube wells or both and pumping machinery for dewatering and lowering the existing water table for construction purposes in the areas where sub- soil water or any sewage and water from any other sources are encountered. The system shall be capable of working non-stop 24 hours a day for the entire duration of the work without break during excavation and for laying of sewer pipes and sewer bedding, construction of manhole, testing of sewers and backfilling. The system of dewatering proposed to be adopted shall be submitted by the contractor with sufficient details alongwith the tender for approval of the Engineer. The Contractor is required to visit the site before submitting his tender and investigate the available mean of disposal of pumped water including laying of temporary pipeline for transmission of water during the period of excavation providing bedding, laying and jointing of sewer pipes. The cost of all such works required for pumping and disposal of water from

trenches shall be considered to be included in the BOQ rates for bailing and pumping of subsoil water or any other water from trenches. No extra cost whatsoever shall be payable to the Contractor.

f) Water pumped from the trenches shall be disposed off by the Contractor in a manner that will neither cause injury to the public health nor damage to the existing structures or the works completed or in progress or to the surface of any roads or streets, nor cause any interference with the use of the same by the public.

g) The Contractor shall be held fully and wholly responsible for all damages done to building and other structures or property resulting from his dewatering, pumping and all other connected operations. If he fails to make good or to pay the expenses of making good damages with all practicable dispatch, the Engineer shall be at liberty to get the work done by other means or to pay the cost of the said damages by deducting the amount from any money that may be or become due to the Contractor or may recover the same from the Contractor from his dues, as decided and found feasible by Engineer, the decision of Engineer will be final.

h) The Contractor shall be paid on the basis of item rate quoted by him for pumping, Bailing and dewatering required during all underground works of, laying of sewer pipes, sewer bedding, construction of manholes etc. The payment shall be made on the basis of volume of earth excavated below ground water table in two parts as under.

   i. One-half payment for dewatering shall be made after satisfactory completion of excavation works upto required depth, width below subsoil water level.

   ii. Next one-half payment will be payable after the satisfactory completion of the work of, laying of sewer pipes, sewer bedding and construction of manholes and backfilling of sewer trenches.

8. FILL, BACKFILLING AND RESTORING OF GROUND TO ORIGINAL CONDITION

8.1. Fill, where required to raise the sub-grade for concrete slabs, shall be clean, unadulterated local river sand and shall be free from wood, stones and other debris. Excavated material shall only be used for fill if approved by the Engineer or his representative.

All fill backfilling or earthwork in embankment shall be compacted by mechanical rammer, or other approved equipment in layers not more than 150 mm thick. Each layer shall be uniformly spread and fully compacted and shall have proper moisture content for the required degree of compaction which shall be done by mechanical tampers as approved by Engineer.

After completion and final approval of the work of sewers and other construction as shown on drawings and prior to backfilling, forms shall be removed carefully and excavation shall be cleaned of stones and debris. Backfill shall be brought to a suitable elevation above ground to provide for anticipated settlement and shrinkage thereof.

Backfill shall not be placed against walls etc., prior to the water proofing treatment if provided and approved by the Engineer. Backfill shall be brought up evenly on each side of walls as far as practicable. Heavy equipment for spreading and compacting backfill shall not be operated closer to the wall than distance equal to the height of the backfill above the top of base slab footing. No back filling shall be done before the new structure has been cured for atleast two weeks.

8.2. Backfilling and Restoring of Ground to Original Condition

The back filling of the trench shall be allowed after the sewer pipe has been laid and jointed over the specified bed, inspected, checked, tested and approved by the Engineer. Backfilling of the trenches shall be carried out by filling to depth up to half pipe level. The filling shall then be thoroughly rammed more filling shall be carried out and rammed again until the consolidated filling reaches pipe top level. Only selected, dry materials free from stones or debris shall be used for backfilling, which shall be spread and rammed evenly across the trench. Thereafter, the trench shall be filled in layers not exceeding 150 mm in depth, each layer being properly rammed before the next layer is placed so that 95-100% compaction is obtained as per AASHTO Standard.

On completion of backfilling, the Contractor shall level all grounds disturbed by him in the course of the work, spread topsoil where necessary as directed by the Engineer.

8.3. Backfilling for Structures

Backfilling operations for structures shall be performed as part of the Contractor's work under the payment items for earth excavation and at no cost to the Employer. It would comprise returning and filling the selected excavated material around foundations, and at back of walls etc., upto finished levels shown on the Drawings or as required in layers not exceeding 6 inches, carefully rammed and consolidated (With addition of water if required so as to achieve a minimum relative density of 85 or 90 as directed by the Engineer. No filling shall be made until the concrete foundations and footings etc., have been inspected and approved by the Engineer. Earth to be used for filling must be free of all the organic impurities, debris or any other foreign matter. Earth which contains more than 1% of salts particularly sulphates will not be used in filling.

8.4. Backfilling of Trenches

The trenches shall not be completely backfilled until all required pressure tests are performed and until the lines as installed conform to the requirements of specifications. Where in the opinion of the Engineer, damage is likely to result from withdrawing sheeting, shoring the same shall be left in place and cut off at a level 1 ft. below ground surface. Sheeting left in place shall be paid for at the approved rate for the item of Trenches shall be backfilled to the ground surface with selected excavated material or other material that is suitable for proper compaction. Trenches improperly backfilled shall be reopened to the depth required for proper compaction, then refilled and compacted to the specified density. The surface shall be restored to its original or better condition. Pavement and base course disturbed by trenching operations shall be replaced.

8.5. Lower Portion of Trench

Backfill material shall be deposited in 6 inch maximum thickness layers and compacted with suitable hand tampers to ninety five percent of maximum density until there is a cover of not less than 1 ft. over the pipe. The backfill material in this portion of trench shall consist of sandy clay or other approved materials free from stones and humps.

8.6. Remainder of Trench

The remainder of the trench shall be backfilled with material that is free from stones larger than 6 inch in any dimension. Backfill material shall be compacted to 90 percent of maximum density for cohesive soils and 95 percent of maximum density for others.

9. BORROW

In case of non-sufficiency of excavated material and un-suitability of earth for backfilling, conforming to the above specifications, such material shall be brought from the approved source, by the Contractor.

10. GRADING

After the completion of all backfilling operations, the Contractor shall grade the work areas to the lines, grades and elevations shown on the drawings or as directed by the Engineer. Finished grading shall not be done until the installation of all utilities of appurtenances has been completed and tested. Prior to final acceptance, all damage due to settlement shall be repaired by an at the expense of the Contractor.

11. TESTING OF SOIL IN PLACE

The Engineer will make tests using the calibrated sand cone method/core cutter method to determine the density of soil in place. If soil in place fails to meet the specified degree of compaction the areas represented by the failing tests shall be removed, replaced and compacted to the specified density in the manner directed by the Engineer and at no additional cost to the Owner.

12. REMOVAL OF EXCESS AND UNDESIRABLE MATERIALS

12.1 Excess and undesirable material from excavation not required for fill or backfill shall be disposed off, removed and / or deposited and leveled on the site where directed by the Engineer. Earth suitable and meant for backfill shall be stored at site in a manner not to interfere with the progress of construction works in progress.

12.2 The Contractor shall keep all excavated soil sprinkled with water during the excavation work so as to prevent any dust nuisance.

12.3 Surplus Excavation Debris etc.

All surplus soil arising out of the work shall be carried away to approved site, within a week, deposited and spread as directed by the Engineer.

The Contractor shall carry out the cutting of existing bituminous road as required for excavation for carrying out the work, to the full depth of hard crest of any existing thickness. The stone metal soling etc. shall be separately stacked along the side of excavation for possible reuse.

13. PROTECTION OF UTILITY SERVICES

13.1 Utility Lines

The Contractor shall take every necessary precaution not to endanger the safety, occupation or operation of any property, structures, installations or services in the vicinity of his operations and shall observe any restrictions imposed by authority concerned / Engineer to this end. Should any such property, structures, installations or services be endangered or damaged as a result of the Contractor's operations, he shall immediately report any such danger or damage to the Engineer's Representative and any authority concerned and shall forthwith undertake remedial measures to the satisfaction of the Engineer or the appropriate authority.

When any existing utility lines are encountered within the area of operations, the contractor shall take all necessary measures so that these are neither disturbed nor damaged. The Contractor shall be fully and solely responsible for any damage occurring due to non-providing of adequate measures for the protection of such services. The Contractor shall be required to obtain all necessary permissions from different departments / agencies in writing prior to start of work and maintain the affective liaison for trouble free progress of work(s). The contractor shall pay all fees, charges officially levied by such department / agencies while issuing required permission. The Contractor shall furnish originals of payment receipts alongwith his written request for allowing payments by the Engineer accordingly. In case of restoration to unavoidable damage to any utility service, line or by passing such line the procedure as detailed shall be followed in accordance with rules, regulation, specification or practice as preferred by the concerned department / agency.

13.2 Damage to Surface

If carriage ways, verges or footways in roads, whether paved or unpaved, or gardens, plantations or other surfaces are damaged outside the limits of the excavations due to lack of proper traffic control or moving plant and equipment or other operations of the contractor then such surfaces shall be reinstated by the contractor at his own expenses. The surfaces shall be restored to their original condition using such materials as may be required whether obtained from the excavated materials or not.

13.3 Maintenance of Traffic

The Contractor shall keep the road crossings manned 24 hours per day. During night time, enough red lights shall be provided to warn traffic. If detour is necessary, the Contractor shall make proper detour for the traffic and shall install- signs 3 ft x 4 ft in size indicating the detour.

When the excavation is in roads, care shall be taken to cause the least inconvenience to traffic. When directed or necessary for the maintenance of traffic, the contractor shall remove from the site all materials as excavated from the trenches and return the same as necessary for refilling after the structures have been completed or the pipes tested and approved.

13.4 Control of Traffic on Roads

The Contractor shall ensure that the flow of traffic over the existing roads and access to properties is maintained at all times during the contract. The flow of traffic is to take place at all time over a reasonable surface, which is to be segregated as far as possible from areas where work is in progress. The contractor shall provide flagmen and signaling equipment as may be necessary to control the traffic to the satisfaction of the Engineer and the appropriate controlling Authority. In the planning and execution of any temporary or permanent works, which may effect the traffic flow and / or access to properties, the contractor shall co-operate closely with the Engineer and the appropriate controlling Authority.

14. MEASUREMENT AND PAYMENT

14.1 Excavation and Backfilling

Measurement and payment for excavation and filling shall be made in accordance with the following provision:

a) Method of Measurement

The measurement shall be made of the earth acceptably excavated for trenches and structures within the lines and grades shown on the drawing or as directed by the Engineer.

b) Basis of Payment

Payment for earth excavations for trenches and structures will be made at unit price stated in Bid Schedule of this contract or in applicable Variation Orders.

14.2 Dewatering of Subsoil Water

a). General

The work covered consists in furnishing all plant, labour, equipment, appliances and materials and in performing all operations in connection with dewatering of subsoil water from excavations for the purpose of construction of sewers and other structures in strict accordance with this section of the specifications and subject to the terms and conditions of the contract.

b). Dewatering Methods and Procedures

Dewatering of subsoil water from excavations of trenches and excavations for other structures shall be arranged by an adequate process of bailing and/or pumping.

c). Disposal of Sub-soil Water

The water pumped and drained from the work shall be disposed of in a manner satisfactory to Engineer's Representative. The Contractor shall build all drains and do ditching required in this connection and shall also take necessary precautions against flooding, at no extra cost.

14.3 Measurement and Payment

No payment shall be made for the Works involved within the scope of this Section of Specifications unless otherwise specifically stated in the Bill 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.

PLAIN & REINFORCED CONCRETE

1. DESCRIPTION

This work consists of furnishing placing, curing, finishing including transport of cement concrete made from approved type of Cement, water, fine and coarse aggregates all in accordance with the requirements in these specifications and conforming to the lines, grades, and typical sections shown on the Drawings or called for in the Special Provisions and to the approval of the Engineer.

1.1 Classes of Concrete

The classes of concrete recognized in these specifications shall be designated: A, B, C, D, Y and Lean Concrete. The Class of concrete to be used shall be as called for on the Drawings or as directed by the Engineer or specified in the Special Provisions. The following requirements shall govern unless otherwise shown on the Drawings.

Class A Concrete shall be used everywhere, for non-reinforced and reinforced concrete structures, except as noted below or directed by the Engineer. Concrete placed under water and for piles shall be Class A with a minimum content of four hundred (400) kg. per cubic meter of concrete with a slump between ten (10) and fifteen (15) cm.

Class B Concrete shall be used only where specified.

Class C Concrete shall be used for cribbing or as otherwise directed by the Engineer or specified in the Special Provisions or on the Drawings.

Class D concrete shall be used for precast, pre-stressed and post- tensioned elements, as indicated on drawings.

Class Y concrete shall be used as a filler in steel grid bridge floors, or where indicated in the Special Provisions or on the Drawings.

Lean Concrete shall be used in thin layers underneath footings and when called for on the Drawings or directed by the Engineer.

The concrete of the various classes shall satisfy the requirements shown in the following Table.

TABLE
Portland Cement Concrete Requirements

Class of Concrete	Min. Cement	Max. Size of Coarse Aggregate	Min 28 days Compressive Strength	Consistency (Range in Slump)		Maximum Permissible Water Cement
				Vibrated	Non-Vibrated	
	(kg/M^3)	(mm)	(kg/cm2)	(mm)	(mm)	Ratio
A	300	20	210	25 - 75	60 -100	0.58
B	250	51	170	25 - 75	50 - 80	0.65
C	275	38	210	25 - 75	60 - 100	0.58
D	450	25	350	50 - 100	75 - 125	0.40
Y	400	13	210	25 - 75	60 - 100	0.58
Lean Concrete	175	51	100	-	-	-

1.2 Types of Concrete Works

Under Ground Concrete

Concrete poured below Natural Surface Level with or without shuttering and shoring.

On Ground Concrete

Concrete poured by erecting formwork with necessary bracings on ground.

Elevated Concrete

Concrete poured by erecting props, bracing and towers to support the formwork at higher levels.

2. MATERIAL REQUIREMENTS

2.1 Portland Cement

Cement remaining in bulk storage at the mill, prior to shipment, for more than six (6) months or cement stored in local storage by contractor for more than three (3) months after shipment from the factory may be retested before use and shall be rejected if it fails to meet any of the specification requirements.

Portland cement shall conform to the requirements of the Standard Specifications for Portland cement, AASHTO Designation M85 (ASTM Designation C 150). The type of the cement to be used, unless otherwise shown on the Drawings, shall be Type-I. Where air entrained concrete is to be used cement shall by type 1A. Sampling of cement shall be in accordance with AASHTO Designation T -127.

Mill certificates shall be provided for all cement used in the Works and the material shall be stored.

Cement shall be delivered in sufficient quantities to ensure that there is no suspension of the work of concreting at any time. Different brand or different types of cement from the same mill, or the same brand or type from different mills shall not be mixed or used alternately in the same item of construction unless authorized by the Engineer, after preparing new mix design.

2.2 Fine Aggregate

The fine aggregate shall consist of sand, stone screening or other approved inert materials with similar characteristics, or a combination thereof, having clean, hard, strong, sound, durable, uncoated grains free from injurious amount of dust, lumps, soft or flaky particles, shale alkali, organic matter, material reactive with alkalis in the cement loam or other deleterious substances, and shall not contain more than three (3) percent of material passing the No.200 sieve by washing nor more than one (1) percent of clay lumps or one (1) percent of shale. The use of beach sand is prohibited without the written consent of the Engineer.

For exposed work, the fine aggregate shall be free from any substance that will discolour the concrete surface.

The fine aggregate shall be uniformly graded and when tested in accordance with AASHTO Designation T-11 and T-27 shall meet the following grading requirement.

GRADING OF FINE AGGREGATES

Sieve Designation	Percentage Passing by Weight
3/8 inch	100
No. 4	95 - 100
No. 16	45 - 85
No. 50	10 - 30
No. 100	2 - 10
No. 200	0 - 3

In case if fine aggregates fail under fineness Modulus or Gradation however material passing No. 4 in combined aggregate, qualifies for these requirements, then the material can be accepted.

Fine aggregates shall be of such quality that mortar specimens, prepared with standard Portland cement and tested in accordance with AASHTO Designation T-71, shall develop a compressive strength at 7 days of not less than 90 percent of the strength developed by a mortar prepared in the same cement and graded sand having a fineness modulus of 2.3 to 3.1 Natural aggregates if required shall be thoroughly and uniformly washed before use. Sand equivalent (T-176) shall be 75 min.

For the purpose or determining the degree of uniformity, a fineness modulus determination shall be made upon representative samples submitted by the contractor from such sources as he proposes to use. Fine aggregate from any one source having a variation in fineness modulus of greater than 0.20 either way from the fineness modulus of mix design samples submitted by the contractor may be rejected till new trial mixes are prepared and tested by the contractor.

2.3 Coarse Aggregate

The coarse aggregate shall consist of crushed or broken stone, gravel or other approved inert materials with similar characteristics, or a combination thereof, having clean, hard, strong, sound, durable unquoted particles, free from injurious amount of soft, friable, thin elongated, or laminated pieces, alkali, organic or other deleterious matter and conforming to the requirements of these Specifications.

The coarse aggregate shall be of uniform grading with maximum sizes as required for the various classes of concrete as shown in Table 2 and when tested in accordance with AASHTO Designation T-11 & T-27 shall meet the following grading requirements.

Table 2

Designated Size	Percentage by Weight Passing Laboratory Sieves Having Square Openings, in Inches							
	2 ½	2	1 ½	1	¾	½	3/8	No.4
½ in to No.4	-	-	-	-	100	90-100	40-70	0-15*
¾ in to No.4	-	-	-	100	90-100	-	20-55	0-10*
1 in to No.4	-	-	100	95-100	-	25-60	-	0-10*
1½ in to No.4	-	100	95-100	-	35-70	-	10-30	0-5*
2 in to No.4	100	95-100	-	35-70	-	10-30	-	0-5*
1½ in to 3/4 in	-	100	90-100	20-55	0-15	-	0-5	-
2 in to 1 in	100	90-100	35-70	0-15		0-5	-	-

- *Not more than five 5 percent shall pass No.8 sieve.*

Coarse aggregate shall contain not more than one (1) percent by weight of material passing the No.200 sieve by washing and not more than five (5) percent of soft fragments. It shall have an abrasion loss of not more than forty (40) percent at five hundred (500) revolutions, when tested in accordance with AASHTO T-96.

When tested in accordance with AASHTO T-104, for five cycle, the loss with the sodium sulphate soundness test shall be not more than 12 percent. Natural aggregates, if required, shall be thoroughly washed before use.

The aggregate shall be non alkali/silica reactive.

2.4 Combined Aggregate

The coarse and fine aggregate shall be combined in the proportions according to the approved trial mixes for each class of concrete.

2.5 Rubble or Cyclopean Concrete

Rubble or cyclopean concrete shall consist of tough, sound, and durable rock. The stone shall be free from coatings, seams, or flaws of any character. In general, the percentage of wear shall not exceed fifty (50) when tested in accordance with the Standard Method of Testing for Abrasion of Coarse Aggregate by use of the “Los Angeles Machine” ASTM C535.

2.6 Storage of cement and Aggregates

a) All cement shall be stored, immediately upon arrival on the site of the work, in weather-proof building, which will protect the cement from dampness. The floor shall be raised from the ground. The buildings shall be placed in locations approved by the Engineer. Provisions for storage shall be ample, and the shipments of cement as received shall be separately stored in such a manner as to provide easy access for identification and inspection of each

shipment. Storage buildings shall have capacity of a sufficient quantity of cement for at least thirty (30) days use. Bulk cement, if used, shall be transferred to elevated air tight and weatherproof bins. However, if approved, sacked cement on small jobs may be stored in the open, upon a raised platform provided that ample waterproof covering is ensured. Stored cement shall meet the test requirements at any time after storage when retest is ordered by the Engineer. At the time of use all cement shall be free flowing and free of lumps. Cement bags shall be weighed at random to check for variation.

b) The handling and storing of concrete aggregates shall be such as to prevent segregation or the inclusion of foreign materials. The Engineer may require that aggregates be stored on separate platforms at satisfactory locations.

In order to secure greater uniformity of the concrete mix, the Engineer may require that the coarse aggregate be separated into two or more sizes. Different sizes of aggregate shall be stored in separate bins or in separate stock piles to prevent the material at the edges of the piles from becoming intermixed.

If aggregates are stored on the ground the bottom layer of aggregate shall not be disturbed or used without recleaning and approval of the Engineer. Aggregates exposed to a marine environment shall be covered to protect them from salt contamination.

2.7 Water

The water for curing, for washing aggregates and for mixing shall be subject to the approval of the Engineer. It shall be free from oil and shall contain not more than one thousand (1,000) parts per million of chlorides nor more than one thousand three hundreds (1,300) parts per million of sulfates (SO_4). In no case shall the water contain an amount of impurities that will cause a change in the setting time of Portland cement of more than twenty five (25) percent nor a reduction in the compressive strength of mortar at fourteen (14) days of more than five (5) percent when compared to the result obtained with distilled water.

In non-reinforced concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than two thousands (2,000) parts per million of chlorides nor more than one thousand five hundreds (1,500) parts per million of sulfates as SO_4.

In addition to the above requirements, water for curing concrete shall not contain any impurities in a sufficient amount to cause discoloration of the concrete or produce etching of the surface.

When required by the Engineer, the quality of the mixing water shall be determined by the standard Method test for Quality of water to be used in concrete, AASHTO Methods of Sampling and testing, Designation: T 26.

2.8 Admixtures

Admixtures shall only be allowed to be used with written permission from the Engineer. If air-entraining agents, water reducing agents, set retarders or strength accelerators are permitted to be used, they shall not be used in greater dosages than those recommended by the manufacturer, or permitted by the Engineer, and shall conform to the requirements for each of agents specified by the manufacturer.

3. CONSTRUCTION REQUIREMENTS

The manufacturing, transport, handling and placing of concrete shall conform with the requirements given hereinafter.

Unless otherwise specified, ordinary Portland cement shall be used for all types of concrete. When sulphate resisting cement or other type of cement is required, it will be specified on the Drawings/or in BOQ or ordered by the Engineer.

3.1 Proportioning of concrete

All concrete shall be proportioned by weighing, except as specified herein. The proportions by weight of cement, fine aggregates, coarse aggregates and water necessary to produce concrete of the required strength and consistency shall be approved by the Engineer. Such approval may

be withdrawn at any time, and changes in the proportions may be required for the purpose of required workability density, impermeability, durability and strength.

Based on the approved mix proportions, the contractor shall prepare lists showing the number of kilograms of the various materials to be used in the batch size adopted. The required consistency shall also be shown. Such lists are subject to approval by the Engineer, and shall be pasted at the mixer. The amount of water in the mix is the total amount of free water, including the free water held by the aggregates.

Samples shall be made from three separate batches of concrete. No concrete shall be placed in the Works until the results of the twenty eight (28) day tests indicate that the design proportions comply with the requirements. Adjustment of the proportions shall be subject to the following provisions.

a) Adjustment for variation in workability – if it is found impossible to obtain concrete of the desired workability with the proportion originally approved, the Engineer shall make such changes as shall be necessary.

b) Adjustment for new materials – No change in the source or character of the material shall be made without due notice to the Engineer and no new materials shall be used until the Engineer has accepted such materials and has approved new proportions based on trial mixes.

The Contractor's attention is drawn to the time required to prepare and test trial batches and the contractor shall be responsible for production of trial batches at a sufficiently early date so that the progress for the work is not delayed.

3.2 Consistency

Concrete shall have a consistency such that it will be workable in the required position. It shall be of such a consistency that it will flow around reinforcement steel but individual particles of the coarse aggregate when isolated shall show a coating of mortar containing its proportionate amount of sand. The consistency of concrete shall be determined to be as dry as it is practicable to satisfy the requirements for transportation and placing of the concrete as described hereinafter.

3.3 Mixing Concrete

a) Mixing General

The concrete shall be mixed only in the quantity required for immediate use. Concrete that has developed an initial set shall be rejected.

Concrete shall be thoroughly mixed in a mixer of an approved size and type that will ensure a uniform distribution of their materials throughout the mass.

All concrete shall be mixed in mechanically operated mixers. Mixing plant and equipment for transporting and placing concrete should be arranged with an ample auxiliary installation to provide a minimum supply of concrete in case of breakdown of machinery or in case the normal supply of concrete is disrupted. The auxiliary supply of concrete shall be sufficient to complete the casting of a section up to construction joint.

Equipment having components made of aluminum or magnesium alloys, which would have contacted with plastic concrete, during mixing, transporting or pumping of Portland cement concrete, shall not be used.

Concrete mixers shall be equipped with adequate water storage and a device for accurately measuring and automatically controlling the quantity of water used.

Materials shall be measured by weighing, except as otherwise specified or where other methods are specifically authorized by the Engineer. The apparatus provided for weighing the aggregates and cement shall ensure accurate measurement of each ingredient.

The accuracy of all weighing devices except that for water shall be such that successive quantities can be measured to within one (1) percent of the desired value. Cement in standard package (bags) approved by the Engineer need not be weighed. The water measuring device shall be accurate to plus or minus half percent ± 0.50%. All measuring devices be subjected to the approval of the Engineer. Scales and measuring devices shall be tested at the expense of the Contractor as frequently as the Engineer may deem necessary to ensure their accuracy.

Weighing equipment shall be isolated so that vibration or movement of other operating equipment do not effect the accuracy of reading. When the entire plant is running, the scale reading at cut-off shall not vary from the weight designated by the Engineer more than one (12) percent for cement one and half (1½) percent for any size of aggregate, or one (1) percent for the total aggregates in any batch.

Where volumetric measurements are authorized by the Engineer, the weight proportions shall be converted to equivalent volumetric proportions. In Such cases, suitable allowances shall be made for variations in the moisture condition of the aggregates, Boxes or similar containers of the exact volume required shall be filled and struck off. Measurement by wheel barrow volumes will not be permitted.

b) Mixing at Site

Concrete mixers may be of the revolving drum or the revolving blade type and the mixing drum or blades shall be operated uniformly at the mixing speed recommended by the manufacture. The pick-up and throw-over blades of mixer shall be restored or replaced when any part or sections is worn two and half (2.5) cms. or below than the original height of the manufacturer's design. Mixers and agitators, which have an accumulation of hard concrete or mortar, shall not be used.

When bulk cement is used and volume of the batch is one cubic meter or more, the scale and weigh hopper for Portland cement shall be separate and distinct from the aggregate hopper or hoppers. The discharge Mechanism of bulk cement weigh hopper shall be interlocked against opening before the full amount of the cement is in the hopper. The discharging mechanism shall also be inter locked against opening when the amount of cement in the hopper is underweight by more than one percent or overweight by more than three (3) percent of the amount specified.

When the aggregates contain more water than the quantity necessary to produce a saturated surface-dry condition, representative samples shall be taken and the moisture content determined for each kind of aggregate.

The temperature of mixed concrete immediately before placing, shall be not more than thirty (30) degree C. aggregates and water shall be cooled as necessary to produce concrete within this temperature limit. If ice is used to cool the concrete, discharge of the mixer will not be permitted until all ice has melted.

The batch shall be so charged into the mixer that some water will enter in advance of cement and aggregates. All water shall be in the drum by the end of the first quarter of the specified mixing time.

Cement shall be batched and charged into the mixer by means that will not result in loss due to the effect of wind, or in accumulation of cement on surfaces of conveyors or hoppers, or in other conditions, which reduce or vary the required quantity of cement in the concrete mixture.

The entire contents of a batch mixer shall be removed from the drum before materials for a succeeding batch are placed therein. The materials composing a batch except water shall be deposited simultaneously into the mixer.

After all materials, including water, are in the mixer the concrete shall be mixed for a period of not less than one and a half (1½) minutes. This may only be reduced if on the basis of site tests, the Engineer is satisfied that the reduced mixing time will produce a concrete of the same strength and uniformity. The reduced mixing time shall under no circumstances be less

than fifty (50) seconds. During the period of mixing, the mixer shall operate at the speed for which it has been designed.

Mixers shall be operated with an automatic timing device that can be locked by the Engineer. The time device and discharge mechanism shall be so interlocked that during normal operation no part of the batch will be discharged until the specified mixing time has elapsed. In case of failure of the timing device, the contractor will be permitted to operate while it is being repaired, provided he furnishes an approved timepiece equipped with minute and second hands. If the timing device is not repaired within twenty four (24) hours, further use of the mixer will be prohibited until repairs are made.

When mixing is to stop for a period of thirty (30) minutes or more, the mixer shall be thoroughly cleaned. To ensure that the drum does not remove mortar from the mix, the first batch of concrete after cleaning of the drum shall have the required amount of coarse aggregate placed in the mixer prior to the addition of the cement, sand and water.

c) Plant Mixing

At central mixing plant, batches shall be discharged from the weighing hopper into the mixer either directly by gravity or by an elevating container large enough to contain the batch. The plant shall be arranged to ensure that there is no loss of cement during transfer from weighing hopper to the mixer drum. The mixing time shall be ninety (90) seconds.

The plasticizer, accelerator or retarder or water reducing admixture, if required, shall be fed separately at the rate recommended by the manufacture, or as established by laboratory trials.

d) Transit Mixing

Truck mixers, unless otherwise authorized by the Engineer, shall be of the revolving drum type, watertight, and so constructed that the concrete can be mixed to ensure a uniform distribution of materials throughout the mass. All solid materials for the concrete shall be accurately measured and charged into the drum at the proportioning plant. The truck mixer shall be equipped with a device by which the quantity of water added can be readily verified. Concrete shall be poured within one hour of the cement and aggregate being added to the drum. However, after the mixing water has been added to the batch, the concrete shall be poured within thirty (30) minutes.

The maximum size of the batch in truck mixers shall not exceed the maximum rated capacity of the mixer as stated by the manufacturer and stamped in metal on the mixer. Truck mixing shall be continued for not less than one hundred (100) revolutions after all ingredients, including water, are in the drum. The mixing speed shall not be less than seven (7) revolutions per minute, or more than ten (10) revolutions per minute.

Mixing shall begin immediately after the cement has been added to the aggregate. The limitation in time between the introduction of the cement to the aggregate and the beginning of the mixing may be waived when, in the judgment of the Engineer, the aggregate is sufficiently free from moisture so that there will be no harmful effects on the cement.

e) Partial Mixing at the Central Plant

When a truck mixer, or an agitator provided with adequate mixing blades, is used for transportation, the mixing time at the central plant mixer may be reduced to thirty (30) seconds and the mixing completed in a truck mixer/agitator. The mixing time in the truck mixer or agitator equipped with adequate mixing blades shall be as specified for truck mixing.

f) Stiff Concrete Mix

For mixing concrete of zero slumps to be laid by pavers, gravity mixer shall not be used. Only force mixer of moving blades shall be allowed to ensure homogenous mix.

g) Hand Mixing

Hand mixing of materials shall not be allowed in any case.

3.4 Hauling and Delivery of Mixed Concrete

Mixed concrete may be transported to the delivery point in truck agitators or truck mixers operation at the speed designated by the manufacturer, provided the consistency any workability of the mixed concrete upon discharge at the delivery point is suitable for adequate placement and consolidation in place.

Truck agitators shall be loaded not to exceed the manufacturer's rated capacity. They shall maintain the mixed concrete in a thoroughly mixed and uniform mass during hauling.

Bodies of non-agitating hauling equipment shall be so constructed that leakage of the concrete mix, or any party thereof, will not occur at any time, and they shall be self-cleaning during discharge.

For Zero slump concrete to be laid by paver, concrete will be allowed to be hauled in open trucks. However concrete hauled in open-top vehicles shall be protected during hauling against rain or exposure to the sun for more than twenty (20) minutes when the ambient temperature exceeds twenty five (25) degree C.

No additional water shall be incorporated into the concrete during hauling or after arrival at the delivery point.

The rate of discharge of mixed concrete form truck mixer agitators shall be controlled by the speed of rotation of the drum in the discharge direction with the discharge gate fully open.

When a truck mixer or agitator is used for transporting concrete to the delivery point, discharge shall be completed within one hour after the introduction of cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is thirty (30) degrees centigrade or above, a time less than one hour will be required.

When non-agitating hauling equipment is used for transporting concrete to the delivery point, discharge shall be completed within one hour after the addition of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is thirty (30) degree C or above, the time between the introduction of cement to the aggregates and discharge and discharge shall not exceed forty five (45) minutes.

a) Delivery

The organization supplying concrete shall have sufficient plant capacity and transportation vehicles to ensure continuous delivery at the rate required. The rate of the delivery of concrete during concerning operations shall be such as to provide for the proper handling, placing, and finishing of the concrete. The rate shall be such that the interval between batches shall not exceed twenty (20) minutes. The methods of delivering and handling the concrete shall be such as will facilitate placing with the minimum rehandling and without damage to the structure of the concrete.

b) Retempering

The concrete shall be mixed only in such quantities as are required for immediate use and any concrete that has developed initial set shall not be used. Concrete that has partially hardened shall not be retempered or remixed.

3.5 Handling and Placing Concrete

i). General

In preparation for the placing of concrete all sawdust, chips and other construction debris and extraneous matter shall be removed from inside the formwork to the satisfaction of the Engineer. Struts, stays and braces serving temporarily to hold the forms in correct shape and alignment pending the placing of concrete at their locations shall be removed when the concrete placing has reached an elevation rendering their services unnecessary. These temporary members shall be entirely removed from the forms and shall not buried in the concrete.

All excavations and other absorbent contact surfaces such as timber formwork shall be damp but no free water will be permitted to remain on any such surface. The internal surfaces of all formwork shall be cleaned to the satisfaction of the Engineer.

No concrete shall be used that does not reach its final position in the forms within the time stipulated above.

Concrete shall be placed so as to avoid segregation of the materials and the displacement of the reinforcement. The use of long troughs, chutes, and pipes for conveying concrete to the forms shall be permitted only on written authorization of the Engineer. In any case the Engineer will reject the use of equipment for concrete transportation that will allow segregation, loss of fines, or in any other way will have a deteriorating effect on the concrete quality.

Open troughs and chutes shall be of metal or metal lined; where steep slopes are required, the chutes shall be equipped with baffles or be in short lengths that reverse the direction of movement.

All chutes, troughs and pipes shall be kept clean and free form coatings of hardened concrete by thoroughly flushing with water after each run; water used for flushing shall be discharged clear off the structure.

When placing operation would involve dropping the concrete more than one and half (1½) meters, it shall be conveyed through sheet metal or other approved pipes. As far as practicable, the pipe shall be kept buried in the newly placed concrete. After the initial set of the concrete the forms shall not be jarred and no loading of any kind shall be placed on the ends of projecting reinforcement bars.

The concrete shall be placed as nearly as possible to its final position and the use of vibrators for extensive shifting of the mass of fresh concrete will not be permitted.

ii). Pneumatic Placing

Pneumatic placing of concrete will be permitted only if authorized by the Engineer. The equipment shall be so arranged that no vibration will occur that might damage freshly placed concrete.

Where concrete is conveyed and placed by pneumatic means, the equipment shall be suitable in kind and adequate in capacity for the work. The machine shall be located as close as practicable to the work. The discharge lines shall be horizontal or inclined upwards from the machine.

At the conclusion of placing the concrete, the entire equipment shall be thoroughly cleaned.

iii). Pumping

The Placing of concrete by pumping will be permitted only if specified in the special provisions or if authorized by the Engineer. The equipment shall be so arranged that no vibration will occur that might damage freshly placed concrete.

Where concrete is conveyed and placed by mechanically applied pressure the equipment shall be suitable in kind and adequate in capacity for the work. The operations of the pump shall be such that a continuous stream of concrete without air pockets is obtained. When pumping is completed, the concrete remaining in the pipeline, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients. After this operation, the entire equipment shall be thoroughly cleaned.

iv). Placing Concrete Under Water

Concrete shall not be placed under water except where inevitable in which case approval must be sought from the Engineer and the work carried out under his immediate supervision. In this case the method of placing shall be as hereinafter specified.

Concrete deposited under water shall be Class A with a minimum cement content of four hundred (400) kilograms per cubic meter of concrete. To prevent segregation, it shall be carefully placed in a compact mass in its final position by means of a tremie, a bottom-dump bucket, or other approved means, and it shall not be disturbed after being placed. Water must not be allowed to flow past the surface of fresh concrete.

A tremie shall consist of a tube having a diameter of not less than 25 cm constructed in sections having flanged couplings fitted with gaskets with a hopper at the top. The tremie shall be supported so as to permit fee movement of the discharge end over the entire top surface of the work and so as to permit rapid lowering when necessary to retard or stop the flow of concrete. The discharge end shall be closed at the start of work so as to prevent water entering the tremie tube shall be kept full to the bottom of the hopper. When a batch is dumped into the hopper, the flow of concrete shall be induced by slightly raising the discharge end, but always keeping it in the; placed concrete. The flow shall be continuous until the work is completed.

When the concrete is placed with a bottom-dump bucket, the top of the bucket shall be open. The bottom doors shall open freely downward and outward when tripped. The bucket shall be completely filled and slowly lowered to avoid backwash. It shall not be dumped until it rests on the surface upon which the concrete is to be deposited and when discharged shall be withdrawn slowly until well above the concrete.

Dewatering may proceed when the concrete seal is sufficiently hard and strong. All laitance or other unsatisfactory material shall be removed from the exposed surface by scraping, chipping or other means, which will not injure the surface of the concrete.

v). Compaction

Concrete, except lean concrete under footings and concrete deposited under water, shall be thoroughly compacted during and immediately after placing Concrete in walls, beams, columns etc. shall be placed in horizontal layers not more than thirty (30) centimeters thick except as hereinafter provided. When less than a complete layer is placed in one operation, it shall be terminated in a vertical bulkhead. Each layer shall be placed and compacted before the preceding layer has taken initial set to prevent injury to the green concrete and avoid surfaces of separation between the layers. The concrete shall be compacted to ensure that successive layers of the same lift are thoroughly bonded together.

The compaction shall be done by mechanical vibration. The concrete shall be vibrated internally unless special authorization of other methods is given by the Engineer or is provided herein. Vibrators shall be of a type, design, and frequency approved by the Engineer. The intensity of vibration shall be such as visibly to affect a mass of concrete with a 3 cm slump over a radius of at least half a meter. The Contractor shall provide a sufficient number of vibrators to properly compact each batch immediately after it is placed in the forms. Vibrators shall be manipulated so as to thoroughly work the concrete around the reinforcement and embedded fixtures and into the corners and angles of the forms and shall be applied at the point of placing and in the area of freshly placed concrete. The vibrators shall be inserted into and withdrawn from the concrete slowly. The vibration shall be of sufficient duration and intensity to compact the concrete thoroughly but shall not be continued at any one point to the extent that localized areas of grout are formed. Application of vibrators shall be at points uniformly spaced and not farther apart than twice the radius over which the vibration is visibly effective. Vibration shall not be applied directly to the reinforcement or to sections or layers of concrete that have hardened to the degree that the concrete ceases to be plastic under vibration. It shall not be used to make concrete flow in the forms over distances so great as to cause segregation and vibrators shall not be used to transport concrete neither in the forms nor in troughs or chutes.

Vibration shall be supplemented by such external vibrator as is necessary to ensure smooth surfaces and dense concrete along form surfaces and in corners and locations impossible to reach with the normal vibrators.

vi). Adverse Weather Conditions

Concrete shall not be placed during falling temperatures when the ambient air temperature falls below 5 degrees centigrade or during rising temperatures when the ambient air

temperature is below 2 degrees centigrade. When placing concrete at air temperature below 5 degrees centigrade the concrete temperature shall not be below 10 degrees centigrade. The temperature of placed concrete shall not be allowed to fall below 5 degrees centigrade until the concrete has attained strength of at least 50 kg/cm2 and the Contractor shall be responsible for all protective measures necessary to ensure this. All concrete that has been damaged by frost or the formation of ice in the concrete shall be removed and replaced by the Contractor at his own expense.

When the ambient air temperature exceeds 32 degrees centigrade during a concreting operation the Contractor shall take such measures as may be necessary to control the temperature of the concrete ingredients so that the temperature of the placed concrete does not exceed 30 degrees centigrade. Such measures shall be subject to the approval of the Engineer and will include spraying the aggregate stock piles with water to promote cooling by evaporation and, where feasible, shading of the stock piles and the area where concreting is carried out. Curing shall commence immediately after placing of the concrete to prevent excessive moisture loss.

vii). Holes, Chasses and Fixings in Concrete

No holes or chases shall be cut in the concrete work without the prior written approval of the Engineer. The Contractor shall ensure that all necessary holes and chases, including fixing holes for railings, balustrades and the like, are carefully formed in the correct positions prior to the placing of concrete. Where these are to be provided, conduits, pipes and special fixings shall be firmly fixed in the positions required before concreting in.

No pipes and conduits other than those shown on the drawings shall be embedded in the concrete without the Engineer's approval. The clear space between such pipes or any reinforcement shall be at least 40 mm or the maximum size of the aggregates plus 5 mm, whichever is the greater. The amount of concrete over the pipes and fittings shall be a minimum of the cover specified for that situation.

3.6 Casting Sections and Construction Joints

a) General

The concrete in each integral part of a structure shall be placed continuously, and the Contractor will not be allowed to commence work on any such part unless sufficiently inspected and approved material for the concrete is at hand, and manpower and equipment are sufficient to complete the part without interruption in the placing of the concrete.

Construction joints shall be allowed only where specified on the drawings or otherwise approved. If not detailed on the drawings, or in the case of emergency, construction joints shall be placed as directed. Shear keys or inclined reinforcement shall be used where necessary to transmit shear or bond the two sections together. When shear keys or inclined reinforcement are not provided, the concrete shall be roughened as directed. Joints in the concrete due to discontinuity of work shall be avoided as far as possible. Such joints, when necessary, shall be constructed to meet the approval of the Engineer.

When the placing of concrete is temporarily discontinued, the concrete after becoming firm enough to retain its shape, shall be cleaned of Latinate and other objectionable material to a sufficient depth to expose sound concrete. Where a "feathered edge " might be produced at a construction joint, as in the sloped top surface of a wing wall, an inset formwork shall be used to produce an edge thickness of not less than 15 centimeters in the succeeding layer. Work shall not be discontinued within fifty (50) centimeters of the top of any face, unless provision has been made for a coping less than 50 centimeters thick, in which cases, if permitted by the Engineer, the construction joint may be made at the underside of coping.

Immediately following the discontinuance of placing concrete all accumulations of mortar splashed upon the reinforcing steel and the surface of forms shall be removed. Dried mortar chips and dust shall not be puddle in to the unset concrete. Care shall be exercised, during the cleaning of the reinforcing steel, not to injure or break the concrete steel bond near the surface of the concrete.

Stub columns for stub walls (kickers) on footings shall be cast integrally with the footing and not afterwards.

b) Slab Culverts

In general, the lean concrete below the foundation shall be placed and allowed to set before the reinforced concrete is started.

After the construction of masonry abutment walls, as specified in Special Provisions, the concrete bedplate and curtain walls shall be constructed monolithically. Construction joints in wing walls where unavoidable shall be horizontal and so located that no joint will be visible in the exposed face of the wing wall above the ground line.

c) Box Culverts

Vertical construction joints shall be at right angles to the axis of the culvert.

In general, the base slab or footings of box culverts shall be placed and allowed to set before the remainder of the culverts is constructed. In this case, suitable provision shall be made for bonding the sidewalls to the culvert base, preferably by means of raised longitudinal keys so constructed as to prevent, as far as possible, the percolation of water through the construction joint.

In the construction of box culverts one and quarter (1-¼) meters or less in height, the sidewalls and top slab may be constructed as a monolithic unit. When this method of construction is used, necessary construction joints shall be vertical and at right angles to the axis of the culvert.

In the construction of box culverts more than one and quarter (1-¼) meters in height the concrete in the walls shall be placed and allowed to set before the top slab is placed. In this case, appropriate keys shall be left in the sidewalls for anchoring the cover slab.

If possible, each wing wall shall be constructed as a monolithic unit. Construction joints, where unavoidable, shall be horizontal and so located that no joint will be visible in the exposed face of the wing wall above the ground line.

d) Girders, Slabs and Columns

For simple, spans, concrete shall preferably be deposited by beginning at the center of the span and working from the center towards the ends. Concrete in girders shall be deposited uniformly for the full length of the girder and brought up evenly in horizontal layers. For continuous spans, where required by design considerations, the concrete placing sequence shall be shown on the plans or in the Special Provisions.

Concrete in girder haunches less than one (1) meter in height shall be placed at the same time as that in the girder stem, and the column or abutment tops shall be cut back to form seats for the haunches. Whenever any haunch or fillet has a vertical height of one(1) meter or more, the abutment or columns, the haunch, and the girder shall be placed in three successive stages; first to lower side of haunch; second, to the lower side of the girder; and third to completion.

For hunched continuous girders, the girder stem (including haunch) shall be placed to the top of stem. Where the size of the pour is such that it cannot be made in one continuous operation, vertical construction joints shall preferably be located within the area of contra flexure.

Concrete in slab spans shall be placed in one continuous operation for each span unless otherwise provided. The floors and girders of through girder superstructures shall be placed in one continuous operation unless otherwise specified, in which case a special shear anchorage shall be provided to ensure monolithic action between girder and floor.

Concrete in T-beam or deck girder spans may be placed on one continuous operation or may be placed in two separate operations; each of which shall be continuous; first, to the top of the girder stems and second, to completion. In the latter case, the bond between stem and

slab shall be provided by suitable shear keys or by artificially roughening the surface of the top of the girder stem. In general, suitable keys may be formed by the use of timber blocks approximately five (5) by the (10) cm in cross-section and having a length of ten (10) cms less than the width of the girder stem. These key blocks shall be spaced along the girder stems as required, but the spacing shall be not greater than thirty (30) cms center to center. The blocks shall be removed as soon as the concrete has set sufficient to retain its shape.

Concrete in box girders may be placed in two or three separate operations. In either case the bottom slab shall be placed first. Bond between the bottom slab and stem shall be positive and mechanical. If the webs are placed separately from the top slab, bond between the top slab and webs shall be secured in the same manner as for T-beams. Requirements for shear keys for T-beams shall also apply to box girders, except that keys need not be deeper than the depth to the top of bottom slab reinforcement.

Concrete in columns shall be placed in one continuous operation, unless otherwise directed. The concrete shall be allowed to set at least 24 hours before the caps are placed.

When friction collars are used to support cap forms, the concrete of columns shall have been poured at least seven (7) days earlier.

Unless otherwise permitted, no concrete shall be placed in the superstructure until the column forms have been stripped sufficiently to determine the character of the concrete in the columns. The load of the superstructure shall not be allowed to come upon the bents until the test cylinders representing the bents have obtained the minimum compressive strength but in no case in less than seven (7) days.

e) Construction Joints

Unless otherwise approved by the Engineer, construction joints shall be made only where shown on the drawings or called for in the pouring schedule. The location of all construction joints not indicated on the drawings or of any construction joint necessary as a result of an emergency interruption in the placing of the concrete shall be subject to the approval of the Engineer. Unless otherwise specified, shear keys or reinforcement shall be used to transmit shear or to bond the two sections together.

Before depositing new concrete on or against concrete which has hardened, the forms shall be re-tightened and the surface of the hardened concrete shall be roughened in accordance with the requirements of the Engineer and in a manner that will not have loose particles of aggregate or damaged concrete at the surface. The roughened surface shall be thoroughly washed with clean water to remove all foreign matter and laitance. If directed by the Engineer, the surface of the hardened concrete which will be in contact with new concrete shall be kept continuously wet for at least two hours prior to recommencement of concreting to ensure an excess of moisture at the junction of the hardened and the newly deposited concrete. The cleaned and vetted surface, including vertical and inclined surfaces, shall be thoroughly covered with a coating of mortar approximately 10 mm thick and of the same proportion of sand and cement as the class of concrete to be used. The new concrete shall be placed before the grout or mortar has attained its final set.

The placing of concrete shall be carried out continuously from joint to joint. The face edges of all joints, which are exposed to view, shall be carefully finished true to line and elevation.

f) Rubble or Cyclopean Concrete

Rubble or cyclopean concrete shall consist of Class B concrete containing large embedded stones. The stone for this class of work shall be placed carefully so as to avoid damages to the forms or to the partially set adjacent concrete. Stratified stone shall be placed upon its natural bed. Stone shall be washed and saturated with water before placing.

The total volume of the stone not be greater than one third of the total volume of the portion of the portion of the work in which it is which it is placed. For walls of piers greater than sixty (60) cms in thickness, stone of such size that one man can handle it, shall be used. Each stone shall be surrounded by at least fifteen (15) cms of concrete and no stone shall be closer than thirty (30) cm to any top surface nor any closer than fifteen (15) cms to any coping. For walls or piers greater than one (1) mater in thickness, larger stone (50 kg or

more) may be used. Each stone shall be closer than sixty (60) cms to any top surface nor closer than twenty (20) cms to any coping.

g) Concrete Exposed to Sea Water

Unless otherwise specifically in the Contract documents or directed by the Engineer, concrete for structure exposed to sea water shall be class A. The clear distance from the face of the concrete to the nearest face of reinforcement steel shall be not less than the cover. The concrete shall be mixed for a period of not less than 1½ minutes and the water content of the mixture shall be carefully controlled and regulated so as to produce concrete of maximum impermeability. The concrete shall be thoroughly compacted and air pockets shall be avoided. No construction joints shall be formed between levels of extreme low water and extreme high water. Between any such levels, sea water shall not come in contact with the concrete for a period of not less than thirty (30) days. The original surface, as the concrete comes from the forms, shall be left undisturbed.

viii). Concrete exposed to Alkali Soils or Alkali Water

Where concrete may be exposed to the action of alkaline water or soils, special care shall be taken to place it in accordance with specifications herein. Wherever possible, placing shall be continuous until completion of the section or until the concrete is at least fifty (50) cms, above ground or water level. Alkaline water or soils shall not be in contact with the concrete during placement and for a period of at least seventy two (72) hours thereafter.

ix). Protection of Concrete from Environmental Conditions

a). General

Precautions shall be taken as needed to protect concrete from damage due to weather or other environmental of conditions during placing and curing operation.

Any concrete placed during hot weather or during cold weather shall be at the Contractor's risk and any damaged concrete shall be removed and replaced at the Contractor's expense.

b). Rain Protection

Under conditions of rain, the placing of concrete shall not commence or shall be stopped unless adequate protection is provided to prevent damage to the surface mortar or damaging flow or wash off the concrete surface.

c). Work in Hot Weather

The temperature of concrete shall not exceed thirty two (32) degree C at the time of laying. Unless the Contractor incorporates in the mix a plasticizer, of a make and in proportion which he has shown by laboratory tests and full scale trial to be satisfactory, to eliminate detrimental effects of high temperature without introducing any other detrimental effects on quality.

The following may be used to keep the temperature of concrete below the above limitations.

i). Chilling of concrete water by heat exchange coils or by addition of broken ice, provided that the water shall be free from ice at the time of entry into the mixer.

ii). Cooling of coarse aggregate by watering. Provided that the water content of the aggregate so cooled shall be uniform.

iii). Reclaiming of aggregate from stock piles by the tunnel method to avoid using the surface layer of the stock pile with shade and wind protection of conveyor elevating to batching plant.

d). Night work provided that (i), (ii) and (iii) are proved inadequate or unsatisfactory in their results and providing also that the engineer has no other reason for refusing permission for night work.

The engineer shall have power to order the suspension of concrete production in case of not taking precautionary measures by the contractor as mentioned above. Under no circumstance will the contractor be entitled to receive any additional payment for complying with the Requirements of this clause.

e). Work In Cold Weather

Except by written approval of the engineer, concerting operations shall not be continued when a descending air temperature in the shade and away from artificial heat false below five (5) degree c nor resumed until an ascending air temperature in the shad and away from artificial heat reaches two (2) degree C in such case, the mixing water and/or aggregates shall be heated to not less then twenty one (21) degree C nor more then sixty six (66) degree c, prior to being placed in the mixer by an approved type of heating device so that the temperature of the concrete shall not be less then ten (10) degree C, nor more then twenty seven (27) degree C, at the time of placing. No materials containing frost shall be used. Cement or fine aggregates containing lumps or crusts of hardened materials shall not be used.

3.7 Concrete surface finishing/rendering

a) General

Concert surface finishing shall be classified as follows:
Bridge deck surface finishing
Sidewalk surface finish
Ordinary surface form finish
Class 1 surface form finish

The bridge deck surface finish shall be given to the surface of the bottom slabs of all box type underpass structures.

The requirements for sidewalk surface finish apply to the surface of the bottom slabs in box culverts, except that the acceptable variation from a three-meters straightedge shall be 10 mm, and brooming shall be omitted.

The ordinary surface form finish shall be the final finish applied to all surface after removal of forms, unless otherwise specified or called for on the drawings.

The class 1 surface form finish shall be applied only where specified, or as required by the engineer when the ordinary surface finish did not produce the required smooth even surface of uniform texture and appearances.

b) Sidewalk surface finish

After the concrete has been placed it shall be compacted and struck off by means of a strike board, floated with a wooden or cork float and finished with a broom. The corrugations produced shall be approximately (1) mm deep and be uniform in character. An approved edging tool shall be used on all edges and at all expansion joints. Brooming shall be transverse to the line of traffic and if water is necessary it shall be applied to the surface immediately in advance of brooming. The surface shall not vary more than six (6) millimeters under a three meter straight-edge and the finished surface shall be free from blemishes.

c) Ordinary Surface Form Finish

Ordinary surface finish shall consist of filling holes, honeycombing or depressions in the surface of the concrete and repairing all bolt pockets stains and discolouration shall be removed from concrete visible from traveled ways. Ordinary surface finish shall be applied to all concrete surfaces either as a final finish or preparatory to the Class 1 finish. On surfaces which are to be buried underground or surfaces which are enclosed, such as the cells of box girders, the removal of fins will not be required.

Except as may be otherwise provided herein, all formwork bolts and any metal placed for the convenience of the Contractor shall be removed to the minimum depth of cover for the class of concrete and exposure condition. All rock pockets and other unsound concrete shall be removed. The resulting holes or depressions shall be cleaned and filled with mortar. Form bolts projecting into the cell of box girders need not be removed unless permanent access is provided into the cells and in these cases, such bolts shall be removed flush with the surface of the concrete. Mortar used to fill bolt holes shall consist of one part cement and two parts sand. Other depressions and pockets shall be filled with either packed mortar or air blown mortar as directed by the Engineer.

If rock pockets or holes in the opinion of the Engineer, are of such an extent or character as to affect the strength of the structure materially or to endanger the life of the steel reinforcement, he may declare the concrete defective and require the removal and replacement of the portions of the structure affected.

d) Class 1 surface form finish

Class 1 surface finish shall consist of finishing the surfaces of the structure as necessary to produce even surfaces of uniform texture and appearance, free of unsightly bulges, depressions and other imperfections. The degree of care in building forms and character of materials used in for work will be a contributing factor in the amount of additional finishing required to produce even surfaces of uniform texture and appearance, free of unsightly bulges, depressions and other imperfections, and the Engineer shall be the sole judge in this respect. After completion of the ordinary surface finish, areas which do not exhibit the required smooth, even surface of uniform texture and appearance shall be sanded with power sanders or other approved abrasive means until smooth, even surfaces of uniform texture and appearance are obtained. The use of power carborundum stones or disks will be required to remove bulges and other imperfections.

Class 1 surface finish shall not be applied until a uniform appearance can be obtained. Class 1 surface finish shall be applied as the final finish for the following surfaces, unless otherwise directed by the Engineer.

i. All form finish surfaces of bridge super-structures, except the under surfaces between girders and the inside vertical surfaces of T girders.

ii. All surfaces of bridge piers, columns and abutments, and retaining walls above finished ground and to at least three tenth (0.3) meter below finished ground.

iii. All surfaces of open spandrel arch rings, spandrel columns and abutment walls.

iv. All surfaces of pedestrian under crossings, except floors and surfaces to be covered with earth.

v. Surface above finished ground of culvert headwalls, endwalls and retaining walls.

vi. Surface inside of culvert barrels having a height of one and half (1.5) meters or more for a distance inside the barrel at least equal to the height of the culvert.

vii. All surfaces of railings.

e) Surface Rendering

All faces of concrete which are to come in contact with back fill or pavement materials shall be applied two coats of hot bitumen of approved quality, before placing any material around concrete.

3.8 Curing Concrete

a) General

All newly placed concrete shall be cured in accordance with these specifications, unless otherwise directed by the Engineer.

b) Method of Curing

The curing method shall be one or more of the following as described hereinafter.
Water Method
Curing compound method
Reinforced waterproof paper method if required by the engineer.
Forms-in-Place Method
Steam method
Polyethylene Sheeting Method
Wetted Burlap Blanket Method

Water Method

The concrete shall be kept continuously wet by the application of water for a minimum period of seven (7) days after the concrete has been placed.

Cotton mats, burlaps, rugs, carpets, or earth or sand blankets, may be used as a curing medium to retain the moisture, the entire surface of the concrete shall be kept damp by applying water with a nozzle that so atomizes the flow that a mist and not a spray is formed, until the surface of the concrete is covered with the curing medium. The moisture from the nozzle shall not be applied under pressure directly upon the concrete in a quantity sufficient to cause a flow or wash the surface. At the expiration of the curing period the concrete surface shall be cleared of all curing mediums.

When concrete bridge decks and flat slabs are to be cured without the use of a moisture retaining medium, the entire surface of the bridge deck or slab shall be kept damp by the application of water with an atomizing nozzle as specified in the preceding paragraph until the concrete has set, after which the entire surface of the concrete shall be sprinkled continuously with water for a period of not less than seven (7) days.

Curing Compound Method

Surface exposed to the air may be cured by the application of an impervious membrane if approved by the Engineer.

The membrane-forming compound used shall consist of a practically colourless liquid. The use of any membrane forming compound that will alter the natural colour of the concrete or impart a slippery surface to any wearing surface shall be prohibited. The compound shall be applied with a pressure spray in such a manner as to cover the entire concrete surface with a uniform film, and shall be of such character that it will harden within 30 minutes after application. The amount of compound applied shall be ample to seal the surface of the concrete thoroughly. Power operated spraying equipment shall be equipped with an operational pressure gauge and means of controlling the pressure.

The curing compound shall be applied to the concrete following the surface finishing operation immediately after the moisture sheen begins to disappear from the surface, but before any drying shrinkage or craze cracks begin to appear. In the event of any delay in the application of curing compound which results in any drying or cracking of the surface. Application of water with an atomizing nozzle as specified under “Water Method”, shall be started immediately and shall be continued until application of the compound which shall not be applied over any free standing water surface. Should the film of compound be damaged from any cause before the expiration of seven (7) days after the concrete is placed in the case of structures. The damaged portion shall be repaired immediately with additional compound.

Curing compounds shall not hard settle in storage. They shall not be diluted or altered in any manner after manufacture. At the time of use, the compound shall be in a thoroughly mixed condition. If the compound has not been used within one hundred twenty (120) days after the date of manufacture, the Engineer may require additional testing before use to determine compliance to requirements.

An anti-settling agent or combination of anti-settling agents shall be incorporating the curing compound to prevent caking.

The curing compound shall be packaged in clean barrels or steel containers or shall be supplied from a suitable storage tank located at the job-suit. On site storage tanks shall have a permanent system designed to completely re-disperse any settled material without introducing air or any other foreign substance. Containers shall be well sealed with ring seals and lug type crimp lids. The linings of the containers shall be of a character that will resist the solvent of the curing compound. Each container shall be of a character that will resist the solvent of the curing compound. Each container shall be labelled with the manufacture's name, specification number, batch number, number of gallons, and date of manufacture. The label shall also warn that the curing compound shall be well stirred before use. When the curing compound is shipped in tanks or tank trucks, a shipping invoice shall accompany each load. The invoice shall contain the same information as that required here for container labels.

Curing compound may be sampled by the Engineer at the source of supply and at the job-site.

Reinforced Waterproof Paper Method

The exposed finished surfaces of concrete shall be sprayed with water, using a nozzle that so atomizes the flow that a mist and not a spray is formed, until the concrete has set, after which the waterproof paper shall be placed. The paper shall remain in place for a period of not less than 72 hours.

Reinforced waterproof paper shall comply with ASTM C 171 specifications. it shall be composed of two sheets of Kraft paper cemented together with a bituminous adhesive and reinforced with fiber. The waterproof paper shall be formed into sheets of such width as to provide a complete cover of entire concrete surface.

All joints in the sheets shall comply be securely cemented together in such a manner as to provide a waterproof joint. The joint seams shall have minimum lap of ten (10) cm.

The sheets shall be securely weighted down by placing a bank of earth on the edges of the sheets or by other means satisfactory to the Engineer.

Should any portion of the sheets be broken or damaged within seventy two (72) hours after being placed, the broken or damaged portions shall be immediately repaired with new sheets properly cemented into place.

Forms-in-Place Method

Formed surfaces of concrete may be cured by retaining the forms in place. The forms shall remain in place for a minimum period of seven (7) days after the concrete has been placed, except that for members over five (5) cms in least dimension the forms shall be in place for a minimum period of five (5) days. Wooden forms shall be kept wet by watering during the curing period.

Steam Method

After placing and vibration the concrete shall be allowed to attain its initial set before steam is applied. During the placing of concrete and application of steam, provision shall be made to prevent surface drying by means of a coating of approved material. The optimum curing temperature shall not exceed sixty five (65) degree C.

Polyethylene Sheeting Method

The wet surface of fresh concrete shall be covered with white polyethylene sheeting as soon as possible without marring the surface and should cover all exposed surfaces of the concrete. The edges of the sheeting shall be weighted securely with a continuous windrow of earth or any other means satisfactory to the Engineer to provide an airtight cover. Adjoining sheets shall overlap not less than thirty (30) cms. And the laps shall be securely weighted with earth, or any other means satisfactory to the Engineer to provide an air-tight cover.

Wetted Burlap Method

The surface of the concrete shall be covered with Wetted Burlap Blankets as soon as the concrete has sufficiently hardened to prevent marking of the surface. At least two (2) layers of Wetted Burlap – Blanket shall be used and they shall be in contact with the edges of the concrete. That portion of material in contact with the edges shall be kept saturated with water. The Burlap, Blankets shall be maintained in place for a minimum period of seven (7) days.

c) Curing Structure

When determining the period of curing, days when the temperature was below five (5) centigrade shall be disregarded. All newly placed concrete for cast-in-place structures, other than highway bridge decks, shall be cured by one of the permitted methods, which shall be covered out.

The curing compound method may be used on concrete surfaces which are to be buried underground and surfaces where only Ordinary Surface Finish is to be applied and on which a uniform colour is not required and which will not be visible from any public traveled way.

The top surface of highway bridge decks shall be cured by both the curing compound method and by the water method. The curing compound shall be applied progressively during the deck finishing operation immediately after finishing operations are completed on each individual portion of the deck. The water cure shall be applied not later than four (4) hours after completion of the deck finishing or, for portions of the decks on which finishing is completed after normal working hours. The water cure be applied not later than 8.00 a.m. the following morning.

When deemed necessary by the Engineer during periods of hot weather water shall be applied to concrete surfaces being cured by the curing compound method or by the forms in place method, until the Engineer determines that a cooling effect is no longer required.

d) Curing Precast Concrete Members

Precast concrete members shall be cured for not less than seven (7) days by the water method or by steam curing for a period in which 80% of strength achieved, at the option of the Contractor. Steam curing for precast members shall conform to the following provisions:

After placement of the concrete, members shall be left for a minimum four (4) hours precasting period.

To prevent moisture loss on exposed surfaces during the presteaming period, members shall be covered immediately after casting or the exposed surfaces shall be kept wet by fog spray or wet blankets.

Enclosures for steam curing shall allow free circulation of steam about the member and shall be constructed to contain the live steam with a minimum moisture loss. The use of the tarpaulins or similar flexible covers will be permitted, provided they are kept in good repair and secured in such a manner to prevent the loss of steam and moisture.

Steam at jets shall be low pressure and in a saturated condition. Steam at jets shall not impinge directly on the concrete, test cylinders, or forms. During application of the steam, the temperature rise within the enclosure shall not exceed twenty (20) degree C per hour. The curing temperature throughout the enclosure shall not exceed sixty five (65) degree C and shall be maintained at a constant level for a sufficient time necessary to develop the required compressive strength. Control cylinders shall be covered to prevent moisture loss and shall be placed in a location where temperature is representative of the average temperature of the enclosure. The rate of subsequent cooling shall not exceed the rate of heating.

Temperature recording devices that will provide an accurate continuous permanent record of the curing temperature shall be provided. A minimum of one temperature recording device per sixty (60) meters of continuous bed length will be required for checking temperature.

Curing of precast concrete will be considered completed after a termination of the steam curing cycle.

e) Curing Precast Concrete Piles

All newly placed concrete precast piles, both conventionally reinforced and prestressed shall be cured by the "Water Method" except that the concrete shall be kept under moisture for at least fourteen (14) days. At the option of the Contractor steam curing may be used in which case the steam curing shall apply except that the concrete shall be kept wet for at least seven (7) days including the holding and steaming period.

f) Applied Loading

No load shall be applied to any part of a structure until the specified curing period has expired and, thereafter, until the approval of the Engineer has been obtained. The Engineer's decision will be based on the type of load to be applied, the age of the concrete, the magnitude of stress induced and the propping of the structure.

No structure shall be opened to traffic until test cubes made from the concrete in all parts thereof have attained the specified minimum twenty eight (28) days strength.

3.9 Testing of Aggregates

Samples of fine and coarse aggregate to be used shall be selected by the Engineer. It shall be the responsibility of the Contractor to designate the source or sources of aggregate and to obtain the necessary samples and submit them for testing at least thirty (30) days before actual concreting operations are to begin.

Samples of aggregates shall be obtained and tested in accordance with the following standard AASHTO methods:-

a) Sampling aggregates T-2
b) Sieve analysis T-27
c) Amount of material passing the No. 200 sieve T-11
d) Organic impurities T-21
e) Mortar strength T-71
f) Sodium sulphate soundness T-104
g) Friable particles T-112
h) Abrasion loss T-96
i) Specific gravity T-84
j) Absorption T-85
k) Production of plastic fines T-176
l) Aggregate durability index T-210
m) Sand Equivalent – T-17.
n) Finess Modulus – T-27

Coarse aggregates shall be tested for grading once for every 100 cm^3 and fine aggregate once for every 50 cm^3 delivered to site, or more frequently if considered necessary by the Engineer.

3.10 Testing of Compressive Strength

Concrete compressive strength requirements consist of a minimum strength at the age of twenty eight (28) days and the minimum strength which must be attained before various loads or stresses are applied to the concrete.

The compressive strength of concrete will be determined from test cylinders, which have been fabricated from concrete sampled and tested in accordance with AASHTO T 23 and AASHTO T 22.

A set of six (6) cylinders shall be taken from each fifty (50) cubic meters of each class of concrete or fraction thereof placed each day, three (3) of the six (6) cylinders to be tested after seven (7) days and three (3) after twenty eight (28) days.

a) The minimum average 28 days test result of all samples tested at any time shall be the

specified twenty eight (28) days strength.

b) No individual samples tested after 28 days shall show a test result lower than eighty five (85) percent of the required twenty eight (28) days.

c) Not more than 5% of all samples tested up to that date shall fall below the required 28 day strength.

Concrete represented by any single test cylinders that fails to comply with the requirement under (b) above will be rejected unless the Contractor at his expense, provides evidence that the strength and quality of the concrete placed in the work are acceptable. If such evidence consists of tests made on cores taken from the work, the cores shall be obtained and tested in accordance with the specifications of AASHTOT-24.

Test results of the cores shall meet the following requirements:-

a) Average test result of the cores shall be less than the minimum required twenty eight (28) days strength. Such that average shoulder >95% of the 25 days strength.

b) No individual core shall show strength less than Ninety five (95) percent of the required twenty eight (28) days strength.

Should the above test results fail to comply with the requirements, concrete of that particular pour shall be rejected and removed as directed by the Engineer. Furthermore contractor shall redesign the concrete mix for approval of the Engineer.

In case, seven (7) days strength shows less than seventy (70) percent of the twenty eight (28) days strength (in case of type-I cement), Engineer may stop further work on that particular portion of concrete, unless twenty eight (28) days strength gives satisfactory results.

Trial Batches for Mix Productions

The placing of concrete shall not begin until trial batches of the mix design to be used have been produced by the Contractor and tested and approved by the Engineer. The trial mix proportions shall be such that the average strength of five (5) consecutive test cylinders shall be 20% higher than the specified twenty eight (28) days strength and no individual test cylinder shall be below the specified strength.

When concrete compressive strength is specified as a pre-requisite to applying loads or stresses to a concrete structure or member, test cylinders will be cured under conditions similar to those at the casting site. The compressive strength of concrete determined for such purposes will be evaluated on the basis of individual tests.

4. MEASUREMENT AND PAYMENT

4.1 Measurement

The quantity of concrete to be paid for shall be as per the BOQ item of concrete of the various classes complete in place and accepted.

In measuring the volume of concrete to be paid for, the dimension to be applied shall be those shown on the Drawings except where others ordered by the Engineer in writing.

Deductions from the theoretical volume of concrete shall be made for the volumes of draining holes, weep holes, pipes and conduits, etc., in case where their cross-sectional areas exceed 500 square centimeters.

The measurement shall not include any concrete used in the construction of cofferdams or false work, or anywhere else by that Contractor to facilitate his works.

The volume involved in fillets, scorings, or chamfers ten square centimeters in cross-sectional area or less shall be disregarded when measuring the quantity of concrete to be paid for.

Concrete for railings, pipe culverts, etc., is not to be measured under this item, but under separate items.

4.2 Payment

The accepted quantity measured as provided above shall be paid for at the contract unit price respectively for the pay items shown in the Bill of Quantities which prices and payment shall be full compensation for Material, Labour equipment/plant concrete quality tests and any incidentals to complete the activity, also for such works as curing, surface finishing and/or rendering as required, formation of construction joints and any such work necessary to complete the item except works that are paid for under other pay items.

For all concrete structures or portions, thereof, no separate measurement or payment shall be made for false work, centering, formwork or any other temporary work to complete the concrete structure or portion thereof, payment for all such temporary works shall be deemed to be included in the contract price paid under various items of concrete work.

STEEL REINFORCEMENT

1. SCOPE

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

2. APPLICABLE STANDARDS

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

Pakistan Standard

PS 241	Tensile Testing of Steel
PS 244	Bend test for Steel
PS 580	Rolled deformed Steel bars (intermediate grade) for concrete reinforcement.
PS 605	Rolled deformed steel bars (hard grade) for concrete reinforcement.
PS 606	Rolled formed Steel bars (structural grade) for concrete reinforcement.
PS 607	General technical delivery requirement for steel

British Standard

BS 693	General requirements for Oxy-acetylene welding of mild steel
BS 785	Hot rolled bars and hard drawn wire for the reinforcement of concrete
BS 1856	General requirement for the metal arc welding of mild steel
BS 4449	Hot rolled steel bars for reinforcement of concrete
BS 4461	Cold worked steel bars for reinforcement of concrete
BS 4466	Bending dimensions and scheduling of bars for the reinforcement of concrete

ASTM Standard

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

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

3. MATERIAL AND SIZE OF BARS

i. Reinforcement for concrete shall conform to the respective Pakistan, British, ASTM, or other Standards as specified in the Drawings and in the Contract Documents or as may be specified by the Engineer.

ii. 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 275 MPA.

iii. Unless otherwise specified, all deformed reinforcing bars shall comply with the requirements of BS 4461 for deformed cold worked new stock billet steel bars and shall have minimum characteristic strength of 460 MPA.

iv. Not used.

v. If the reinforcement is supplied by the Employer, the Contractor should inform the Employer of his requirements much before its use in construction.

vi. Reinforcement of all types is to be stored at on site in an approved manner so as to avoid damage.

vii. If the reinforcement is supplied by the Employer, the Contractor should report immediately on receipt of any consignment, any deviation from the standard of three enforcement bars beyond those allowed in respective standards. If the Engineer directs, the Contractor shall test the samples of reinforcement at his cost and submit to him the test report.

viii. Steel wire mesh reinforcement shall conform to requirements of ASTM Designation A 185 - 64 or BS 4483, 1969: Standard Specifications for Welded Steel Wire Fabric for concrete reinforcement. It shall be used where shown on the Drawings.

ix. 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 bend. Reduced sections steel reinforcement shall not be used.

4. DELIVERY & STORAGE

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

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.

5. BAR BENDING SCHEDULES

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

6. FABRICATING, BENDING & PLACING

i. All metal reinforcement shall be free from loose mill scale, loose rust, mud, oil, grease, or other harmful matter immediately before the concrete is placed.

ii. Reinforcement is to be accurately placed as shown in the drawings, and secured against displacement by using 16 gauges G.I 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.

iii. Bars used for concrete reinforcement shall be fabricated in accordance with the dimensions shown in the bar bending schedule approved by the Engineer.

iv. The cutting tolerance for all bars shall be ± 25 mm.

v. 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 following Table.

Table
Bending Tolerances

Dimensions of bent bars		Tolerance	
Over	**Up to & including**	**Plus**	**Minus**
mm	mm	mm	mm
--	1000	5	5
1000	2000	5	10
2000	--	5	25

vi. Bars shall be placed to the following tolerances:

1. Concrete cover to formed surfaced	+ 5 mm
2. Minimum spacing between bars	± 5 mm
3. Top bars in slabs and beams	
a. Members 8 inch deep or less	± 5 mm
b. Members more than 8 inch	
But not over 24 inch deep	± 10 mm
Members more than 24 inch deep	± 25 mm
4. Crosswise members : Spaced evenly within :	50 mm
5. Lengthwise members	+50 mm

vii. 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.

viii. 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.

ix. 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 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 heated for any reason. Other kinds of reinforcement larger than 40 mm in dia: may be bent by the use of heat at cherry - red heat (not exceeding 840 Bars) bent shall not be cooled by quenching.

x. No splice of reinforcement shall be made except as shown on the working drawings.

xi. Welding shall be permitted for bars only under suitable conditions and with suitable safeguards in accordance with BS 693, BS 1856, or AWS D 12.1, provided the type of reinforcement bar has the required welding properties. Tack welding may be used to fix in position bars that cross each other, only with prior approval of the Engineer.

xii. 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 pat is to be built into later concrete.

xiii. No concreting is to be carried out until the reinforcement has been checked and approved by the Engineer.

xiv. Welding shall be done as in section Structural Steel Works.

xv. All detailing shall be done as per ACI standards ACI - 315 and ACI - 318.

xvi. Concrete clear cover for reinforcing steel shall be as follows:

Structural Members	**Minimum Cover, inch**
a) Concrete cast against and permanently exposed to earth	75 mm
b) Concrete exposed to earth or weather:-	
Bar Dia > 20 mm	50 mm
Bar Dia > 16 mm	40 mm

c) Concrete not exposed to weather or in contact with ground

Slabs, Walls	20 mm
Beams, Columns (Primary Reinforcement)	40 mm

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

7. MEASUREMENT & PAYMENT

7.1 General

Except otherwise specified herein or elsewhere in the Contract Documents, no separate measurement and payment will be made for providing and installing chairs, supports, hooks, spacers, binding wires and laps not shown on Drawings including wastage and rolling margin, the cost of which shall be deemed to have been included in the quoted unit rate of the respective items of the Bill of quantities.

7.2 Measurement

All measurements of acceptably completed works of reinforcement shall be made in linear dimensions end to end according to the cut lengths shown in bar bending schedules approved by the Engineer and converted into theoretical weight as per schedules.

7.3 Payment

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

ROAD WORKS

CLEARING AND GRUBBING

1. DESCRIPTION

This work shall consist of removal to the specified depth, grubbing and disposal of all surface objects, as and where directed in writing by the Engineer, including, bushes, trees with stumps and roots of less than 150 mm girth, vegetation, logs, rubbish and all other objectionable material except such objects as are designated to remain or are to be removed in accordance with other sections of specification.

Such organic topsoil would carefully be stored and re-applied on top of new surfaces as directed by Engineer upon completion of work. In this way new vegetation would be facilitated for early/quick regeneration.

2. CONSTRUCTION REQUIREMENTS

2.1. Clearing/Grubbing

In roadway cut areas, all surface objects or any object to the depth of 30 Cm, below subgrade level such as stumps, roots, vegetation, bushes, logs, rubbish shall be cleared and/or grubbed as directed by the Engineer. In roadway fill areas where clearing and grubbing is required, same shall be carried out to the depth of 30 cm below original surface level as described above.

Original surface is the surface of the ground received by the contractor for the purpose of road construction under contract and upon which joint levels were taken and joint cross section were prepared prior to clearing grubbing.

Operation of clearing and grubbing shall in no way be deemed to effect any level or volume change of the area and the Embankment quantities shall be calculated/ measured and paid from the joint levels prior to clearing and grubbing operation.

After clearing and grubbing, which includes the removal of top 15 cm soil or any layer of unsuitable material or after excavation; the compaction of cleared/grubbed surface, suitable filling material shall be placed and compacted, up to original ground level as determined by joint leveling and the compaction of the area will be restored to its original value without any extra payment.

Before bottom layer of embankment is placed, contractor will grub up and remove without extra payment any vegetation that may, in the meantime have grown on surface previously cleared and grubbed.

All trees having girth less than 150 mm measured at (600) mm above ground 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 remains the property of the Employer, which shall be delivered at designated place as directed by the Engineer.

2.2. Protection and Restoration

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

3. MEASUREMENT AND PAYMENT

3.1. Measurement

Clearing and grubbing will be measured for payment only on areas so designated in writing by the Engineer or shown on the drawings. The quantity to be paid for shall be satisfactorily clearing

and grubbing & disposal of 15 cm top soil & filling with suitable material and compacting it to the required density as defined below, to attain the levels determined by joint leveling prior to the clearing and grubbing works.

Depth below sub grade level.	**Percent of Maximum Dry Density as determined by AASHTO T -180.***
0 to 30 cm	95
30 to 75cm	93
Over 75 cm	90
Below the foundation of structures	95

Any tree having girth of less than 150 mm (measured 600 mm above ground level) shall be measured under this item and no separate payment shall be admissible for this, as it is included in clearing & grubbing.

Clearing and grubbing carried out by the Contractor in roadway cut areas and borrow pits is not payable, as such, shall not be measured for payment.

3.2. Payment

The quantities determined as provided above will be paid for at the contract unit price for the pay item shown in the Bill of Quantities, which price and payment shall be full compensation for clearing and grubbing as per the requirement of this item and restoration of area, to its original level upto the required density as determined by joint leveling.

COMPACTION OF NATURAL GROUND

1. DESCRIPTION

The natural ground or surface ready for construction purposes after stripping (if required) and/or excavation will be considered for natural ground compaction in this item only. The compaction of cleared / grubbed surface after Clearing and Grubbing is covered in “Clearing and Grubbing”.

The compaction of natural ground shall be carried out through a written order by the Engineer.

2. CONSTRUCTION REQUIREMENTS

After striping of the topsoil or any layer of unsuitable material or after excavation, the ground up to a depth of 20 cms below the surface of exposed road bed (natural ground) shall be broken up by ploughing and scarifying to compact to a degree as defined below:

Depth below sub grade level.	**Percent of Maximum Dry Density as determined by AASHTO T -180.***
0 to 30 cm	95
30 to 75cm	93
Over 75 cm	90
Below the foundation of structures	95

2.1 Compaction of original ground in areas of high water levels and salinity

Compaction of natural ground surface in such areas will be difficult if not impossible.

Accordingly, the locations/ areas shall be strengthened with stones of a minimum 30cm thick layer soling or as directed by the Engineer.

3. MEASUREMENT AND PAYMENT

3.1. Measurement

The measurement shall be made by multiplying the length and breadth of the area approved in writing by the Engineer to be paid under this item. The measurement of the item shall be as per the BOQ.

Any subsidence of levels of Natural Ground due to compaction under this item shall not be measured for payment; the Contractor is expected to take care of such factors while bidding.

3.2. Payment

The payment under this item shall be made at the contract unit price shown in BOQ of compaction of (natural) ground measured as above and shall be deemed to include cost of scarification, ploughing, watering, mixing, leveling, rolling, labour, equipment, tools, and incidentals necessary to complete this item.

ROADWAY AND BORROW EXCAVATION FOR EMBANKMENT

1. DESCRIPTION

The work shall consist of excavating the roadway and borrowpits, removal and satisfactory disposal of all materials taken from within the limits of the work, also such excavation as is necessary for inlet and outlet ditches of structures and shall include all excavation, shaping and sloping for the construction, preparation of all embankment, subgrade, shoulders, intersections and approaches as directed and in conformity to the alignment, grade, level and cross-sections shown on the plans or established by the Engineer.

2. CLASSIFICATION OF EXCAVATION

2.1. Road Way Excavation

Roadway Excavation shall comprise of all excavation that is not classified as structural excavation carried out within the limits of roadway including permanent drainage ditches and side slopes in cut.

Roadway Excavation shall further, be classified as either "Common Excavation", or "Rock Excavation", which are defined in para ‘a’ and ‘b’ of this clause.

a) Common Excavation

Common excavation shall consist of the removal and satisfactory disposal of all eolian, alluvial and residual materials, in place unaltered and un-weathered strata, which are not firm or rigid enough to possess all the characteristics of "Rock Excavation". Boulders of less than one quarter (1/4) cubic meter volume shall also be classified as "Common Excavation". Eolian and alluvial materials consist of gravel, shale, volcanic ash, loess, dunes and, loams, sands and clays or any combination of these materials.

b) Rock Excavation

This includes all hard and rigid igneous, metamorphic and sedimentary rocks. Boulders larger than quarter (1/4) cubic meter in volume will also be considered as "Rock Excavation", provided these are firm and stable lying in continuous bed and constitute more than 50% by volume as compared to other type of material in the total mass.

Further classification of rock as hard rock, medium hard rock or soft rock is given as under:-

i) Hard Rock

Any rock, which cannot be excavated with Ripper of a 200 H.P, bulldozer and constitutes a firm and continuous bed of rock only.

ii) Medium Rock

Any rock which cannot be removed with the blade of 200 H.P Bulldozer but can be removed by the ripper, will be termed as Medium Rock, irrespective of the fact that it is removed by blasting.

iii) Soft Rock

Any rock which can be removed with the blade of 200 H.P Bulldozer. This item will be termed as Soft Rock, irrespective of the fact that it is removed by blasting.

2.2. Borrow Excavation

Borrow Excavation shall comprise all excavation taken from borrow pits. Material from borrow pits shall normally be used for the construction of embankment or for the backfill when there is no material available from roadway excavation or structural excavation. Permission to use material from borrow pit shall first be obtained in writing from the Engineer. Nevertheless the total quantity of material from roadway excavation and structural excavation after deduction of the material declared unsuitable by the Engineer, shall be considered available for use in the work and any

material used from borrow pits for formation of embankment in lieu thereof shall not be measured for payment.

In making his bid, the Contractor shall inspect the site and prepare his estimate of the haulage cost on the basis of his own survey of the possible nature and locations of the borrow pits. Their distance from the work sites shall not be grounds for extra payment or revision of the contract price.

The consent of the landowner or tenant for excavating the borrow material and hauling along private access roads shall be secured by the Contractor who shall, if required, pay for such concession. Borrow pits shall be left in a condition acceptable to the landowner and/or tenant and the Engineer.

The borrow pits must not become a source of water stagnation. Closure and landscaping of borrow pits would be carried out upon completion of the road before demobilization by the Contractor. If the borrow pits are away from populated areas, and are left open, then the site must be fenced with adequate sign postings by the Contractor at no additional cost to the project. Under no circumstances such borrow pits would be permitted to become a health or safety hazard, or become visual eyesores.

2.3. Structural Excavation

The description method of measurement and payment of this section shall conform to as specified in item covering Structural Excavation and Backfill.

3. CONSTRUCTION REQUIREMENTS

3.1 General

All material removed from excavation shall be used in the formation of embankment, subgrade, shoulders, and at such other places as directed, unless it is declared unsuitable and ordered to waste by the Engineer. No excavated material shall be wasted without written permission from the Engineer, and when such material is to be wasted, it shall be so placed that it will present a neat appearance and not offer any danger to abutting property.

The material shall be declared unsuitable if the soaked CBR (96 hours) is less than Five (05) percent, or if falls under A-6 or A-7 of AASHTO soil classification for which Engineer may ask for further testing at contractor's cost to arrive at a conclusion.

During construction of the roadway, the roadbed shall be maintained in such a condition that it will be well drained at all times.

All slopes, except in solid rock or other material shall be trimmed precisely as per cross-sections, and care must be exercised that no material shall be loosened beyond the required slopes. In blasting rock slopes, a reasonably uniform face shall be left, regardless of whether or not the excavation is carried beyond the specified side slope. All breakage and slides shall be removed by the contractor and disposed of as directed by the Engineer.

Rock, shale and other unsuitable roadbed material encountered in cuts shall be excavated to required width and depth indicated on the plans or as otherwise directed. Any over breakage below the depth shown on the plans will not be paid for. Backfill of the over cut shall be of approved earth material and shall have the same density requirements as specified on the plans and shall be at the expense of contractor.

Borrow pits shall be located so that the nearest edge of the pit is at least thirty (30) meters from the roadway toe of slope unless otherwise directed by the Engineer.

Permission to use any borrow material, including its suitability, shall be obtained in writing from the Engineer before execution of work. It is responsibility of the contractor to submit a request for test at least fifteen (15) working days prior to the day the contractor intends to begin taking material from the borrow area.

In no case shall borrow material be obtained from downstream of any hydraulic structure. However the borrow pit may be established at five hundred (500) meters upstream of the

hydraulic structure, The side slopes of the pits or channels shall be constructed as shown on the plans or directed by the Engineer. In no case the side slopes of borrow pit be steeper than a slope; 1:5 (V:H).

Upon abandonment of borrow pit or quarry area, the contractor shall, at his own expense, clean and trim the borrow pit or quarry area, the right of way, and adjoining properties which were occupied during execution of work, all to the satisfaction of the Engineer.

All drilling and blasting shall be done in such a manner as will most nearly complete the excavation to the required grade line, and produce the least disturbance of the material to be left in place. Blasting by means of drill holes or any other methods shall be performed at the entire risk and responsibility of the Contractor. Care shall be taken to ensure that no injury be done to persons or properties or to the finished work. Blasting shall be restricted to the hours prescribed by the local authorities or the Engineer.

Where between two successive cross-sections of the roads, the properties of rock boulder, in sizes larger than a one quarter (¼) of a cubic meter to earth is more than 50%, the excavation will be considered wholly as rock.

Rock material above ground level such as stones, boulders, piles of stone, and dry stones walling whose individual sizes are greater than one quarter of a cubic meter shall be removed and disposed of if directed in writing by the Engineer and shall be paid under relevant item of work in the Bill of Quantities,

When the contractor is directed to excavate unsuitable material below the surface of original ground in fill areas other than required for clearing and grubbing the depth to which these unsuitable materials are to be removed will be determined by the Engineer.

The contractor shall schedule his work in such a way that authorized cross section can be taken jointly with the Engineer or his representative before and after such excavation of the unsuitable material removed.

4. MEASUREMENT AND PAYMENT

4.1. Measurement

When the Bill of Quantities specifies for "Common Excavation", "Rock Excavation" and "Borrow Excavation" the quantities of the different classes of excavation shall be computed as follows:

a) Common Excavation

The unit of measurement for common excavation shall be in cubic meter and be computed by average end area method based on cross-sections duly approved by the Engineer prior to commencement and completion of required excavation.

The excavated material approved for fill under any item of the Bill of Quantities shall be used in the manner as described under the relevant item of work, irrespective of haulage distance.

b) Rock Excavation

Authorized "Rock Excavation" to be measured in cubic meters shall consist of area that is necessary to provide the design section and grade or as directed by the Engineer. Any over breakage beyond the lines shown on the plans and outside of the tolerances set for subgrade in cuts shall not be paid for. The Engineer shall define the beginning and end points of areas classified as "Rock Excavation". Any area over excavated in the subgrade shall be reinstated at the cost of contractor and as directed by the Engineer.

The pay quantity for "Rock Excavation" shall be computed by means of average end area method from approved cross-sections based on original ground elevations after the authorized removal of unsuitable or overburden materials, if required.

For disposal of excavated rock material, same procedure shall be followed as described above for the "Common Excavation" specified in sub item No. 4.1 (a).

c) Borrow Excavation

No measurement shall be made for any Borrow Excavation, however this material if used in any of the Bill item(s), shall be measured and paid as provided under that relative item(s) of work.

4.2. Payment

No payment for Roadway or Borrow Excavation shall be made under this item as the same is deemed to be included under item of Formation of Embankment.

FORMATION OF EMBANKMENT

1. DESCRIPTION

This work shall consist of formation of embankment, including preparation of area for placing and compaction of embankment material in layers and in holes, pits and other depressions within the roadway area in accordance with the specifications and in conformity with the lines, grades, thickness and typical cross-section shown on the plans or established by the Engineer.

2. MATERIAL REQUIREMENTS

Material for embankment shall consist of suitable material excavated from borrow, roadway excavation or structural excavation and shall include all lead and lift. Borrow material will be used only when material obtained from roadway or structural excavation is not suitable or is deficient for embankment formation and shall include all lead and lift.

The material under this item shall conform to the following specification.

a). Contractor shall use AASHTO Class A-1, A-2 or A-4 soil as specified in AASHTO M-145 as per approval of the Engineer.

b). CBR of the material shall not be less than five (5) percent, determined in accordance with AASHTO T-193. CBR value shall be obtained at a density corresponding to the degree of compaction required for the corresponding layer.

c). Swell value of the material for embankment formation shall not exceed five tenth (0.5) percent. However, while establishing the swell value, surcharge weights representing the overburden will be used. In case sandy material is used for embankment formation, it shall be properly confined at no extra payment with a material and to the extent as approved by the Engineer and sandy material shall not be used on slopes of embankment.

d). In areas subject to flood and prolonged inundation of the embankment, such as at bridge sites, the material used in embankment, unless rock, shall be AASHTO Class (a), A-1 (b) and A-2-4 soils. Other soils may be used only with the written consent of Engineer.

3. CONSTRUCTION REQUIREMENTS

3.1. Formation of Embankment with Borrow Common Material

Material for embankment obtained and approved as provided above, shall be placed in horizontal layers of uniform thickness and in conformity with the lines, grades, sections and dimensions shown on the Drawings or as required by the Engineer. The layers of loose material other than rock shall be not more than 20 cm. thick, unless otherwise allowed by the Engineer after a trial section is prepared and approved.

The material placed in layers and that scarified to the designated depth for formation of embankment shall be compacted to the density specified below:

Depth in centimeters below subgrade Level	**Percent of Maximum Dry Density as determined by AASHTO T -80.***
0 to 30	95
30 to 75	93
Over 75	90

* Method 'B' or 'D' whichever is applicable or corresponding Relative Density in case of sand fill.

In-place density determinations of the compacted layers shall be made in accordance with AASHTO T -191 or other approved methods. For all soils, with the exception of rock fill materials, containing more than 10% oversize particles (retained on ¾" /19 mm sieve), the in-place density thus obtained shall be adjusted to account for such oversize particles or as directed by the Engineer. Subsequent layers shall not be placed and compacted unless the previous layer has been properly compacted and accepted by the Engineer.

Material for embankment at locations inaccessible to normal compacting equipment shall be placed in horizontal layers of loose material not more than 15 centimeters thick and compacted to the densities specified above by the use of mechanical tempers, or other appropriate equipment.

The compaction of the embankment shall be carried out at the designated moisture content consistent with the available compacting equipment.

Embankment material that does not contain sufficient moisture to obtain the required compaction shall be given additional moisture by means of approved sprinklers and mixing. Material containing more than the optimum moisture may not, without written approval of the Engineer, be incorporated in the embankment until it has been sufficiently dried out. The drying up of wet material may be expedited by scarification, disking or other approved methods.

When materials of widely divergent characteristics, such as clay and chalk or sand, drawn from different sources, are to be used in the embankment they shall be deposited in alternate layers of the same material over the full width of the embankment to depths approved by the Engineer. Rock, clay or other material shall be broken up and no accumulation of lumps or boulders in the embankment will be permitted. No surplus material shall be permitted to be left at the toe of embankment or at the top of cut sections.

Side slopes shall be neatly trimmed to the lines and slopes shown on the drawings or as directed by the Engineer, and the finished work shall be left in a neat and acceptable condition.

3.2. Formation of Embankment with Rock Material

Embankment formed of material consisting predominantly of rock fragment of such size that the material cannot be placed in layers of the thickness prescribed without crushing, pulverizing or further breaking down the pieces, such material may be placed in layers not exceeding in thickness than the approximate average size of the rocks except that no layer shall exceed eighty (80) centimeters of loose measurement and compacted by a vibratory roller with the minimum mass as shown in the following table.

Mass per meter width of vibrating roller (Kg/M)	Depth of fill layer (mm)	Number of passes of the roller on each layer
2300-2900	400	5
2900-3600	500	5
2600-4300	600	5
4300-5000	700	5
>5000	800	5

The material shall be carefully placed in layers, so that all larger stones will be well distributed and voids completely filled with smaller stones, clean small spells, shale, earth, sand, gravel, to form a solid mass. After placing rock material, surface shall be covered with a layer of fine material having thickness less than twenty (20) centimeters.

Such fine material shall be reserved from roadway excavation by the Contractor. Should such material be available but not reserved, Contractor will supply and place borrow material for forming smooth grade without extra payment.

Each layer shall be bladed or leveled with motor grader, bulldozer or similar equipment capable of shifting and forming the layer into a neat and orderly condition. No rock larger than eight (8) centimeters in any dimension shall be placed in the top fifteen (15) centimeters of embankment unless otherwise allowed by the Engineer.

Material for each layer should be consolidated with heavy weight vibratory roller until settlement as checked between two consecutive passes of roller is less that one (1) percent of the layer thickness. In evaluation of settlement, survey points should be established and rolling continued until difference of levels as checked after two consecutive passes is less than one (1) percent of the total layer thickness. Moreover initial rolling of overlaid fine material shall be done without watering to ensure their intrusion in voids of rock layer beneath. Watering shall be done when voids are properly filled.

Embankments, which are formed of material that contain rock but also contain sufficient compactable material other than rock or other hard material to make rolling feasible, shall be placed and compacted in the manner prescribed above and to the point when settlement is within above mentioned requirement. Compaction test will be made whenever the Engineer determines they are feasible and necessary. The Engineer must approve each layer before the next layer is placed.

When rock to be incorporated in fill is composed largely of weak or friable material, the rock shall be reduced to a maximum size not exceeding fifty (50) percent of the thickness of the layer being placed.

3.3. Formation of Embankment on Steep Slopes

Where embankments are to be constructed on steep slope, hill sides or where new fill is to be placed and compacted against existing pavement or where embankment is to be built along one half the width at a time, the original slope of the hill side, of existing pavement or adjacent to half width of embankment shall be cut in steps of twenty (20) centimeters depth.

Benching shall be of sufficient width to permit operation of equipment possible during placing and compaction of material.

Cut material shall be incorporated with the new embankment material and compacted in horizontal layers. No extra payment will be allowed for such an operation.

3.4. Formation of Embankment on Existing Roads

Before fill is placed and compacted on an existing roadway, the existing embankment and/or pavement may be leveled by cutting, rooting or scarifying by approved mechanical means to a level to be determined by the Engineer. The earth, old asphalt or other material arising as a result of this operation will be declared either suitable or unsuitable, for use in the embankment or other items by the Engineer. If the material is declared suitable it will be measured under relative item and if it is declared unsuitable, it will be measured separately.

3.5. Formation of Embankment in Water Logged Areas

Where embankments are to be placed in water logged areas and which are inaccessible to heavy construction equipment, a special working platform shall be first established, consisting of a blanket of fill material placed on top of the soft layer. The material of the working table shall consist of normal or processed granular fill, obtained from borrow excavation. This material shall conform to the following specifications:

Percentage of Sieve Description	**Weight Passing Mesh Sieve. AASHTO T -27**
3 inch (75 mm)	100

The remaining grading shall be such as to avoid intrusion into the working platform material of subgrade or natural ground surface material. For this condition to be met it will be required that the ratio.

$$\frac{D_{15}\text{ (Working Platform Material)}}{D_{85}\text{ (Natural Ground Material)}} \text{ is less than 5.}$$

D_{85} and D_{15} mean the particle diameters corresponding to 85% and 15%, respectively, passing (by weight) in a grain size analysis. Construction of this working table shall proceed from one edge of the soft area by using the fill as a ramp for further material transport.

The thickness of the working table as prescribed above shall be approximately 0.5 meter unless directed otherwise by the Engineer, and the width shall be that of the embankment. The p1acement and compaction of the working table shall be carried out by use of light equipment or as directed by the Engineer.

No density requirements are specified for the working platform, however, subsequent layers above it shall be compacted to the densities specified.

3.6. General Requirements

To avoid interference with the construction of bridge abutments and wing walls, the Contractor shall at points determined by the Engineer, suspend work on embankments and/or in cuts forming the approaches to any such structure until such time as the construction of the later is sufficiently advanced to permit the completion of the approaches without the risk of interference or damage to the bridge works. The cost of such suspension of work shall be included in the contract unit prices for embankment. In carrying embankments up to or over bridges, culverts or pipe drainage, care shall be taken by the Contractor to have the embankments brought to equally on both sides and over the top of any such structure. Contractor shall make special arrangements to ensure proper compaction in restricted spaces and around structures. No compensation shall be made to the Contractor for working In narrow or otherwise restricted areas.

When as a result of settlement, an embankment requires the addition of material up to 30 cm in thickness to bring it up to the required grade level, the top of the embankment shall be thoroughly scarified before the additional material is being placed without extra payment to Contractor for the scarification.

The Contractor shall be responsible for the stability of all embankments and shall replace any portions that in the opinion of the Engineer have been damaged or displaced due to carelessness or neglect on the part of the Contractor. Embankment material which may be lost or displaced as a result of natural causes such as storms, cloud-burst or as a result of unavoidable movement or settlement of the ground or foundation upon which the embankment is constructed shall be replaced by the Contractor with acceptable material from excavation or borrow. No additional compensation will be allowed for the replacement.

During construction, the roadway shall be kept in shape and drained out at all times. When unsuitable material has been placed in the embankment by the Contractor, he shall remove it without extra payment.

4. MEASUREMENT AND PAYMENT

4.1. Measurement

The quantities to be paid for shall as per BOQ, calculated on theoretical designed lines and grades and the original ground levels as defined in item and as established using Average End Area Method compacted in place, accepted by the Engineer formed with material resulting from:

a). Formation of Embankment from Borrow Excavation

Measurement shall be made as under:-

Formation from Borrow	=	Total Embankment Quantity (Calculated with reference to original ground level by Average End Area Method) (Minus) Roadway Excavation Quantity (Minus) Structural Excavation Quantity

b). Formation from structural Excavation

This quantity shall be the same as calculated for structural excavation irrespective of its haulage distance except that declared unsuitable by the Engineer, which shall not be placed in Embankment and shall be disposed off as per the direction of Engineer.

c). Formation from Roadway Excavation

This quantity shall be the same as calculated for Roadway Excavation except that declared unsuitable by the Engineer which shall not be placed in embankment and shall be disposed off as directed by the Engineer. The contractor will be supposed to use only declared suitable material from Roadway Excavation irrespective of haulage distance. However if

contractor, for his own convenience, uses the material from borrow, the payment will still be made under this item.

In the measurement of "Formation of Embankment on steep slopes" no allowance will be made for the benching or volume of material cut out from the hill side or from the first half width fill to accommodate the compacting equipment but will be calculated only on the net volume of fill placed against the original hill sides, the old embankment or the first half width fill.

4.2. Payment

a) Formation from Borrow Excavation

The quantity to be paid for shall as per BOQ, placed in embankment, measured as provided above for material from borrow excavation and such a payment will be deemed to include cost of excavation, payment of royalty, levies and taxes of Local, Provincial and Federal Government, cost of hauling including all lead and lift, spreading, watering, rolling, labour, equipment, tools and incidental necessary to complete this item.

b) Formation from Structural Excavation

The quantity to be paid for shall be as per BOQ, placed in embankment irrespective of the haulage distance and measured as provided above for suitable material from structural excavation and such payment will be deemed to include cost of excavation, hauling, dumping, spreading, watering, rolling, labour, equipment, tools and incidentals necessary to complete this item.

c) Formation from Roadway Excavation

The quantity to be paid for shall be as per BOQ, placed in embankment irrespective of the haulage distance and measured as provided above for suitable material from roadway excavation and such payment will be deemed to include cost of excavation, hauling, dumping, spreading, watering, rolling, labour, equipment, tools and incidental necessary to complete this item.

SUBGRADE PREPARATION

1. DESCRIPTION

The sub grade preparation shall be that part of the work on which, the sub base is placed or in the absence of sub base, acts as the base of the pavement structure. It shall extend to the full width of the road bed including the shoulders and laybyes as indicated on the Drawings or as specified herein.

2. CONSTRUCTION REQUIREMENT

2.1. Prior Work

Before commencing the work all culverts, drains, ditches including fully compacted backfill over them, outlets for drainage, head walls/wing walls of culverts and any other minor structure below thirty (30) centimeters of existing subgrade level or all structures which will be below thirty (30) centimeters of newly placed subgrade level, shall be in such operative conditions as to ensure prompt and effective drainage and to avoid damage to subgrade by surface water. No work of subgrade preparation will be started before the prior work herein described have been approved by the Engineer.

2.2. Compaction Requirement

All materials down to a depth of 30 cm below the subgrade level in earth cut or embankment shall be compacted to at least 95 percent of the maximum dry density as determined according to AASHTO T -180 Method 'B' or 'D' whichever is applicable, or corresponding Relative Density as per D-4254-83 (ASTM).

2.3. Subgrade Preparation in Earth Cut

In case bottom of subgrade level is within thirty (30) cm of the natural ground, the surface shall be scarified, broken up, adjusted to moisture content and compacted to minimum density of ninety five (95) percent of the maximum dry density as determined by AASHTO T -180 Method D. Subsequent layer of approved material shall be incorporated to ensure that the depth of subgrade layer is thirty (30) cm.

In case, the bottom of subgrade is below the natural ground by more than Thirty (30) cm, the material above the top of subgrade shall be removed and subsequent layer of thirty (30) cm shall be scarified, broken up, adjusted to moisture content and compacted to the same degree of compaction as described above.

In case, unsuitable material is encountered at the sub grade level within a depth of thirty (30) cm, the same shall be removed in total and replaced by the approved material. The contractor shall be paid for removal of unsuitable material as per pay item.

2.4. Subgrade Preparation in Rock Cut

Excavation in rock shall extend to the subgrade level as shown on drawings. Rock shall be undercut nearly to required elevation and sections shown on the plans or as directed by the Engineer. Transverse and longitudinal profiles checked by template shall be accurate to the requirement. Cuts below subgrade level shall be backfilled with selected subbase material and compacted to minimum ninety eight (98) percent of the maximum dry density as determined by AASHTO T -180, method 'D'. No compensation shall be made to the Contractor for over-cut or remedial measures as described above.

No rock shall be higher than two (2) centimeters above the under cut section elevation. The under cut material shall be placed in embankment or disposed of at the direction of Engineer.

2.5. Subgrade in Embankment

When the subgrade is formed in embankment, its width shall be the full width of top of embankment and material placed in the upper part of embankment down to a depth of thirty (30) centimeters below subgrade level shall meet compaction requirements of 2.2 above. Soils having

a minimum value of C.B.R of five (05) percent and swell value of not more than 0.3 percent shall be used.

Unsuitable material if encountered within the existing formation layer as per laboratory specified test, shall be removed, disposed of and replaced by suitable one as per direction of the Engineer of which the payment will be made under relevant items of work.

Rollers and other equipments of approved size and type, accepted by the Engineer, shall be used for compaction. Water shall be added to obtain optimum moisture content if necessary. Contractor shall ensure proper compaction in restricted areas by use of special equipments and rollers. No compensation shall be made for extra work due to restricted space.

Performance of this item of work shall not be paid for under this section but shall be deemed to be covered by the contract price for pay item, Formation of Embankment.

2.6. Sub-grade Level in Existing Road

Where indicated on the Drawings or directed by the Engineer that the existing road surface is to be used as the subgrade, the correct elevation on which the base or subbase is to be laid shall be obtained, where necessary, either by means of leveling course or by excavation. The leveling course shall be constructed to the requirements of the Engineer and paid for under the appropriate pay item involved. Excavation shall include disposal of any surplus material in the adjacent embankment or elsewhere as directed by the Engineer.

In case, the design level of subgrade is within 30 cm of the existing ground/road then the item shall be measured and paid accordingly.

When the width of the new road is greater than the existing road then the part of the new road subgrade which comprises the existing road surface shall be prepared as herein provided and the part that falls outside the existing road surface shall be prepared as provided in items above as the case may be.

2.7. Sub-grade reinforcement

When the width of the existing pavement, either to be scarified or not, is insufficient to contain the subbase or base to be placed upon it, the Engineer may order to strengthen and support the subbase or base on one or both sides of the existing pavement. This work shall consist of the removal and disposal of any unsuitable material and its replacements with suitable material to such width and depth as required by the Engineer.

The excavated material shall, if declared suitable for use elsewhere in the embankment by the Engineer, be so used, and payment for its removal shall be covered under the contract price for Formation of Embankment, if declared unsuitable it shall be disposed of and paid under the contract price for Excavation of unsuitable material. The finished compacted surface shall be as specified in item 2.3 above.

2.8. Protection of Completed Work

Any part of the subgrade that has been completed shall be protected and kept well drained. Any damage resulting from carelessness of the Contractor shall be repaired as directed by the Engineer without additional payment.

The Contractor shall be responsible for all the consequences of traffic being admitted to the subgrade. He shall repair any ruts or ridges occasioned by his own traffic or that of others by reshaping and compacting with rollers of the size and type necessary for such repair. He shall limit the area of subgrade preparation to an area easily maintained with the equipment available. Subgrade preparation and subbase or base placing shall be arranged to follow each other closely. The subgrade, when prepared too soon in relation to the placing of the subbase, is liable to deteriorate, and in such case the Contractor shall, without additional payment, repair, re-roll, or re-compact the subgrade as may be necessary to restore it to the state specified herein.

2.9. Templates and Straightedges

The Contractor shall provide for the use of the Engineer, satisfactory templates and straightedges in sufficient numbers to check the accuracy of the work, as provided in these specifications and no subsequent work shall be permitted until the subgrade levels have been checked and approved by the Engineer. For tolerances refer to the "Table for Allowable Tolerances" in NHA specifications.

3. MEASUREMENT AND PAYMENT

3.1. Measurement

The quantity to be paid for shall be as per BOQ of subgrade prepared as herein before prescribed and accepted. Subgrade in rock cuts and on embankment not consisting of the existing road surface in fill area shall not be measured for direct payment.

Subgrade preparation on "Existing Surface" shall only be measured for payment when ordered by the Engineer.

3.2. Payment

The quantities, determined as provided above, shall be paid for at the contract unit price respectively, for each of the particular pay items shown in the Bill of Quantities which prices and payment shall be full compensation for furnishing of material, water, equipment, tools, labour and all other items plus incidentals necessary for completion of work.

GRANULAR SUBBASE

1. DESCRIPTION

This item shall consist of furnishing, spreading in one or more layers and compacting granular subbase according to the specifications and drawings and/or as directed by the Engineer.

2. MATERIAL REQUIREMENTS

Granular subbase material shall consist of natural or processed aggregates such as gravel, sand or stone fragment and shall be clean and free from dirt, organic matter and other deleterious substances, and shall be of such nature that it can be compacted readily under watering and rolling to form a firm, stable subbase. The material shall comply to the following grading and quality requirements:

a). The subbase material shall have a gradation curve within the limits of grading given below:

Grading Requirements for Subbase Material			
Sieve Designation		Mass Percent Passing Grading	
Mm	**Inch**	**A**	**B**
60.0	(2-½)	100	--
50.0	(2)	90-100	100
25.0	(1)	50-80	55-85
9.5	(3/8)	--	40-70
4.75	No.4	35-70	30-60
2.0	No.10	--	20-50
0.425	No.40	--	10-30
0.075	No.200	2-8	5-15

The Coefficient of Uniformity D60/D10 shall be not less than 3, where D60 and D10 are the particle diameters corresponding to 60% and 10%, respectively, passing (by weight) in a grain size analysis, curve.

b). The Material shall have a CBR value of at least 50%, determined according to AASHTO T - 193. The CBR value shall be obtained at a density corresponding to Ninety eight (98) percent of the maximum dry density determined according to AASHTO T –180 Method-D.

c). The coarse aggregate material retained on sieve No.4 shall have a percentage of wear by the Los Angeles Abrasion (AASHTO T -96) of not more than 40%.

d). In order to avoid intrusion of silty and clayey material from the subgrade in the subbase, the ratio D15 (Subbase)/D85 (Subgrade) should be less than 5.

Where D85 and D15 are the particle diameters corresponding to eighty five (85) % and fifteen (15) %, respectively passing (by weight) in a grain size analysis curve.

e). The fraction passing the 0.075 mm (No.200) sieve shall not be greater than two third of the fraction passing the 0.425 mm (No. 40) sieve. The fraction passing the 0.425 mm sieve shall have a liquid limit of not greater than 25 and a plasticity index of 6 or less.

f). If over-size is encountered, screening of material at source shall invariably be done, no hand picking shall be allowed, however hand picking may be allowed by the Engineer, if over-size quantity is less than 5% of the total mass.

g). Sand equivalent for all classes shall be 25 min.

3. CONSTRUCTION REQUIREMENTS

3.1 Spreading

Granular subbase shall be spread on approved subgrade layer as a uniform mixture. Segregation shall be avoided during spreading and the final compacted layer shall be free from concentration of coarse or fine materials.

Granular subbase shall be deposited on the roadbed or shoulders in a quantity which will provide the required compacted thickness without resorting to spotting, picking up or otherwise shifting the subbase material. In case any material is to be added to compensate for levels, the same shall be done after scarifying the existing material, to ensure proper bonding of additional material.

Where the required thickness is fifteen (15) cm or less, the aggregates may be spread and compacted as one layer, but in no case shall a layer be less than seven and one half (7.5) centimeters thick. Where the required thickness is more than 15 cm, the aggregates shall be spread and compacted in 2 or more layers of approximately equal thickness, but in any case the maximum compacted thickness of one layer shall not exceed 15 cm. All subsequent layers shall be spread and compacted in a similar manner.

Granular subbase shall be spread with equipment that will provide a uniform layer conforming to the specified item both transversely and longitudinally within the tolerances as specified in "Table for Allowable Tolerances" in these specifications. No hauling or placement of material will be permitted when, in the judgment of the Engineer, the weather or road conditions are such that the hauling operation will cause cutting or rutting of subgrade or contamination of sub base material.

3.2 Compaction Trials

Prior to commencement of granular subbase operation, contractor shall construct a trial length, not to exceed, five hundred (500) meters and not less than two hundred (200) meters with the approved subbase material as will be used during construction to determine the adequacy of the contractor's equipment, loose depth measurement necessary to result in the specified compacted layer depths, the field moisture content, and the relationship between the number of compaction passes and the resulting density of the material.

3.3 Compaction

The moisture content of subbase material shall be adjusted prior to compaction, by watering with approved sprinklers mounted on trucks or by drying out, as required, in order to obtain the specified compaction.

The subbase material shall be compacted by means of approved vibrating rollers or steel wheel rollers (rubber type rollers may be used as a supplement), progressing gradually from the outside towards the centre, except on super elevated curves, where the rolling shall begin at the low side and progress to the high side. Each succeeding pass shall overlap the previous pass by at least one third of the roller width. While the rolling progresses, the entire surface of each layer shall be properly shaped and dressed with a motor grader, to attain a smooth surface free from ruts or ridges and having proper section and crown. Rolling shall continue until entire thickness of each layer is thoroughly and uniformly compacted to the specified density.

Any area inaccessible to rolling equipment shall be compacted by means of hand guided rollers, plate compactors or mechanical tampers, where the thickness in loose layer shall not be more than 10 cm.

If the layer of subbase material or part thereof does not conform to the required finish, the Contractor shall, at his own expense, rework, water and recompact the material before succeeding layer of the pavement structure is constructed.

Immediately prior to the placing of first layer of base course the subbase layer (both under the travelled way and the shoulders) shall conform to the required level and shape. Prior to placing the succeeding layers of the material, the top surface of each layer shall be made sufficiently moist to ensure bond between the layers. The edges or edge slopes shall be bladed or otherwise dressed to conform to the lines and dimensions shown on the plans.

No material for construction of the base shall be placed until the subbase has been approved by the Engineer.

3.4 Compaction requirements

The relative compaction of each layer of the compacted subbase shall not be less than Ninety Eight (98) percent of the maximum dry density determined according to AASHTO T -180 Method-D. The field density shall be determined according to AASHTO T -191 or other approved method. For all materials, the field density thus obtained shall be adjusted to account for oversize particles (retained on 19 mm sieve) as directed by the Engineer. Also for adjustment of any material retained on 4.75 mm sieve, AASHTO Method T -224 shall be used.

3.5 Moisture Content Determination

As It is customary in the project laboratories that small samples of materials are placed in ovens for moisture determination for proctor following precautions are necessary to ensure proper compaction results.

a). Same size of sample is placed in oven for moisture determination in case of laboratory density (modified proctor) and field density.

b). Moisture content for calculation of field density and proctor shall be observed on material passing 4.75 mm sieve.

3.6 Tolerance

The subbase shall be compacted to the desired level and cross slopes as shown on the drawings. The allowable tolerance shall be according to the "Table for Allowable Tolerances" in NHA specifications.

4. MEASUREMENT AND PAYMENT

4.1. Measurement

The quantity of subbase to be paid for shall be measured by the theoretical volume in place as shown on the drawings or as directed and approved for construction by the Engineer, placed and accepted in the completed granular subbase course. No allowance will be given for materials placed outside the theoretical limits as shown on the cross-sections.

4.2. Payment

The accepted quantities measured as provided above shall be for the Pay Item shown in the Bill of Quantities, which price and payment shall constitute full compensation for furnishing all materials, hauling, placing, watering, rolling, labour, equipment, tools and incidentals necessary to complete the item.

AGGREGATE BASE COURSE

1. DESCRIPTION

This item shall consist of furnishing, spreading and compacting one (1) or more layers of aggregate base on a prepared subgrade, subbase or existing road surface, in accordance with the specifications and the drawings and/or as directed by the Engineer.

2. MATERIAL REQUIREMENTS

Material for aggregate base course shall consist of crushed hard durable gravel, rock or stone fragments. It shall be clean and free from organic matters, lumps of clay and other deleterious substances. The material shall be of such a nature that it can be compacted readily under watering and rolling to form a firm, stable base for both flexible and rigid pavements. The aggregate base shall comply with the following grading and quality requirements.

a). The gradation curve of the material shall be smooth and within the envelope limits for Grading A or B given below.

Grading Requirements for Subbase Material			
Sieve Designation		Mass Percent Passing Grading	
mm	Inch	A	B
50.0	2	100	100
25.0	1	70-95	75-95
9.5	3/8	30-65	40-75
4.75	No.4	25-55	30-60
2.0	No.10	15-40	20-50
0.425	No.40	8-20	12-25
0.075	No.200	2-8	5-10

The material shall be well graded such that the coefficient of Uniformity D60/D10 shall be greater than four (4).

b). Crushed Aggregate (material retained on sieve No.4) shall consist of material of which at least ninety (90) percent by weight shall be crushed particles, having a minimum of two (2) fractured faces.

c). The Coarse aggregate shall have a percentage of wear by the Loss, Angeles Abrasion test (AASHTO T -96) of not more than forty (40).

d). The material shall have a loss of less than twelve (12) percent when subjected to five cycles of the Sodium Sulphate Soundness test according to AASHTO T -104.

e). The sand equivalent determined according to AASHTO T -176 shall not be less than 45 and the material shall have a Liquid limit of not more than twenty five (25) and a plasticity Index of not more than 6 as determined by AASHTO T-89 and T-90.

f). The material passing the 19 mm sieve shall have a CBR value of minimum eighty (80) percent, tested according to the AASHTO T193. The CBR value shall be obtained at the maximum dry density determined according to AASHTO T 180, Method D.

g). Laminated material shall not exceed 15% of total volume of Aggregate Base Course.

2.1 Filler for Blending

If filler, in addition to that naturally present in the aggregate base material is necessary for meeting the grading requirement or for satisfactory bonding of the material, it shall be uniformly blended with the base course material at the crushing plant or in a pugmill unless otherwise approved. The material for such purpose shall be obtained from sources approved by the Engineer. The material shall be free from organic matter, dirt, shale, clay and clay lump or other deleterious matter and shall conform to following requirement.

AASHTO Sieve	Percent Passing
3/8 Inch	100
No. 4	85-100
No. 100	10-30
Plasticity Index (AASHTO T -90)	6 maximum
Sand Equivalent (AASHTO T -176)	30 minimum

However the combined aggregates prepared by mixing the coarse material and filler shall satisfy the requirements as mentioned in Clause 2 above.

3. CONSTRUCTION REQUIREMENTS

3.1. Preparation of surface for Aggregate base course

In case crushed aggregate base is to be laid over prepared sub base course, the subbase course shall not have loose material or moisture in excess to optimum moisture content.

3.2. Compaction

Compaction process shall conform in all respect to the requirements specified under Clause 3.3 of Granular Subbase.

3.3. Compaction Requirement

The relative compaction of each layer of the compacted base shall not be less than 100 percent to the maximum dry density determined according to AASHTO T -180, Method D (Modified). The field density shall be determined according to AASHTO T -191 or other approved method. For all materials, the field density thus obtained shall be adjusted to account for oversize particles (retained on 19 mm sieve) as directed by the Engineer. Also for adjustment of any material retained on 4.75 mm sieve, AASHTO Method T-224 shall be used. Completed base course shall be maintained in an acceptable condition at all times until prime coat is applied. When base course is to carry traffic for an indefinite length of time before receiving surfacing, the contractor shall maintain the surface until final acceptance and shall prevent ravelling by wetting, blading, rolling and addition of fines as may be required to keep the base tightly bound and leave a slight excess of material over the entire surface which must be removed and the surface finish restored before application of prime coat.

3.4. Moisture Content Determination

Moisture Content Determination shall conform in all respects to the requirements specified under Clause 3.5 of Granular Subbase.

3.5. Trial Sections

Prior to commencement of aggregate base course operations, a trial section of two hundred (200) meters minimum but not to exceed five hundred (500) meters shall be prepared by the contractor using same material and equipment as will be used at site to determine the adequacy of equipment, loose depth measurement necessary to result in the specified compacted layer depths, field moisture content, and relationship between the number of compaction passes and the resulting density of material.

3.6. Tolerance

The completed base course shall be tested for required thickness and smoothness before acceptance. Any area having waves, irregularities in excess of one (1) cm in three (3) M or two (2) cm in fifteen (15) M shall be corrected by scarifying the surface, adding approved material, reshaping, re-compacting and finishing as specified. Skin patching of an area without scarifying the surface to permit proper bonding of added material shall not be permitted. The allowable tolerances shall be according to the "Table for Allowable Tolerances" in these specifications.

3.7. Acceptance, Sampling and Testing

Acceptance of sampling and testing with respect to materials and construction requirements shall be governed by the relevant, "Table for Sampling and Testing Frequency" or as approved by the Engineer.

4. MEASUREMENT AND PAYMENT

4.1 Measurement

The quantity of aggregate base to be paid for shall be measured by the theoretical volume in place as shown on the drawings or as directed and approved for construction by the Engineer, placed and accepted in the completed crushed aggregate base course. No allowance will be given for materials placed outside the theoretical limits as shown on the cross sections.

4.2 Payment

The accepted quantities measured as above shall be paid for at the contract unit price, for the item shown in the Bill of Quantities, which price and payment shall constitute full compensation for furnishing all materials, hauling, placing, watering, rolling, labour, equipment, tools and incidentals necessary to complete this item.

BITUMINOUS PRIME COAT

1. DESCRIPTION

This work shall consist of furnishing all plant, labour, equipment, material and performing all operations in applying a liquid asphalt prime coat on a previously prepared and untreated earth sub grade, water-bound base course, crushed aggregate base course, tops of roadway shoulders and as otherwise shown on the plans in strict accordance with the specification and in conformity with the lines shown on the drawings.

2. MATERIAL REQUIREMENTS

Asphaltic material shall conform to the requirements of asphalt cement, cutback or emulsified asphalt, whichever is specified in the Bill of Quantities.

3. CONSTRUCTION REQUIREMENTS

Prime coat shall be applied when the surface to be treated is dry except that when emulsified asphalt is used, the surface may be reasonably moist. The application is prohibited when the weather is foggy or rainy, or when the atmospheric temperature is below fifteen (15) degree C unless otherwise directed by the Engineer. Prior to the application of the prime coat, all loose materials shall be removed from the surface and the same shall be cleaned by means of approved mechanical sweepers or blowers and/or hand brooms, until it is as free from dust as is deemed practicable. No traffic shall be permitted on the surface after it has been prepared to receive the bituminous material. Prior to the application of prime coat on bridge decks and concrete pavements, the surfaces shall be cleaned of all loose material. All expansion joints shall be cleaned and filled with bituminous material as directed by the Engineer. Areas to be primed will be classified as under:

a). The top of earth surface or water bound base courses from a point twenty (20) centimeters outside the edge of the pavement line to 20 cm outside the line on the opposite side of the roadway.

b). The top of the shoulders from the inter-section of embankment slope and top of subgrade to the edge of the pavement line.

c). The bridge wearing surface from curb to curb and end to end of bridge wearing surface.

d). Other surfaces as shown on the drawings or ordered by the Engineer.

Primed surface shall be kept undisturbed for at least 24 hours, so that the bituminous material travels beneath and leaves the top surface in non tacky condition. No further asphaltic operations shall start on a tacky condition.

3.1 Equipment

The liquid asphaltic material shall be sprayed by means of a pressure distributor of not less than 1000 liter capacity, mounted on pneumatic tyres of such width and number that the load produced on the road surface will not exceed hundred (100) Kg per cm width of tyre. It shall be of recognized manufacturer.

The tank shall have a heating device able to heat a complete charge of asphaltic liquid up to one hundred eighty (180) degree C. The heating device shall be so that overheating will not occur. Consequently, the flames must not touch directly on the casting of the tank containing the asphaltic liquid or gases there-from. The Contractor will be responsible for any fire or accident resulting from heating of bituminous materials. The liquid shall be circulated or stirred during the heating. The tank shall be insulated in such a way that the drop in temperature when the tank is filled and not heated, will be less than two (2) degree C per hour. A thermometer shall be fixed to the tank in order to be able to control continuously the temperature of the liquid. The thermometer shall be placed in such away that the highest temperature in the tank is measured. The tank shall be furnished with a device that indicates the contents. The pipes for filling the tank shall be furnished with an easily interchangeable filter.

The distributor shall be able to vary the spray width of the asphaltic liquid in steps of maximum 10 cm, to a total width of four (4) M. The spraying bar shall have nozzles from which the liquid is sprayed fan-shaped on the road surface equally distributed over the total spraying width.

The distributor shall have a pump for spraying the liquid driven by a separate motor, or the speed of the pump shall be synchronized with the speed of the distributor. The pump shall be furnished with an indicator showing the performance in litres per minute. At the suction side the pump shall have a filter easily exchangeable. A thermometer shall be fixed, which indicates the temperature of the liquid immediately before it leaves the spraying bar.

The distributor shall be furnished with a tachometer indicating the speed in meter per minute. The tachometer shall be visible from the driver's seat. The function of the distributor shall be so exact that the deviation from the prescribed quantity to be spread on any square meter does not exceed 10% The distributor shall be equipped with a device for hand spraying of the bituminous liquid, to cover any irregular area or covering the area improperly sprayed.

3.2 Application of Asphaltic Material

Immediately before applying prime coat, the full area of surface to be treated shall be swept with a power broom to remove all dirt and other objectionable material. If required by the Engineer, the surface shall be made moist but not saturated. Asphaltic Materials shall be applied temperature by approved pressure distributors operated by skilled workmen. The spray nozzles and spray bars shall be adjusted and frequently checked so as to ensure uniform distribution. Spraying shall cease immediately upon any clogging or interference of any nozzle and remedial measures taken before spraying is resumed. The rate for application of asphaltic material (cut back/emulsified) shall be as under: -

	TYPE OF SURFACE	**LITRES PER SOUARE METER**	
		Minimum	**Maximum**
1.	Subgrade, Subbase, Water bound base courses, and Crushed stone base course.	0.65	1.75
2.	Bridge, Wearing Surfaces, Concrete Pavement	0.15	0.4

However, the exact rate shall be specified by the Engineer determined from field trials.

The test methods shall be determined by the Engineer and performed by the Contractor in the presence of Engineer.

The prime coat shall be left undisturbed for a period of at least 24 hours, and shall not be opened to traffic until it has penetrated and cured sufficiently so that it will not be picked up by the wheels of passing vehicles. The Contractor shall maintain the prime coat until the next course is applied. Care shall be taken that the application of bituminous material is not in excess of the specified amounts; any excess shall be blotted with sand or similar treatment. All areas inaccessible by the distributor shall be sprayed manually using the device for hand spraying from the distributor.

The surface of structures and trees adjacent to the area being treated shall be protected in such a manner as to prevent their being spattered or marred.

Where no convenient detour is available for traffic, operations shall be confined to one-half the roadway width at a time. The Contractor shall provide proper traffic control so that vehicles may proceed without damage to the primed area. Work shall not be started on the portion of the road not covered by previous application until the surface previously covered has dried.

Any area which gets damaged by traffic or otherwise due to the negligence of the contractor shall be re-primed by the contractor at his own cost.

4. MEASUREMENT AND PAYMENT

4.1 Measurement

The unit of measurement shall be for the area as actually covered by prime coat in accordance with these specifications. No measurement or payment will be made for the areas primed outside the limits, specified, herein shown on the Drawings or designated by the Engineer. Blotting material will not be measured for payment and shall be considered subsidiary to the prime coat.

4.2 Payment

The payment for area primed measured as stated above, shall be made for the adjusted contract unit price as shown in BOQ item, which payment shall be full compensation for furnishing all labour, material, tools, equipment and incidentals and for performing all the work involved in applying prime coat, complete in place.

PRE CAST CEMENT CONCRETE ROAD KERB BLOCK

1. DESCRIPTION

This work shall consist of cement concrete pre cast kerb block constructed of the following materials and in accordance with the specifications, dimensions and designs shown on the drawings or as approved by Engineer.

2. MATERIAL REQUIREMENTS

Pre cast concrete kerbing units industrial made shall consist of cement concrete 1:1½:3 having cylindrical strength of 3000 psi, hydraulically compressed, steam cured & to the lengths, shapes and other details shown on the drawing. Kerbing which shows surface irregularities of more than 5 mm when checked with 3 meter straight edge or surface pits more then fifteen (15) mm in diameter will be rejected.

3. CONSTRUCTION REQUIREMENTS

3.1. Excavation and Bedding

Excavation shall be made to the required depth as shown on the Drawings. All soft and unsuitable material shall be removed and replaced with a suitable material acceptable to the Engineer. Bedding shall consist of Class B Concrete and shall be to the section and dimension shown on the drawings.

3.2. Placing

Pre cast concrete kerbs shall be set in 1:3 of cement sand mortar to the line, level and grade as shown on the Drawing or as directed by the Engineer.

3.3. Slip form

Kerb blocks may be executed using slip form method as per approval of the Engineer.

4. JOINTS

Joints between consecutive kerbs shall be three (3) to five (5) mm wide and filled with cement mortar to the full section of the kerb.

5. BACK FILLING

After concrete has been cured as specified, excavation of kerb, shall be back filled with suitable earth or granular material tamped into place in layers of not more than fifteen (15) cm each until firm and solid.

6. MEASURMENT AND PAYMENT

The unit of measurement for pre cast concrete kerb shall be measured by the linear foot along the front face of the section at the finished grade elevation. Deduction in length will be made for drainage structure installed in the kerbings such as catch basins and drop lintels etc. measurement will not include any area in excess of those shown on the drawing except for any area authorized by the Engineer in writing.

Bed course material shall be measured by the cubic foot of material compacted in place.

6.1. Payment

Measurement and excepted quantities shall be paid for at the contract unit price, showing in Bill of Quantities. Payment shall constitute full compensation for furnishing and placing all materials for concrete, drainage opening, excavation, backfilling and dumping and disposal of surplus material and for all labour, equipment tool and incidental necessary to complete the item.

Payment for expansion joint filler material used in transverse expansion and contraction joint in kerb shall be understood to be included in the price tendered for the kerbs.

Mortar required for bedding and jointing of pre cast concrete kerbs as shown on the drawing shall not be paid for as separate item, but the cost shall be included in the contract price for pre cast concrete kerb.

No extra payment will be made if slip form method is approved by the Engineer for construction of Kerb blocks.

PAVEMENT MARKING

1. DESCRIPTION

This work shall consist of furnishing reflective thermoplastic paint material shown in the Bill of Quantities for sampling and packing, for the preparation of the surface and for the application of the paint to the pavement surface all in accordance with these Specifications.

The paint shall be applied in conformance to the size, shape and location of the markings as shown in the Drawings.

2. HOT APPLIED THERMOPLASTIC ROAD PAINTS

2.1 Material Requirements

2.1.1 Aggregate

The aggregate shall consist of light coloured silica sand, calcite, quartz, calcined flint, or other material approved by the Engineer.

2.1.2 Pigment and extender

a). White material

The pigment shall be titanium dioxide complying with the requirements of Type A (anatase) or Type R (rutile) of BS 1851.

b). Yellow materials

Sufficient suitable yellow pigment shall be substituted for all or part of the titanium dioxide to comply with the other requirements of this specification.

c). All materials

The extender shall normally be whiting (i.e. calcium carbonate prepared from natural chalk) complying with the requirements of BS 1795. The manufacturer may substitute lithopone complying with the requirement of BS 296 for any or all of the whiting.

d). Binder

The binder shall consist of synthetic hydrocarbon resin, or, with the approval of the Engineer, gun or wood resin, plasticized with mineral oil.

e). Composition of mixture

Thu proportions of the constituents of the mixed material as found on analysis shall comply with the requirements of the following table;

PROPORTIONS OF CONSTITUENTS OF MIXTURE

Constituent	Percentage by mass of total mixture	
	Minimum	Maximum
Binder (resin and oil)	18	22
Pigment	6*	-
Pigment and extender	18	22
Ballotini	20	-
Aggregate	78	82
Pigment		
Extender and ballotini		

***** For titanium dioxide only. No minimum is specified for yellow material.

Where specified, 10% in the case of material to which surface ballotini is to be applied by pressure application.

The grading of the combined aggregate, pigment, extender and ballotini (where specified) as found on analysis shall comply with the requirements of table shown below;

GRADING OF COMBINED AGGREGATE, PIGMENT, EXTENDER AND BALLOTINI

Sieve	Percentage by mass passing Sprayed
2.80 mm	100
600 µm	75 - 95

2.2 Sampling and Testing

2.2.1 Sampling

For the purpose of carrying out the testing, it is essential that adequate and representative samples be taken in the manner prescribed in specification BS-3262 at following stages.

a) At the manufacturer's plant.
b) After it has been re-melted by the road application contractor.

2.2.2 Testing

The samples shall be prepared and tested in accordance with BS Specification 3262 (1976) Appendix-A to H. The test results shall conform the following properties.

- **Softening Point**

  The softening point measured in accordance with Appendix-C shall be not less than 65^{o} centigrade.

- **Color and luminance**

  a) White Material

  The luminance factor of white material as delivered by the manufacturer shall be measured in accordance with Appendix-D and shall not be less than 70 whereas the luminance factor of material obtained from an applicator or melter on site after re-melting measured in accordance with Appendix-D, shall not be less than 65.

  b) Yellow Material

  The color of yellow material shall be approximately BS 381C Color No. 355, Lemon. The luminance factor of yellow material as delivered by the manufacturer shall not be less than 60 whereas the luminance factor of material obtained from an applicator or melter on site after re-melting measured in accordance with Appendix-D shall not be less than 55.

- **Heat Stability**

  a) White Material

  When tested in accordance with Appendix-E, the luminance factor of white material as measured in accordance with Appendix-D shall be not less than 65.

  b) Yellow Material

  When tested in accordance with appendix-E the luminance factor of yellow material as measured in accordance with Appendix-D shall be not less than 55.

- **Flow resistance**

  In testing the flow resistance, a cone made and tested in accordance with Appendix-F, shall not slump by more than 25%.

- **Skid resistance**

  When tested in accordance with Appendix-G, the skid resistance of a newly laid marking prepared under the stated conditions shall be not less than 45.

2.3 Manufacturing, Packing and Storing of Paint

2.3.1 Manufacturing

The paint shall be produced in a plant owned and operated by the manufacturer following a process which has been used by the manufacturer for at least five (05) years to produce paint. The equipment for mixing and grinding shall be clean, modern and in good condition.

2.3.2 Packing

a). The material shall be supplied in sealed containers which do not contaminate the contents and which protect them from contamination.

b). Each container shall be clearly and indelibly marked with the manufacturer's name, Batch number, date of manufacture, Reflectorization (if applicable), color, chemical type of binder and maximum safe heating temperature.

2.3.3 Storing

The material shall be stored in accordance with the manufacturer's instructions and any material that is in damaged containers of which the seal has been broken, shall not be used.

2.4 Certification

The Contractor shall furnish a certificate from manufacturer that the material he proposes to use has the required properties, stating the maximum and minimum proportions and grading of the constituents, the acid value of the binder, the setting time, the maximum safe heating temperature, the temperature range of the apparatus and the proposed method of laying.

2.5 Application of Material to the Road

a) Preparation of site

The thermoplastic paint shall only be applied to surfaces, which are clean and dry. Immediately before the application of paint, the surface shall be cleaned with mechanical broom, compressed air or other approved means to remove surplus asphalt, oils, mud, dust and other loose or adhered material. The material shall not be applied if the road surface is at a temperature of less than 5^{o} centigrade.

b) Preparation of material on site

- The material shall be melted in accordance with the manufacturer's instruction in a heater fitted with a mechanical stirrer to give a smooth consistency to the thermoplastic material and such that local overheating will be avoided. The temperature of the mass shall be within the range specified by the manufacture, and shall on no account be allowed to exceed the maximum temperature stated by the manufacturer. The molten material shall be used as expeditiously as possible, and for thermoplastic material, which has natural resin binders or is otherwise sensitive to prolonged heating, the material shall not be maintained in a molten condition for more than 4 hours.

- After transfer to the laying apparatus, the material shall be maintained within the temperature range specified by the manufacturer and stirred to maintain the right consistency for laying.

- On concrete carriageway, a tack coat compatible with the marking material shall be applied in accordance with the manufacturer's instructions prior to the application of thermoplastic material.

c) Laying

Carriageway centre lines, lane lines and edge lines shall be laid to a regular alignment by self propelled machine. Other markings may be laid by hand, hand propelled machine or self propelled machine as approved by the engineer. The surface produced shall be uniform in texture and thickness and appreciably free from blisters and streaks.

d) Reflectorization by surface application

When surface application of ballotini is required, additional ballotini (400 g/m^2 to 500 g/m^2 from the machine) shall be applied by pressure concurrently with the laying of the line with sufficient velocity to ensure retention in the surface of the line. The ballotini so sprayed shall give uniform cover and immediate reflectivity over the whole surface of the marking. Ballotini dispensed on the surface of the markings shall conform to the following grading:

Sieve	Percentage by mass passing
1.7 mm	100
600 µ	80-100
425 µ	45-100
300 µ	10-45
212 µ	0-25
75 µ	0-5

Not less than 90% by mass of the ballotini shall be of transparent glass, spherical in shape and not more then ten (10) percent shall be ovate in shape or have other flaws. The ballotini shall be made of soda glass.

e) Thickness

Unless otherwise approved by the Engineer, the material shall be laid to the following thicknesses:

a). Sprayed lines other than yellow not less than 1.5 mm.
b). Sprayed yellow edge lines not less than 0.8 mm.

The minimum thicknesses specified are exclusive of surface applied ballotini. The method of thickness measurement shall be in accordance with Appendix-H of BS 3262 (1976).

2.6 Trail Section

In no case shall the contractor proceed with the work until the equipment, method of application and rate of application conforming the required thickness (as established by a test section) have been approved by the Engineer.

3. MEASUREMENT AND PAYMENT\

3.1 Measurement

The quantity of reflective thermoplastic pavement marking paint for the specified width shall be as indicated in BOQ. The arrows shall be measured in number.

The measurement shall be made of painted areas, completed and accepted. No measurement shall be made of unauthorized areas. Paint that is applied in un-authorized areas shall be completely removed from the surface of the road to the satisfaction of the Engineer and at Contractor's expense.

3.2 Payment

The quantities measured as determined above shall be paid for at the contract unit price respectively for the pay items shown in BOQ, which price and payment shall constitute full compensation for furnishing and placing all materials including sampling, packing and testing at approved laboratory. The cost shall also include the preparation of the surface and for all other costs necessary to complete the work as prescribed in this item.

WATER SUPPLY NETWORKS

UNPLASTICISED POLYVINAYLE CHLORIDE (uPVC) PIPES AND PIPE FITTINGS

1. SCOPE

The work under this section of the specifications includes furnishing all plant, labour, equipment, appliances, materials and in performing all operations required in connection with supply, Installation Testing and Commissioning of Unplasticised Polyvinayle Chloride (uPVC) Pipes and Pipe fittings as specified herein, in bill of quantities, and as shown on the drawings and/or as directed by the Engineer.

2. GENERAL REQUIREMENTS

a). Pipes and fittings shall be new and unused.

b). Where manufacturers of pipes and fittings are specified, they shall be of the same manufacturers unless otherwise approved by the Engineer.

c). Where more than one similar items of pipes and fittings are specified, they shall be of the same manufacturer.

d). The Contractor shall submit to the Engineer for approval the following information regarding, the specified/proposed items of pipes and fittings.

i). Name and address of the manufacturers
ii). Country of origin, make and model
iii). Dimensions and wall thicknesses of pipes and fittings
iv). Factory test certificate from the manufacturers
v). Warranty if so provided by the manufacturers
vi). Method of jointing, testing and commissioning

e). Approval by the Engineer shall not be construed as authorizing any deviation(s) from the specifications unless they are specifically brought to notice of the Engineer.

f). Approval by the Engineer shall not relieve the Contractor from any of his contractual responsibility regarding satisfactory performance and other requirements of the pipes and fittings.

3. APPLICABLE CODES AND STANDARDS

All works and materials under this section shall conform to the latest edition of the following applicable codes and standards. When the requirements of these specifications or the drawings exceed the code requirements, the Contractor shall be bound by the specifications and/or drawings for that requirements.

EN 1401
ISO 21138-1

Other authoritative codes and standards which ensure equal or higher quality then those references may also be acceptable subject to satisfaction and approval of the Engineer.

Any conflict between requirements of this specification and those on the figures herein or in the codes, standards and specifications referred to herein shall be brought to the attention of the Engineer for resolution whose decision will be final and binding.

4. SPECIAL REQUIREMENTS

a). Pipes and fittings shall be suitable for the intended use.

b). Every pipe shall be tested at the manufacturer's works to specified hydraulic test pressure. The test pressure shall be maintained for sufficiently long time for proof and inspection.

c). Each pipe and fitting shall be permanently marked or engraved giving the following information:

i). Manufacturers Name and Trade mark
ii). Manufacturing date
iii). Manufacturing No.
iv). Nominal diameter in mm
v). Class or pressure rating
vi). Manufacturers Inspection mark
vii). Standards according to which the pipe and fitting have been manufactured
viii). Heat number should be embossed on all pipes, fittings and flanges

d). Unless otherwise specified diameters of pipes and fittings shall be nominal. Actual inside and outside diameters and tolerances in diameters of pipes and fittings shall be according to the specified standards.

e). Unless otherwise specified, service ratings of pipes and fittings shall not be less than the maximum pressure to which they will be subjected to.

f). Unless otherwise specified, wall thicknesses of the pipes shall be according to the class, schedule or duty of the pipes. The wall thicknesses shall be measured at locations excluding the jointing ends. The tolerances in wall thicknesses shall be according to the specified standards.

Wall thicknesses of fittings shall not be less than those of corresponding pipes to which they are joined together.

g). Pipes and fittings ends shall be matching and compatible with each other and with the ends of valves and appurtenances to which they are joined.

h). Unless otherwise approved by the Engineer, pipes and fittings, jointing materials such as rubber rings, gaskets, nuts & bolts and jointing compound, etc. shall be of the same manufacturers as those of the pipes and fittings.

5. MATERIALS

5.1. Pipe

uPVC Pipes shall conform to specified or appropriate class of BS 3505 & AWWA Standards.

5.2. Fittings

uPVC fittings and specials shall be of injection moulded of specified appropriate class and shall conform to AWWA Standards. Fittings and specials shall have the required shapes, and dimensions to be joined with the uPVC pipes.

5.3. Material

The material from which the pipe is produced shall consist substantially of polyvinyl chloride, to which may be added only those additives that are needed to facilitate the manufacture of the polymer, and production of sound, durable pipe of good surface finish, mechanical strength and opacity. None of these additives shall be used separately or together in quantities sufficient to constitute a toxic hazard or to impair the fabrication of welding properties of the pipe or to impair its chemical and physical properties.

The pipe material shall not have any detrimental effect on composition of the water flowing through them. The quantities of lead, dialectal tin C4 and higher homologues and any other toxic substances extracted from the internal wall of the pipes shall not exceed the values specified in BS 3505 and AWWA Code/ Manual.

5.4. Joints

uPVC pipes and fittings shall be joined with elastomeric rubber ring (gasket) or shall be solvent welded as specified herein, in bill of quantities or as shown on the drawings and/or as directed by the Engineer. The elastomeric rubber rings shall conform to AWWA Code.

6. TRENCHING

Pipe trenches shall be excavated upto required depth as indicated in the drawing. The bottom shall be carefully leveled. In-situ field density of trench bottom shall be determined. The bottom shall be compacted if in-situ density is less than 60% of relative density as determined by ASTM D 2043 and AWWA manual M23 or other authorities code. The test shall generally be carried out at spacing of 200 meters. If in some portion soft clayey material or loose material is encountered 300mm of this material shall be replaced by specified bedding material in that reach. If excavation is carried below required depth, the excess excavated part shall be refilled with bedding material at no extra cost to the owner. No bedding material shall be placed nor any permanent work commenced until the trench has been inspected by the Engineer and his permission to proceed to the work is given.

7. INSTALLATION

7.1. Transportation, Handling and Storage

The Contractor shall be responsible for proper transportation, handling (loading and unloading) and storage of pipes and fittings as per the manufacturer's recommendations and direction of the Engineer.

Crane, rope or nylon slings, lifting beams with flattened hooks or scissor-dog shall be used for loading and unloading of pipes and fittings. Hooks and dogs shall be well padded to prevent the pipe being damaged and shall be fitted with locking device. Steadying ropes are essential.

Pipes and fittings damaged during transportation, handling or storage or lowering shall be rejected and replaced at the Contractor's expense. Storage of uPVC pipes, fittings, rubber rings, jointing compound shall be under shade to prevent damage by sunlight and extreme heat.

7.2. Inspection

Pipe and fittings shall be visually inspected for any evidence of damage or hair cracks. The turned ends of pipes and fittings shall be inspected for any local irregularities which could affect the water tightness of the joint. Damaged pipes and fittings shall be rejected and replaced at the Contractor's expense.

7.3. Laying and Jointing

a). Above Ground (Unburied)

Pipelines shall be erected true to the location, alignment and grade as shown on the drawings and/or as directed by the Engineer. All vertical pipelines shall be erected plumb and shall be parallel to wall and other pipelines. All horizontal pipelines shall be kept close to walls and shall be parallel to floor, ceiling or roof and other pipelines. If any deviation is required from the route and arrangement as shown on the drawings, the Contractor shall obtain approval from the Engineer before installation.

Solvent welded joints shall be made water tight with use of jointing compound. The jointing compound shall be spread liberally over the external surface of the spigot end and the internal surface of the socket end. The sockets and spigots shall be joined as quickly as possible after application of jointing compound. The joints shall not be disturbed for at least 30 minutes and the pipeline shall not be subjected to testing at least for 24 hours. Elastomeric joints shall be made with rubber ring. The ring shall be inserted in the groove of the socket end and then the spigot end shall be pushed into the socket. Flanged joints shall be made water tight with gasket, nuts and bolts.

Pipelines passing through wall, floor or roof shall be provided with black steel pipe sleeve. The annular space between the pipe sleeve and the outside diameter of the pipe shall not be

less than 12mm. The space shall be filled with approved packing and sealant. Pipelines passing through water retaining structure shall be provided with black steel puddle (anchor) flange. The Contractor shall submit to the Engineer for approval of shop drawings showing the dimensions and thicknesses of the sleeves and puddle (anchor) flanges before installation.

b). Below Ground (Buried)

Pipelines shall be laid in accordance with the British Code of Practice CP 2010 (Part 2) or American Water Works Association Manual M23 in trenches on a bed of well compacted graded material as specified on the drawings, as specified in the bill of quantities or as directed by the Engineer true to the location, alignment and grade as shown on the drawings and/or as directed by the Engineer.
Backfilling shall be carried out in the specified sequence. Recesses shall be excavated in the bottom and sides of the trench to accommodate fittings and appurtenances. These recesses shall be filled with specified selected bedding material and shall be well compacted manually. Great care shall be taken to avoid abrasion with the pipes. Pipelines that have grades or joints disturbed or dislocated after laying shall be removed and re-laid to the satisfaction of the Engineer.
Pipes fittings and specials shall be lowered into the trench with great care with tackle, shear legs, mobile crane or by methods approved by the Engineer. When lifting gear is used positioning of sling to ensure a proper balance shall be checked when the pipe is just clear of the ground.

All construction debris shall be removed from the inside of the pipe before a joint is made. When the laying is not in progress the open end of the pipeline shall be fitted with a temporary end closure, as approved by the Engineer.

Small changes in direction may be made by deflecting the last laid pipe after the joint has been made. If the alignment requires deflections in excess of specified limit, bends or a number of short lengths of pipes shall be used.

8. TESTING

8.1. General

All sewers built under this contract shall be tested for infiltration or exfiltration as specified below. The tests shall be made at time selected or approved by the Engineer. Sections of the completed sewer shall be isolated and measurements of the infiltration or exfiltration shall be made by approved methods.

8.2. Infiltration Tests

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

8.3. Exfiltration Tests

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

i). After isolation of sewer section, it shall be filled with water to a level which is 3 ft. minimum above the crown of the sewer at the higher end of the isolated section under test.

ii). The duration of the exfiltration test shall be one hour after the filling with water has been completed.

iii). Determination of the amount of exfiltration shall be made by measuring the total loss of volume of water in the manholes.
iv). The amount of exfiltration over a 24 hour period will then be calculated from the measured logs of volume during the test observation period.

8.4. Allowable Infiltration or Exfiltration

The calculated amount of infiltration or exfiltration over a 24 hour period shall not exceed 500 gallons per inch of pipe diameter per mile of sewer which rate shall be applied to the actual sewer size and length tested to determine the allowable infiltration or exfiltration over the 24 hour period.

If the measured infiltration or exfiltration exceeds the specified allowable limit, then the Contractor shall locate the points of leakage and make necessary repairs as to reduce the leakage to less than the permissible maximum stated above.

8.5. Cleaning of Sewer Lines

The contractor shall clean all the sewer lines at no extra cost with the method approved by the site Engineer prior to handing it over to the Owner.

9. MEASUREMENT OF POLYETHYLENE PIPE

Measurement of acceptable completed works of uPVC pipes and pipe strainer including fittings will be made on the basis of actual length in meter of pipes provided, installed in position, tested, and commissioned as specified herein, in bill of quantities, as shown on the drawings, and/or as directed by the Engineer.

Payment

Payment will be made for the acceptable measured quantity of uPVC pipes and including fittings at the unit rate per meter quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

VALVE

1. SLUICE VALVE

The gate face rings shall be securely pegged over their full circumference. Valves of 450 mm and above shall be provided with a thrust bearing arrangement for ease of operation. They shall also have renewable channel and shoe linings. The gap between the shoe and channel shall be limited to 1.5 mm. Alternatively, valve of diameter 450 mm and above may be provided with a gear arrangement for ease of operation. The operation gear of all valves shall be such that they can be opened and closed by one man against an unbalanced head 15 % in excess of the maximum specified rating. Valve and gearing shall be such as to permit manual operation in a reasonable time and not to exceed a required rim pull of 400 N. All hand wheels shall be arranged to turn in a clock wise direction for opening and counter clockwise for closing. These directions shall be indicated on the hand wheels. All valves shall be rated for not less than PN 10.

Material of Construction

Body, Bone, Wedge	:	CI conform to ASTM A48/A48M
Spindle	:	SS AISI 431
Seat Ring, Wedge Ring	:	SS AISI 431
Back seat Bush	:	Bronze Confirming to international standard

Parameters

Type	:	Non-rising spindle
Nominal pressure	:	2 times working pressure in pipeline
Nature of operation	:	Horizontal/vertical
Applicable code	:	As per international codes
Tests	:	Acceptance tests as per international codes

SEWER NETWORK

RCC PIPE

1. SCOPE

The work covered by this section of the specifications consists in furnishing all reinforced and non-reinforced concrete pipes, plant, labour, equipment, appliances and materials and in performing all operations required for installing and testing the sewer pipes in strict accordance with the specifications of this section and the applicable drawings and subject to the terms and conditions of the contract.

2. MATERIALS

All materials used in the manufacture of reinforced cement concrete pipes for use under this contract shall conform to ASTM Designation C-76-79 and C-14 latest revision and also with the following specifications.

2.1. Cement

The Portland cement to be used in the manufacture of reinforced concrete pipe shall conform to the requirement of ASTM Designation C 150 (latest revision).

2.2. Aggregates

The coarse/fine aggregate to be used in the manufacture of concrete pipes to be furnished and installed under this contract shall be generally in accordance with the provisions of section of these specifications.

2.3. Water

Water to be used in the manufacture of pipes shall be approved by the Engineer.

2.4. Steel Reinforcement

The material will conform to the specifications contained in section of these specifications.

3. CLASSES OF SEWER PIPE

The reinforced and non reinforced cement concrete pipes to be furnished and installed under this contract shall conform to ASTM-C-14-Class-III for pipe sizes 8" and 10" and ASTM C-76 Class-II, wall 'B' for pipe sizes greater than 10".

4. BASIS OF ACCEPTANCE

Acceptance of reinforced cement concrete pipes will be on the basis of three edge bearing and material tests as per ASTM Designation C-76-79 or latest revision and inspection of manufactured pipes for defects and imperfections. The Contractor shall bear the cost of such tests and pay fees etc., and also pay for the carriage of such samples and all other expenses contingent to tests.

5. JOINTS FOR CONCRETE PIPE SEWERS

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

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

The rubber gasket joints shall conform to all applicable requirements of the latest revision of ASTM Designation C443, entitled "Joints for Circular Concrete Sewer and Culvert pipe, using Flexible Watertight Rubber Type Gaskets" except that the test pressure and not exceed 10 feet

of head at which the completed sewers shall meet the in- filtration or ex-filtration limits set forth hereinafter. The groove end of tongue and groove pipes shall have atleast one line of wire reinforcement of 8 gauge size placed in the centre of the groove.

The rubber gasket shall be installed on the pipe in accordance with the instructions of the gasket manufacturer. In general the gaskets shall be pre-assembled to the pipe at the pipe manufacturing plant. The pipes shall be handled with special care at all times to prevent damage to the ~i pipe ends. A lubricant shall be used for jointing the pipes as recommended by the rubber gasket manufacturer.

Care shall be taken to avoid contamination of the gasket and lubricates surfaces with earth or other undesirable material during installation.

For either tongue and groove or bell and spigot pipes, I mechanical means shall be used to pull the pipe home for all sizes of 8" or larger diameter in accordance with the recommendations of the rubber gasket manufacturer.

6. INSTALLATION

6.1 Handling of Pipes

Concrete sewer pipes shall be handled with special care at all times during the manufacture, while transporting to the site of work, and while installing. Each pipe shall be carefully inspected before being laid and no cracked, broken or defective pipe shall be used in the work. Chipping of the tongue and groove or bell and spigot pipe ends, which in the Engineer's opinion may cause defective joints, shall be sufficient cause for the rejection or any concrete pipe.

6.2 Excavation and Backfill

The excavation and backfill for sewer installations shall be as specified in applicable provisions of these technical specifications and will be paid for under separate contract items as classified or and as per applicable Variation Order.

6.3 Placing of Bedding

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

6.4 Laying of Sewers

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

Each length of sewer pipe shall be checked for cracks and defects before placing in the line. Defects which in the opinion of the Engineer indicate imperfect placing, shall make the pipe liable to rejection. Each pipe shall be placed carefully to line and grade and in close contact with adjoining pipe. These specifications require rejection of the work if the sewer invert varies as much as much from the proper elevation. As shown on Drawings, the bottom of the trench must be shaped to fit the pipe barrel, with holes left for the bells. If excavation has been carried below the correct grade, refilling must be done with satisfactory materials as approved by the Engineer at no extra cost.

The concrete pipe joints shall be of the types designated above and shall be made in accordance with the aforesaid specifications.

When laying progress, the open pipe shall be closed with wooden plug to keep out foreign matter.

7. TESTING OF SEWER LINES

7.1. General

All sewers built under this contract shall be tested for infiltration or exfiltration as specified below. The tests shall be made at time selected or approved by the Engineer. Sections of the completed sewer shall be isolated and measurements of the infiltration or exfiltration shall be made by approved methods.

7.2. Infiltration Tests

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

7.3. Exfiltration Tests

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

i). After isolation of sewer section, it shall be filled with water to a level which is 3 ft. minimum above the crown of the sewer at the higher end of the isolated section under test.

ii). The duration of the exfiltration test shall be one hour after the filling with water has been completed.

iii). Determination of the amount of exfiltration shall be made by measuring the total loss of volume of water in the manholes.

iv). The amount of exfiltration over a 24 hour period will then be calculated from the measured logs of volume during the test observation period.

7.4. Allowable Infiltration or Exfiltration

The calculated amount of infiltration or exfiltration over a 24 hour period shall not exceed 500 gallons per inch of pipe diameter per mile of sewer which rate shall be applied to the actual sewer size and length tested to determine the allowable infiltration or exfiltration over the 24 hour period.

If the measured infiltration or exfiltration exceeds the specified allowable limit, then the Contractor shall locate the points of leakage and make necessary repairs as to reduce the leakage to less than the permissible maximum stated above.

7.5. Cleaning of Sewer Lines

The contractor shall clean all the sewer lines at no extra cost with the method approved by the site Engineer prior to handing it over to the Owner.

FORM OF BID
AND
APPENDICES TO BID

FB-1

FORM OF BID

Bid Reference No. **SLT-115**

Director General
Malir Development Authority
Bungalow No. G-4/B
Block-17, Gulshan-e-Iqbal,
Karachi

SUBJECT: CONSTRUCTION OF ROAD, DRAIN, SEWERAGE NETWORK AND WATER SUPPLY IN SECTOR 20-D IN SHAH LATIF TOWN SCHEME 25-A. CONTRACT NO. SLT-115

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.

FB-2

Dated this _____day of_____2015

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_____

FORMS

BID SECURITY

PERFORMANCE SECURITY

CONTRACT AGREEMENT

MOBILIZATION ADVANCE GUARANTEE

BA-1
APPENDIX - A TO BID

SPECIAL STIPULATIONS

		Clause No.	
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	Up to 10% of contract price. Total amount including performance security and retention money deducted from bills should not exceed 10% of contract price stated in the Letter of Acceptance.
3.	Time for Furnishing Programme	14.1	Within 42 days from the date of receipt of Letter of Acceptance.
4.	Minimum amount of Third Party Insurance	23.2	Rupees one million (Rs. 1,000,000) per occurrence with number of occurrences unlimited.
5.	Time for Commencement	41.1	Within Fourteen (14) days from the date of receipt of Engineers Letter to commence which shall be issued within Fourteen (14) days after signing of Contract Agreement
6.	Time for Completion	43.1 48.2	09 months from the date of receipt of Engineer's notice to commence
7.	a). Amount of Liquidated Damages	47.1	0.1 % of contract price for each day of delay in completion of works subject to a maximum of 10% of contract price stated in the Letter of Acceptance
	b). Amount of Bonus	47.3	0.05 % for each day the Works are completed before the specified completion date of the Works subject to a maximum of 5% of Contract Price stated in the Letter of Acceptance.
8.	Defects Liability Period	49.1	364 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	Total Contract Price stated in the Letter of Acceptance / (time for completion in months x 3)
12.	Time of Payment from delivery of Engineer's Interim Payment Certificate to the Employer.	60.10	30 days
13.	Mobilization Advance (Interest Free)	60.12	10% of Contract Price stated in the Letter of Acceptance

Initials of Signatory of Bid _____

BB-1
APPENDIX-B TO BID

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	----------
----------	----------
----------	----------

BC-1
APPENDIX-C TO BID

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:

Cost Element	Description	Weightages	Applicable index
1	2	3	4
(i)	Fixed Portion	0.62	
(ii)	Local Labour	0.10	Government of Pakistan (GP) Federal Bureau of Statistics (FBS) Monthly Statistical Bulletin.
(iii)	Cement	0.05	" " "
(iv)	Reinforcing Steel	0.05	" " "
(v)	High Speed Diesel (HSD)	0.13	As per the rates fixed by Oil & Gas Regulatory Authority (OGRA)
(vi)	Bitumen	0.05	As per the rates of Attock Oils (Pvt.) Ltd.
	Total	**1.000**	

Notes:

1) Indices for (ii) to (iv) are taken from the Government of Pakistan Federal Bureau of Statistics, Monthly Statistical Bulletin, (v) is taken from Oil & Gas Regulatory Authority (OGRA) and (vi) is taken from Attock Oils (Pvt.) Ltd rates. 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) The wightages have been determined for fixed portion considering cost elements having cost impact of 5% or more in this specific project.

BD-1
Appendix-D to Bid

BILL OF QUANTITIES

A. Preamble

1. The Bill of Quantities shall be read in conjunction with the Conditions of Contract, Specifications and Drawings.

2. The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work executed and measured by the Contractor and verified by the Engineer and valued at the rates and prices entered in the priced Bill of Quantities, where applicable, and otherwise at such rates and prices as the Engineer may fix in accordance with provisions of the Contract.

3. The rates and prices entered in the priced Bill of Quantities shall, except insofar as it is otherwise provided under the Contract include all costs of Contractor's plant, labour, supervision, materials, execution, insurance, profit, taxes and duties, together with all general risks, liabilities and obligations set out or implied in the Contract. Furthermore all duties, taxes and other levies payable by the Contractor under the Contract, or for any other cause, as on the date 28 days prior to deadline for submission of Bids, shall be included in the rates and prices and the total Bid Price submitted by the Bidder.

4. A rate or price shall be entered against each item in the priced Bill of Quantities, whether quantities are stated or not. The cost of items against which the Contractor will have failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities.

5. The whole cost of complying with the provisions of the Contract shall be included in the items provided in the priced Bill of Quantities, and where no items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related items of the Works.

6. General directions and description of work and materials are not necessarily repeated nor summarised in the Bill of Quantities. References to the relevant sections of the Bidding Documents shall be made before entering prices against each item in the priced Bill of Quantities.

7. Provisional sums included and so designated in the Bill of Quantities shall be expended in whole or in part at the direction and discretion of the Engineer in accordance with Sub-Clause 58.2 of Part I, General Conditions of Contract.

SUMMARY
BILL OF QUANTITIES

Client / Owner : Malir Development Authority (MDA)
Name of Project : Infrastructure Development Works at Shah Latif Town, Scheme 25-A
Name of Work : Construction of Road, Drain, Sewerage and Water Supply in Sector 20-D
Location : Shah Latif Town
Contract No. : SLT - 115

Sr. No.	Description	Amount Rs.
A	Road & Drainage Work	
B	Water Supply Lines	
C	Sewer Lines	
	GrandTotal (Rs.)	

(Rupees_____)
In Words

_____
CONTRACTOR

SUMMARY
BILL OF QUANTITIES

Client / Owner : Malir Development Authority (MDA)
Name of Project : Infrastructure Development Works at Shah Latif Town, Scheme 25-A
Name of Work : Construction of Road, Drain, Sewerage and Water Supply in Sector 20-D
Sub-Head : Construction of 60' & 40' Wide Road
Location : Shah Latif Town
Contract No. : SLT - 115

Sr. No.	Description	Amount Rs.
A - Road & Drainage Work		
Ai	Road Work.	
Aii	Drainage Work.	
	Total Amount (Rs.)	

(Rupees_____)
In Words

_____
CONTRACTOR

BILL OF QUANTITIES

Client / Owner : Malir Development Authority (MDA)
Name of Project : Infrastructure Development Works at Shah Latif Town, Scheme 25-A
Name of Work : Construction of Road, Drain, Sewerage and Water Supply in Sector 20-D
Sub-Head : Construction of 60' & 40' Wide Road
Location : Shah Latif Town
Contract No. : SLT - 115

Sr. No.	Particulars	Qty.	Unit	Rate		Amount (Rs.)
				In Figure	In Words	
Ai - Road Work						
1	Clearing and grubbing the site by cutting, uprooting and removing all rubbish and shrubs including disposal to (outside limits) designated places.	97,450	Sft.			
2	Compaction of Natural Ground upto a depth of 20cm (8inch) below the natural ground level compacted upto 90% density modified AASHTO.	129,150	Sft.			
3	Earth work excavation upto required level in ordinary soil and using the excavated earth in embankment including all lead and lift, dressing, leveling of earth to design section and compaction by sheep foot / power roller with optimum moisture content 95-100% of modified A.A.S.H.T.O dry density, complete as per the instructions of Engineer.	89,000	Cft.			
4	Earth work for embankment from borrow pits including laying in 6 inch layers, clod breaking, ramming, dressing & compaction by sheep foot / power roller with optimum moisture content 95-100% of modified A.A.S.H.T.O dry density complete, upto an average lead of 5 miles and lift upto 5 ft (in ordinary soil). (Compacted depth will be considered for payment)	66,500	Cft.			
5	Preparing sub-grade including earth excavation or filling to an average depth of 9 inches dressing to camber and consolidation with power roller.	45,720	Sft.			
6	Preparing sub-base by supplying and spreading stone metal 1-1/2" - 2" gauge of approved quality from approved quarry in required thickness to proper camber and grade including hand packing filling voids with 10 Cft. screening & non plastic quarry fines of approved quality and gauge from approved source, watering & compacting to achieve 98-100% density as per modified AASHTO specification. Compacted thickness will be considered for payment (Rate includes all cost of materials T&P and carriage upto site).	39,870	Cft.			
7	Preparing base course i/c supplying and spreading stone metal of approved quality properly graded to maximum size of 1-1/2" in required thickness to proper camber and grade including supplying and spreading 15 Cft screenings and non plastic quarry fines, filling depressions with stone metal after initial rolling-including watering and compaction the same so as to achieve 100% density as per modified AASHTO specifications, (Rate includes providing and using templates, camber plates, screens, forms as directed. Compacted thickness will be considered for payment) (Rate includes all cost of materials T&P and carriage upto site).	79,740	Cft.			

Sr. No.	Particulars	Qty.	Unit	Rate		Amount (Rs.)
				In Figure	In Words	
8	Applying priming coat or tack coat with approved binder at the required rate including cleaning the road surface thoroughly, heating to the required temperature and spraying the binder with pressure as directed etc. complete. (Priming Coat)	106,310	Sft.			
9	Providing Bitumen for Prime Coat. i/c cartage upto site of work.	11	Ton.			
10	Laying mechanically to proper line and grad 1-1/2" thick plant mixed Asphalt Concrete specified formula according to job mixed formula approved by the Engineer incharge rolling and finishing to design proper grade line level and comber etc, (Machinery with POLs cost of material carriage etc. all inclusive.)	106,310	Sft.			
11	Pavement marking in reflective tharmo plastic paint for lines of 6" width.	13,300	Rft.			
12	Cement concrete plain including placing compacting, finishing and curing complete including screening and washing of stone aggregate without shuttering. Ratio 1:4:8. (Under Kerb Blocks)	3,020	Cft.			
13	Cement concrete plain including placing compacting, finishing and curing complete including screening and washing of stone aggregate using Deodar wood shuttering. Ratio 1:3:6. (For Kerb Block)	2,220	Cft.			
14	Providing & fixing in proper position pre-cast cement concrete road kerb block industrial make Envicrete or any other of approved equivalent quality having minimum cylindrical strength of 3000 psi with a mix not leaner than 1:1-1/2:3 (1 cement : 1-1/2 sand : 3 stone crushed), using SR cement, size 18" (450mm) deep 12" (300mm) long 4" (100mm) thick on top and 6" (150mm) thick at bottom of approved shape & section, dry mix, hydraulically compressed, steam cured. Laying & jointing with 3/4" (20mm) thick cement sand mortar (1:3), deep ruled pointing on front and top and flush on back side i/c. curing etc. complete as per the directions of Engineer-in-charge.	6,190	Rft.			
15	Providing and fixing in proper positino precast cement concrete road Gutter Kerb industrial make of approved quality with cement concrete class A1, using SR cement, size 450mm x 300mm x 300mm. Laying and jointing over 2" thick C.M 1:3 base & jointing with 12mm (1/2)" thick, 1:3 cement Sand mortar deep ruled pionting on sides i/c curing etc. complete as per directions of the Engineer.	2,670	Rft.			
Pipe Sleeves						
16	Excavation in foundation of building, bridges and other structures including dagbelling dressing, refilling around structure with (suitable) excavated earth watering, ramming complete and disposal of surplus excavated materials to designated area i/c all lead & lift.	3,680	Cft.			

Sr. No.	Particulars	Qty.	Unit	Rate		Amount (Rs.)
				In Figure	In Words	
17	Providing and laying RCC pipe of ASTM C-76-62T/C-76-70 class-II wall B. and fixing in trenches including cutting, fitting and jointing with rubber rings i/c testing with water to specified pressure. (15 inch dia).	300	Rft.			
18	Reinforced cement concrete work including all labour and material except the cost of steel reinforcement and its labour for bending and binding which will be paid separately. This rate also includes all kinds of forms moulds, lifting shuttering curing rendering and finishing the exposed surface (including screening and washing of shingle). Precast reinforced cement concrete slabs at end for closing of sleeves. (Ratio 1:2:4)	22	Cft			
19	Erecting and fixing in position precast cement concrete or stone slab in roofs, lintels, end of pipe sleeves, etc lift upto 20 feet including all charges. (For slabs at end of sleeve)	22	Cft			
20	Fabrication & supplying of steel reinforcement for cement concrete including cutting, bending, laying in position, making joints and fastenings including cost of binding wire (also includes removal of rust from bars. (Using Tor Bars. Laps not shown in the drawings will not be paid) (For slabs at end of sleeve)	1	Cwt.			
21	Back filling of trenches after laying of pipe with approved granular materials laid in layers not exceeding 9" in depth and compacted to the required density by approved mechanical means as per design and specifications including watering, with all lead and lift, etc complete	3,310	Cft.			
Soil Investigation						
21	Excavation of test pits upto a depth of 1 meter below existing ground level 3 Nos. at different locations identified by the Engineer and preparing pit log as following:- i) Recording layer thickness of Base course, sub-base course and soil strata as per observation. ii) Field density test to assess in situ density of the natural soil. Collection of representative sample of undisturbed soil to classify the soil type and to carryout following tests; (iii) Atterberg limits which include liquid limit, plastic limit and plasticity indes. (iv) Los Angeles Abrasion Test. (v) Sodium Sulphate Soundness Test (vi) Compaction / CBR Test	1	Job.			

Sr. No.	Particulars	Qty.	Unit	Rate		Amount (Rs.)
				In Figure	In Words	
	Note:- a) Actual execution will be taken in hand on receipt of result of pit logs and finalization of pavement design. 'b) The cost of required standard proctor and determination of specific gravity of embankment material deemed to be included in the rate.					
					Total Amount Rs.	

(Rupees _____)
In Words

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CONTRACTOR

BILL OF QUANTITIES

Client / Owner : Malir Development Authority (MDA)
Name of Project : Infrastructure Development Works at Shah Latif Town, Scheme 25-A
Name of Work : Construction of Road, Drain, Sewerage and Water Supply in Sector 20-D
Sub-Head : Construction of Drain
Location : Shah Latif Town
Contract No. : SLT - 115

Sr. No.	Particulars	Qty.	Unit	Rate		Amount (Rs.)
				In Figure	In Words	
Aii - Drainage Work						
Note:-	***All Cement Concrete in contact with earth to be carried out with S.R. Cement*** ***Fairface steel formwork is to be used in all the items of R.C.C***					
1	Earth work excavation in irrigation channels, drains etc, dressed to designed section grades and profiles excavated material disposed off and dressed within 50 ft. lead.	1,737	Cft.			
2	Cement concrete placing including placing compacting, finishing and curing, complete (including screening and washing at stone aggregate without shuttering. Ratio (1:2:4)	282	Cft.			
3	Errection and removal of centering for R.C.C or plain cement concrete works of Partal wood.	919	Sft.			
4	Providing RCC pipes and Collars of class "B" and fixing in trench. i/c cutting, fitting and jointing with maxphalt composition and cement mortar (1:1) i/c testing with water to a head of 22.5 metter or 75 ft. 18" dia.	121	Rft.			
5	Providing R.C.C chambers 3' x 3' ft (inside dimensions) x 3' ft deep, R.C.C 1:2:4 slab 6 inches thick, 8 inches RCC thick walls, RCC 1:2:4 8" thick in foundation (with 5 lbs of steel per Cft), 1 inch thick CC 1:2:4 flooring, 1/2 inch thick cement plaster 1:3 to all inside wall surfaces and to top including providing and fixing foot rest at every one foot beyond 2-1/2 feet depth, curing, excavation, backfilling and disposal of surplus earth etc complete. (including cost of steel reinforcement)	4	Nos.			
6	Dismantling of existing asphalt concrete road including base, sub-base and disposal of dismantled materials to designated placed.	781	Sft.			
7	Making & fixing grating in opening including fixing at site with flat iron 2" x 3/8" and 3/4' sq. bars at 4" center to center etc, complete in all respect.	344	Sft.			

Sr. No.	Particulars	Qty.	Unit	Rate		Amount (Rs.)
				In Figure	In Words	
8	Back filling of trenches after laying of pipe with approved granular materials laid in layers not exceeding 9" in depth and compacted to the required density by approved mechanical means as per design and specifications including watering, with all lead and lift, etc complete	875	Cft.			
					Total Amount Rs.	

(Rupees _____)

In Words

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CONTRACTOR

BILL OF QUANTITIES

Client / Owner : Malir Development Authority (MDA)
Name of Project : Infrastructure Development Works at Shah Latif Town, Scheme 25-A
Name of Work : Construction of Road, Drain, Sewerage and Water Supply in Sector 20-D
Sub-Head : Water Supply Network
Location : Shah Latif Town
Contract No. : SLT - 115

Sr. No.	Particulars	Qty.	Unit	Rate		Amount (Rs.)
				In Figure	In Words	
B - Water Supply Network						
1	Excavation for pipe lines in trenches, and pits in all kind of soil of murum i/c trimming and dressing sides to true alignment and shape levelling of beds of trenches to correct level and grade, cutting joint holes and disposal of surplus earth as directed by Engineer Incharge, providing fence guard, lights, flags and temporary crossing for non vehicular trafic where ever required i/c all lead and lift.	56,880	Cft.			
2	Providing uPVC pipes of Class 'B" fixing in trench i/c cutting, fitting and jointing with solvent cement i/c testing with water to a head of 61 meters or 200 ft.					
a)	uPVC pipe dia 4" class "B"	4,200	Rft.			
b)	uPVC pipe dia 6" class "B"	1,740	Rft.			
c)	uPVC pipe dia 8" class "B"	790	Rft.			
3	Cement concrete plain including placing compacting, finishing and curing complete including screening and washing of stone aggregate without shuttering. Ratio 1:2:4. (For thrust blocks).	170	Cft.			
4	Errection and removal of centering for R.C.C or plain cement concrete works of Partal wood. (for thrust blocks)	420	Sft.			
5	Refilling the excavated stuff in trenches 6" thick layers including watering, ramming to full compaction, etc. complete	47,760	Cft.			
6	Providing R.C.C chambers 3' x 3' ft (inside dimensions) x 6' ft deep as per approved design for sluice valves 3 inches to 12 inches dia with 18x18 inches inside size cast iron cover and frame (wt = 1 cwt. or 50 kg) fixed in R.C.C 1:2:4 slab 6 inches thick (with 5 lbs of steel per Cft), 6 inches thick block masonry walls set in 1:6 C.M, RCC 1:2:4 6" thick in foundation, 1 inch thick CC 1:2:4 flooring, 1/2 inch thick cement plaster 1:3 to all inside wall surfaces and to top including providing and fixing foot rest at every one foot beyond 2-1/2 feet depth, curing, excavation, backfilling and disposal of surplus earth etc complete. (including cost of steel reinforcement)	30	Nos.			
6a	Add for extra depth beyond of 6 ft and deduct for depth less than 6 ft at the same rate.	95	Inch.			

Sr. No.	Particulars	Qty.	Unit	Rate		Amount (Rs.)
				In Figure	In Words	
7	Supplying & stacking with all lead & lift Course sand of approved quality and grading & filling in trenches under pipe as per drawing & direction of Engineer. (compacted depth will be considered for payment)	7,900	Cft			
8	Providing and fixing Cast Iron Sluice Valves of approved quality (made in China) with flanged ends & short pieces if required to each valve, of approved quality and make, complete with bolts and nuts, including the cost of insertion rubber washers, valves to stand specified test pressure, the sluice valve is to be removed after fixing/checking and handing over to department's store. Opening of pipe ends to be closed with ordinary Flanges of required dia, as directed by the Engineer.					
a)	For 4" dia pipe	1	Nos.			
b)	For 6" dia pipe	1	Nos.			
c)	For 8" dia pipe	1	Nos.			
9	Providing & fixing uPVC Equal Tee all end turned.					
a)	For 4" Dia pipe	1	Nos.			
b)	For 6" Dia pipe	1	Nos.			
c)	For 8" dia pipe	1	Nos.			
10	Providing & fixing uPVC unequal Tee all end turned.					
a)	Dia 6" X 4"x 6"	15	Nos.			
b)	Dia 8" X 4"x 8"	6	Nos.			
11	Providing & fixing uPVC elbows all end turned.					
a)	Dia 8" x 6"	3	Nos.			
b)	Dia 6" x 6"	3	Nos.			
c)	Dia 4" x 4"	17	Nos.			
12	Providing & fixing uPVC reducers all end turned.					
a)	Dia 8" x 6"	4	Nos.			
b)	Dia 8" x 4"	5	Nos.			
c)	Dia 6" x 4"	15	Nos.			
	Service Connection					
13	Making 1/2" dia service connection from uPVC pipe line with and including cost of PP male threaded adopter with end cap for 1/2" dia service connection. PP saddle clamp suitable for uPVC pressure pipe, with and i/c the cost of excavation, providing and fixing G.I plug to plug the connection, back filling the trench with suitable granular material as per the directions of the Engineer.					
a)	Service Connection form 4" dia pipe line	30	Nos.			
b)	Service Connection form 6" dia pipe line	40	Nos.			

Sr. No.	Particulars	Qty.	Unit	Rate		Amount (Rs.)
				In Figure	In Words	
14	Providing & Laying in trenches 3/4" dia (20 mm) Polyethylene water pipe line including cutting, fitting, jointing, connecting with adopter for making connection at one end & plugging at other end as per the directions of the Engineer.	800	Rft.			
					Total Amount Rs.	

(Rupees _____)
In Words

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CONTRACTOR

BILL OF QUANTITIES

Client / Owner : Malir Development Authority (MDA)
Name of Project : Infrastructure Development Works at Shah Latif Town, Scheme 25-A
Name of Work : Construction of Road, Drain, Sewerage and Water Supply in Sector 20-D
Sub-Head : Sewer Network
Location : Shah Latif Town
Contract No. : SLT - 115

Sr. No.	Particulars	Qty.	Unit	Rate		Amount (Rs.)
				In Figure	In Words	
C - Sewer Network						
Note: 1.	***All Cement Concrete in contact with earth to be carried out with S.R. Cement***					
2.	***Fairface steel formwork is to be used in all the items of R.C.C***					
1	Excavation for pipe lines in trenches, and pits in gravely soils i/c trimming and dressing sides to true alignment and shape leveling of beds of trenches to correct level and grade, cutting joint holes and disposal of surplus earth after backfilling in trenches, in the depression or as directed by the engineer with in the boundaries of the scheme, providing fence guard, lights, flags and temporary crossings for non vehicular traffic where ever required including all lead & lift upto 5ft.	39,870	Cft.			
2	Excavation for pipe lines in trenches, and pits in gravely soils i/c trimming and dressing sides to true alignment and shape leveling of beds of trenches to correct level and grade, cutting joint holes and disposal of surplus earth after backfilling in trenches, in the depression or as directed by the engineer with in the boundaries of the scheme, providing fence guard, lights, flags and temporary crossings for non vehicular traffic where ever required including all lead & lift 5ft to 8ft.	7,980	Cft.			
3	Refilling the excavated stuff in trenches in 6" thick layer including watering, ramming, to full compaction etc complete.	61,540	Cft.			
4	Cement concrete plain including placing compacting, finishing and curing, complete (including screening and washing of stone aggregate without shuttering. Ratio 1:4:8. (for Manhole & Chambers)	430	Cft.			
5	Reinforced cement concrete work including all labour and material except the cost of steel reinforcement and its labour for bending and binding which will be paid separately. This rate also includes all kinds of forms moulds, lifting shuttering curing rendering and finishing the exposed surface (including screening and washing of shingle). (Ratio 1:2:4) (a) R.C. work in roof slab, beams column rafts, lintels and other structural members laid in situ or precast laid in position completes in all respects.(For Manhole Walls, Base & Chambers)	3,430	Cft.			

Sr. No.	Particulars	Qty.	Unit	Rate		Amount (Rs.)
				In Figure	In Words	
6	Reinforced cement concrete work including all labour and material except the cost of steel reinforcement and its labour for bending and binding which will be paid separately. This rate also includes all kinds of forms moulds, lifting shuttering curing rendering and finishing the exposed surface (including screening and washing of shingle). (Ratio 1:2:4) (b) Precast reinforced cement concrete in columns, beams, lintel, stair cases, shelves, etc. (For Manhole & Chamber Cover)	110	Cft.			
7	Cement concrete plain including placing compacting, finishing and curing, complete (including screening and washing of stone aggregate without shuttering. Ratio 1:2:4.(for Benching of Manhole)	500	Cft.			
8	Fabrication & supplying of steel reinforcement for cement concrete including cutting, bending, laying in position, making joints and fastenings including cost of binding wire (also includes removal of rust from bars. (Using Tor Bars)(Laps not shown in the drawings will not be paid)	190	Cwt.			
9	Erecting fixing in position precast cement concrete or slab in roofs or lintels, etc., lift upto 20 ft including all charges.	110	Cft.			
10	Cement concrete plain including placing compacting, finishing and curing, complete (including screening and washing of stone aggregate without shuttering. Ratio 1:3:6. (For Encasing pipe at junction of manhole)	620	Cft.			
11	Bitumen coating to plastered or cement concrete surface.	4,530	Sft.			
12	Providing & laying RCC pipe of ASTM C-76-62T/C-76-70 Class-II wall B. using S.R. Cement and fixing in trenches including cutting, fitting and jointing with rubber rings i/c testing with water to specified pressure. 09" Dia Pipe	4,330	Rft.			
13	Providing & filling coarse sand in trenches in 6" thick layers, watering and compacting to required level etc.	5,420	Cft			
					Total Amount Rs.	

(Rupees _____)

In Words

_____

CONTRACTOR

BD-8
Appendix-D to Bid

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 stagings, scaffolding, workshops and stores, portable power tools, manual plant and tools; supervision by the Contractor's staff, foremen and other supervisory personnel; and charges incidental to the foregoing.

BD-08 to BD-15 of Standard Form of Bidding Documents for Procurement of Civil Works are deleted being Not Applicable.

BE-1
Appendix-E to Bid

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	_____ days
b)	Part-A	_____ days
c)	Part-B	_____ days
d)	_____	_____ days
e)	_____	_____ days

BF-1
Appendix-F to Bid

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.]

BG-1
Appendix-G to Bid

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.]

BG-2
Appendix-G to Bid

LIST OF MAJOR EQUIPMENT

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

BH-1
Appendix-H to Bid

CONSTRUCTION CAMP AND HOUSING FACILITIES

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

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

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

1. Site Preparation (clearing, land preparation, etc.).

2. Provision of Services.

    a) Power (expected power load, etc.).
    b) Water (required amount and system proposed).
    c) Sanitation (sewage disposal system, etc.).

3. Construction of Facilities

    a) Contractor's Office. Workshop and Work Areas (areas required and proposed layout, type of construction of buildings, etc.).
    b) Warehouses and Storage Areas (area required, type of construction and layout).
    c) Housing and Staff Facilities (Plans for housing for proposed staff, layout, type of construction, etc.).

4. Construction Equipment Assembly and Preparation (detailed plans for carrying out this activity).

5. Other Items Proposed (Security services, etc.).

BI-1
Appendix-I to Bid

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

BJ-1

Appendix-J to Bid

ESTIMATED PROGRESS PAYMENTS

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

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

BK-1
Appendix-K to Bid

ORGANIZATION CHART FOR THE SUPERVISORY STAFF AND LABOUR

BL-1
Appendix-L to Bid

(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.

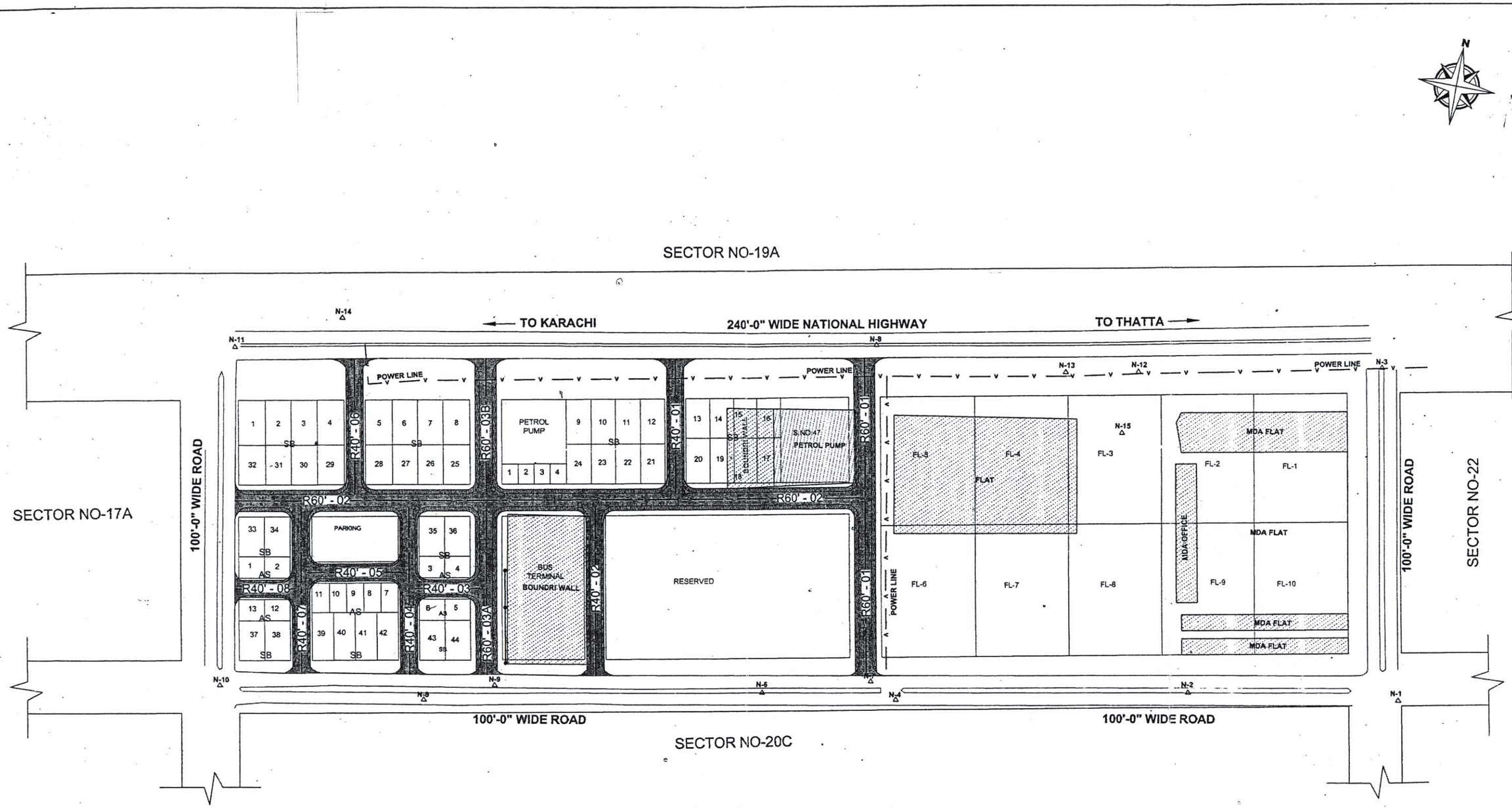
[name of Supplier] certifies that it has made and will make full disclosure of all agreements and arrangements with all persons in respect of or related to the transaction with GoP and has not taken any action or will not take any action to circumvent the above declaration, representation or warranty.

[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 time 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]

BIDDING DRAWINGS



TENDER DRAWING

NOTES

1. ALL DIMENSIONS ARE IN FEET EXCEPT WHERE OTHERWISE MENTIONED.

EXECUTING AGENCY:-

MALIR DEVELOPMENT AUTHORITY

PROJECT:-

INFRASTRUCTURE DEVELOPMENT WORK OF SHAH LATIF TOWN (SCHEME NO. 25A)

CONSULTANTS:-

OSMANI

Engineering - Architecture - Planning - Mapping - Technology

OSMANI & COMPANY (PVT.) LTD.
CONSULTING ENGINEERS-ARCHITECTS-PLANNERS

OSMANI HOUSE: 245/2-K, Block 3, PECHS, Karachi-75400, Pakistan.
Tel. (92-21) 34536007-08, 34548541-42, Fax (92-21) 34534691,
E-mail: oci-khi@osmani.com, Website: www.osmani.com
ISLAMABAD HYDERABAD LAHORE FAISALABAD

SUB PROJECT:-

SECTOR 20D

TITLE:-

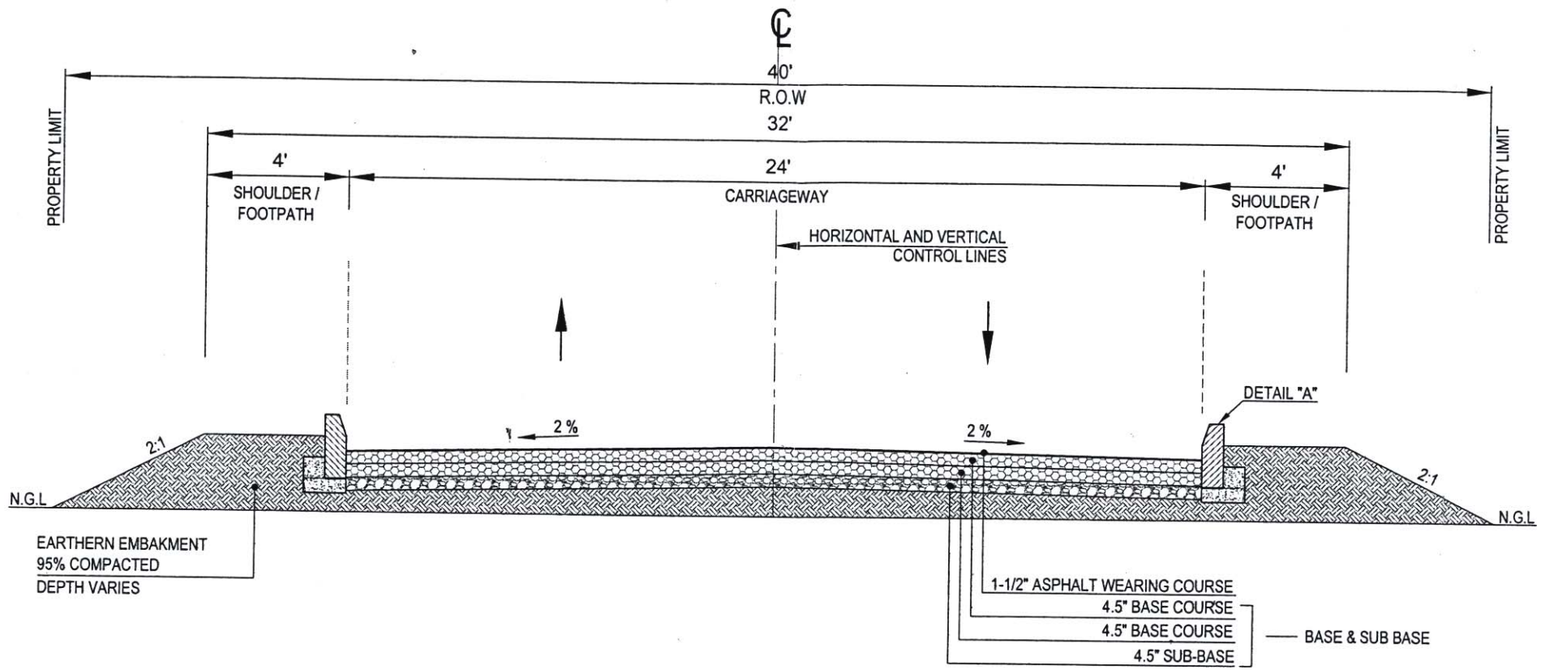
ROAD LAYOUT PLAN

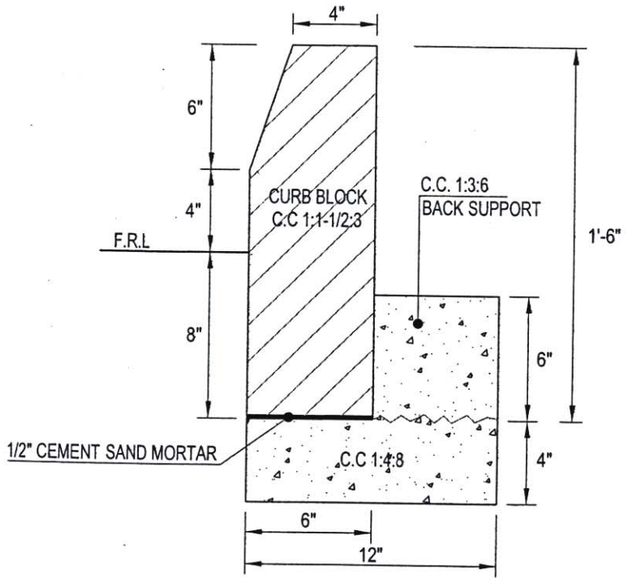
ED.NO.	DATE	DESCRIPTION	DRAWN	CHECKED
01	12-07-14	ISSUED FOR TENDER	A.K	N.R.R

DRAWN:- A.K
DESIGNED:- N.R.R
CHECKED:- N.A.S
APPROVED:-

SCALE:- N.T.S
DRAWING NO:- 1960-TRN-SEC20D-TCS-02-01
CAD FILE NAME:- 1960-TRN-ROAD LAYOUT - CAD FILE
DATE:- JULY 2014
EDITION:- 01

Drawing file path & name: L:\storage-server\..03 - Engineering\..0 - Aslam\..1960 - Shah Lat...\m\WORKING-28-05-2014\..SECTOR 20D\..1960-TRN-ROAD LAYOUT - CAD ...dwg
User and Plot Date: Aslam - Tue, 22 Jul 2014 - 10:51am





DETAIL A

UPSTAND CURB BLOCK 18"x12"x6"

TENDER DRAWING

NOTES:

1. ALL DIMENSIONS ARE IN FEET/ INCHES UNLESS STATED OTHERWISE.
2. IN EMBANKMENT / SUBGRADE, AASHTO CLASS A1, A2 AND A4 SOIL WITH 4 DAYS SOAKED CBR GREATER THAN 10% WILL BE UTILIZED. PLASTICITY INDEX SHOULD NOT EXCEED 6%.
3. IN FILL AREAS, BEFORE COMMENCING FILL OPERATION, THE EXISTING GROUND SHALL BE CLEARED / GRUBBED WHERE DIRECTED BY THE ENGINEER. THE CLEARED / GRUBBED OR ORIGINAL GROUND SURFACE SHALL BE SCARIFIED / PLOUGHED TO A DEPTH OF 8 INCHES, WATERED AND COMPACTED TO SPECIFIED DENSITY.
4. IN CUT AREAS, BEFORE LAYING SUBGRADE, THE EXCAVATED SURFACE SHALL BE SCARIFIED / PLOUGHED TO A DEPTH OF 8 INCHES, WATERED AND COMPACTED TO SPECIFIED DENSITY.
5. UNSUITABLE SOILS WHICH DO NOT MEET SPECIFIED REQUIREMENTS SHALL BE REMOVED AND REPLACED WITH SUITABLE SOILS.
6. FILL SLOPE:–

FILL HEIGHT (h) IN FT	FILL SLOPE (n)
h < 6FT	2
h > 6FT	3

7. THE EMBANKMENT / SUBGRADE SHALL BE COMPACTED TO THE DENSITY AS SPECIFIED BELOW:

DEPTH BELOW SUBGRADE LEVEL (FT–IN)	PERCENT OF MAXIMUM DRY DENSITY AS PER AASHTO T–180
UPTO 1 FT	95
> 1 FT TO 2 FT–6 IN	93
> 2 FT –6 IN	90

8. THE NEAREST ROAD EDGE LEVEL (FRL) TO BE USED AS REFERENCE FOR MEASURING DEPTH OF UTILITIES.
9. FINAL LOCATION OF ALL SERVICES SHALL BE BASED ON APPROVAL OF ENGINEER–IN–CHARGE.
10. ONLY THE SERVICES ITEMISED IN THE BILL OF QUANTITIES ARE TO BE LAID/CONSTRUCTED.
11. THE DEPTH OF SEWER LINE IS 3'–6" MINIMUM AND VARIABLE AS PER INVERT LEVELS SHOWN ON DRAWING.
12. ANY CONFLICT BETWEEN DRAWINGS SHALL BE BROUGHT TO THE ATTENTION OF ENGINEER FOR ANY CLARIFICATION BEFORE PROCEEDING WITH THE WORK INVOLVED.

EXECUTING AGENCY:-

MALIR DEVELOPMENT AUTHORITY

PROJECT:-

INFRASTRUCTURE DEVELOPMENT WORK OF SHAH LATIF TOWN (SCHEME NO. 25A)

CONSULTANTS:-

OSMANI
Engineering - Architecture - Planning - Mapping - Technology
OSMANI & COMPANY (PVT.) LTD.
CONSULTING ENGINEERS-ARCHITECTS-PLANNERS
OSMANI HOUSE: 245/2-K, Block 6, PECHS, Karachi-75400, Pakistan.
Tel. (92-21) 34536007-08, 34546541-42, Fax (92-21) 34534691,
E-mail: oci-khi@osmani.com, Website: www.osmani.com
ISLAMABAD HYDERABAD LAHORE FAISALABAD

SUB PROJECT:-

SECTOR 20D

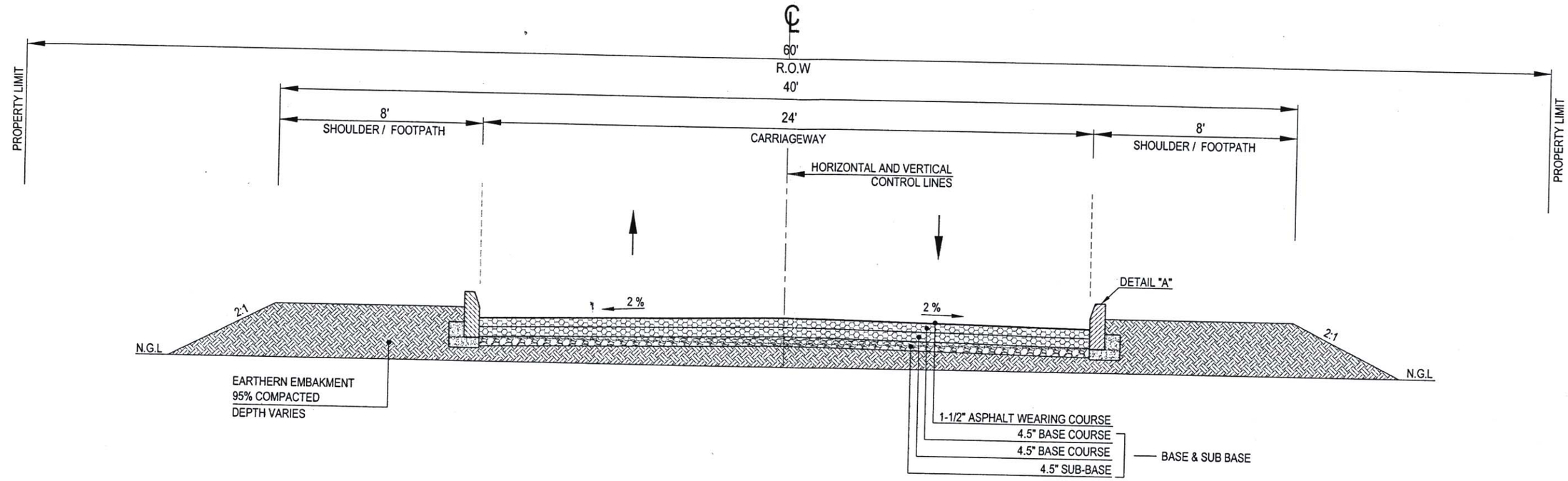
TITLE:-

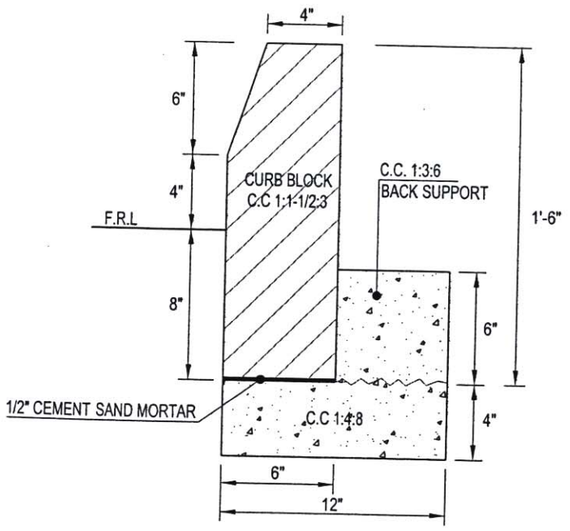
TYPICAL CROSS SECTION 40' WIDE ROAD

ED.NO.	DATE	DESCRIPTION	DRAWN	CHECKED
01	05-07-14	ISSUED FOR TENDER	A.K	N.R.R

DRAWN:- A.K
DESIGNED:- N.R.R
CHECKED:- N.A.S
APPROVED:-

SCALE:- N.T.S
DRAWING NO:- 1960-TRN-SEC20D-TCS-02-01
CAD FILE NAME:- 1960-TRN-TCS-40FT
DATE:- JULY 2014
EDITION:- 01





DETAIL A
UPSTAND CURB BLOCK 18"x12"x6"

TENDER DRAWING

NOTES:

1. ALL DIMENSIONS ARE IN FEET/ INCHES UNLESS STATED OTHERWISE.
2. IN EMBANKMENT / SUBGRADE, AASHTO CLASS A1, A2 AND A4 SOIL WITH 4 DAYS SOAKED CBR GREATER THAN 10% WILL BE UTILIZED. PLASTICITY INDEX SHOULD NOT EXCEED 6%.
3. IN FILL AREAS, BEFORE COMMENCING FILL OPERATION, THE EXISTING GROUND SHALL BE CLEARED / GRUBBED WHERE DIRECTED BY THE ENGINEER. THE CLEARED / GRUBBED OR ORIGINAL GROUND SURFACE SHALL BE SCARIFIED / PLOUGHED TO A DEPTH OF 8 INCHES, WATERED AND COMPACTED TO SPECIFIED DENSITY.
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5. UNSUITABLE SOILS WHICH DO NOT MEET SPECIFIED REQUIREMENTS SHALL BE REMOVED AND REPLACED WITH SUITABLE SOILS.
6. FILL SLOPE:–

FILL HEIGHT (h) IN FT	FILL SLOPE (n)
h < 6FT	2
h > 6FT	3

7. THE EMBANKMENT / SUBGRADE SHALL BE COMPACTED TO THE DENSITY AS SPECIFIED BELOW:

DEPTH BELOW SUBGRADE LEVEL (FT–IN)	PERCENT OF MAXIMUM DRY DENSITY AS PER AASHTO T–180
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> 1 FT TO 2 FT–6 IN	93
> 2 FT –6 IN	90

8. THE NEAREST ROAD EDGE LEVEL (FRL) TO BE USED AS REFERENCE FOR MEASURING DEPTH OF UTILITIES.
9. FINAL LOCATION OF ALL SERVICES SHALL BE BASED ON APPROVAL OF ENGINEER–IN–CHARGE.
10. ONLY THE SERVICES ITEMISED IN THE BILL OF QUANTITIES ARE TO BE LAID/CONSTRUCTED.
11. THE DEPTH OF SEWER LINE IS 3'–6" MINIMUM AND VARIABLE AS PER INVERT LEVELS SHOWN ON DRAWING.
12. ANY CONFLICT BETWEEN DRAWINGS SHALL BE BROUGHT TO THE ATTENTION OF ENGINEER FOR ANY CLARIFICATION BEFORE PROCEEDING WITH THE WORK INVOLVED.

EXECUTING AGENCY:-
MALIR DEVELOPMENT AUTHORITY

PROJECT:-
INFRASTRUCTURE DEVELOPMENT WORK OF SHAH LATIF TOWN (SCHEME NO. 25A)

CONSULTANTS:-
OSMANI
Engineering - Architecture - Planning - Mapping - Technology
OSMANI & COMPANY (PVT.) LTD.
CONSULTING ENGINEERS-ARCHITECTS-PLANNERS
OSMANI HOUSE: 245/2-K, Block 6, PECHS, Karachi-75400, Pakistan.
Tel. (92-21) 34536007-08, 34546541-42, Fax (92-21) 34534691,
E-mail: oci-khi@osmani.com, Website: www.osmani.com
ISLAMABAD HYDERABAD LAHORE FAISALABAD

SUB PROJECT:-
SECTOR 20D

TITLE:-
TYPICAL CROSS SECTION
60' WIDE ROAD

ED.NO.	DATE	DESCRIPTION	DRAWN	CHECKED
01	05-07-14	ISSUED FOR TENDER	A.K	N.R.R

DRAWN:- A.K
DESIGNED:- N.R.R
CHECKED:- N.A.S
APPROVED:-

SCALE:- N.T.S
DRAWING NO:- 1960-TRN-SEC20D-TCS-01-01
CAD FILE NAME:- 1960-TRN-TCS-60FT
DATE:- JULY 2014
EDITION:- 01

LEGEND:-

9" DIA PIPE

MANHOLE

TENDER DRAWING

240' - 0" WIDE NATIONAL HIGHWAY

2643000 N

2642750 N

2642500 N

2642250 N

6771500 E

6771750 E

6772000 E

6772250 E

6772500 E

6772750 E

6773000 E

MH-01 MH-02 MH-03 MH-04 MH-05 MH-06 MH-07 MH-08 MH-09 MH-10

1 2 3 4 5 6 7 8 32 31 30 29 28 27 26 25 SB

P-11,9" 95.95' P-12,9" 56.74' P-09,9" 54.91' P-08,9" 94.56' P-16,9" 105.50' P-15,9" 103.56' P-14,9" 31.35' P-13,9" 169.32' P-10,9" 166.57'

60' - 0" WIDE ROAD

MH-11 MH-12 MH-13 MH-14 MH-15 MH-21 MH-22 MH-23 MH-24

PETROL PUMP

9 10 11 12 24 23 22 21 1 2 3 4 SB

P-05,9" 173.01' P-04,9" 96.13' P-06,9" 126.00' P-07,9" 47.27' P-23,9" 37.60' P-22,9" 62.36' P-21,9" 74.67' P-20,9" 97.99' P-19,9" 76.88'

60' - 0" WIDE ROAD

40' - 0" WIDE ROAD

MH-16 MH-17 MH-18 MH-19 MH-20 MH-46 MH-49

13 14 15 16 20 19 18 17 SB S.NO.47

P-01,9" 91.48' P-02,9" 101.38' P-03,9" 168.39' P-17,9" 91.73' P-18,9" 53.40' P-29,9" 125.87'

P-46,9" 52.40' P-31,9" 53.85' P-30,9" 190.72' P-28,9" 147.29' P-27,9" 104.91' P-26,9" 200.12' P-25,9" 205.33' P-24,9" 46.84'

MH-31 MH-32 MH-33 MH-34 MH-35 MH-36 MH-37 MH-38 MH-39 MH-40 MH-41 MH-42 MH-43 MH-44 MH-45 MH-47 MH-48

33 34 SB 35 36 SB 3 AS 4 MH-44 MH-45 1 AS 2 MH-25 MH-26 MH-27 13 AS 12 MH-29 MH-28 MH-30 11 10 9 AS 8 7 6 AS 5 MH-42 37 38 SB 39 40 41 42 SB 43 44 SB

PARKING

40' - 0" WIDE ROAD

P-47,9" 120.84' P-32,9" 42.06' P-38,9" 104.56' P-37,9" 35.37' P-36,9" 66.23' P-35,9" 64.61' P-34,9" 67.22' P-33,9" 53.00' P-45,9" 26.06' P-48,9" 36.01' P-44,9" 102.76' P-49,9" 51.54' P-43,9" 43.61' P-42,9" 153.90' P-41,9" 42.89' P-40,9" 80.60' P-39,9" 127.38'

OUTFALL - 1

100' - 0" WIDE ROAD

BUS TERMINAL

RESERVED

FL

Executing Agency:-

MALIR DEVELOPMENT AUTHORITY

Project:-

SHAH LATIF TOWN KARACHI.

Consultants:-

OSMANI

Engineering - Architecture - Planning - Mapping - Technology

OSMANI & COMPANY (PVT.) LTD.

CONSULTING ENGINEERS-ARCHITECTS-PLANNERS

OSMANI HOUSE: 245/2-K, Block 6, PECHS, Karachi-75400, Pakistan.

Tel. (92-21) 34536007-08, 34546541-42, Fax (92-21) 34534691,

E-mail: oci-khi@osmani.com, Website: www.osmani.com

ISLAMABAD HYDERABAD LAHORE FAISALABAD

Sub Project:-

SECTOR - 20D SEWERAGE NETWORK

Title:-

LAYOUT PLAN

Ed.No.	Date	Description
01	24.07.14	ISSUED FOR TENDER

Drawn:- ARSHAD AHMED

Designed:- NOMAN

Checked:- M.AHSAN

Approved:-

Scale:- 1"=100'

Drawing No:- 1960-WAT-SWNW-LYPL-01-01

Date:- JULY,2014

Edition:- 01

Drawing file path & name: \\ storage-server\ 03 - Engineering\ 0 - Arshad 1960 - Shah Latif Town SECTOR - 20 D\ 02- LAYOUT PLAN 1960-WAT-SWNW-LYPL-01-01.dwg
User and Plot Date: Arshad - Thu, 24 Jul 2014 - 3:46pm

LEGEND:–

- 4" DIA PIPE
- 6" DIA PIPE
- 8" DIA PIPE
- TEE
- BENDS
- REDUCER
- SV — SLUICE VALVE (CAST IRON)

TENDER DRAWING

240'-0" WIDE NATIONAL HIGHWAY

2643000 N
2642750 N
2642500 N
2642250 N
6771500 E
6771750 E
6772000 E
6772250 E
6772500 E
6772750 E
6773000 E

6"Ø PIPE
8"Ø PIPE
4"Ø PIPE
SB
AS
PETROL PUMP
PARKING
S.NO.47
BUS TERMINAL
RESERVED
FL-5
FL-6
100'-0" WIDE ROAD
80'-0" WIDE ROAD
60'-0" WIDE ROAD
40'-0" WIDE ROAD
40'-0" ROAD

Executing Agency:–

MALIR DEVELOPMENT AUTHORITY

Project:–

SHAH LATIF TOWN
KARACHI.

Consultants:–

OSMANI
Engineering - Architecture - Planning - Mapping - Technology
OSMANI & COMPANY (PVT.) LTD.
CONSULTING ENGINEERS-ARCHITECTS-PLANNERS
OSMANI HOUSE: 245/2-K, Block 6, PECHS, Karachi-75400, Pakistan.
Tel. (92-21) 34536007-08, 34546541-42, Fax (92-21) 34534691,
E-mail: ocl-khi@osmani.com, Website: www.osmani.com
ISLAMABAD HYDERABAD LAHORE FAISALABAD

Sub Project:–

SECTOR – 20D
WATER SUPPLY NETWORK

Title:–

LAYOUT PLAN

Ed.No.	Date	Description
01	24.07.14	ISSUED FOR TENDER

Drawn:– ARSHAD AHMED	Scale:– 1"=100'
Designed:– NAVEEN	Drawing No:– 1960-WAT-WSNW-LYPL-01-01
Checked:– AGHA MANZOOR	Date:– JULY,2014
Approved:–	Edition:– 01

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