MEHRAN UNIVERSITY ENGINEERING AND TECHNOLOGY
SHAHEED Z. A. BHUTTO CAMPUS KHAIRPUR MIRS' SINDH,
PAKISTAN

CONSTRUCTION OF AUDITORIUM

Bidding Documents

- Instructions to Bidders
- Bidding Data, Form of Bid and Appendices
- General Conditions of Contract
- Particular Conditions of Contract
- Bill of Quantities for Civil, Plumbing, External Development and Specialist Items of Works

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INSTRUCTIONS TO BIDDERS

INSTRUCTIONS TO BIDDERS

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

A. GENERAL

IB.1 Scope of Bid

1.1 Procuring agency as defined in the bidding data hereinafter called "the procuring agency" wishes to receive bids for the construction and completion of works as described in these bidding documents, and summarized in the bidding data hereinafter referred to as the "Works".

1.2 The successful bidder will be expected to complete the Works within the time specified in Appendix-A to Bid.

IB.2 Source of Funds

2.1 The Procuring Agency (Mehran University of Engineering and Technology, Shaheed Z.A Bhutto Campus, Khairpur Mir's.) has received / allocated / applied for loan/grant/Federal/ Provincial/Local Government funds from the source (s) indicated in the Bidding Data in various currencies towards the cost of the project/scheme specified in the Bidding Data and it is intended that part of the proceeds of this loan/grant/funds 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 interested bidders who are eligible under provisions of Sindh Public Procurement Rules as mentioned below and the criteria given in the Notice Inviting Tender (NIT)/Bidding Document.

Firms and individuals, national or international, may be allowed to bid for any project where international competitive bidding is feasible. Any conditions for participation shall be limited to those that are essential to ensure the bidder's capability to fulfill the contract in question.

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 (SSP Rule 23(1))

8.1 Any interested bidder requiring any clarification (s) in respect of the Bidding Documents may notify the procuring agency in writing at the procuring agency's address indicated in the Invitation for Bids/NIT. Procuring agency will respond to any request for clarification provided they are received at least five calendar days prior to the date of opening of bid.

Provided that any clarification in response to query by any bidder; shall be communicated to all parties who have obtained bidding documents.

IB.9 Amendment of Bidding Documents

9.1 At any time prior to the deadline for submission of bids, the procuring agency may, for any reason, whether at his own initiative or in response to a clarification requested by a interested 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 IB 7.1 hereof and shall be communicated in writing to all bidders. interested bidders shall acknowledge receipt of each addendum in writing to the procuring agency.

9.3 To afford bidders reasonable time in which to take an addendum into account in preparing their bids, the procuring agency may extend the deadline for submission of bids in accordance with 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 procuring agency shall be in the language stipulated in the bidding data and Special 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 authorization on the letterhead of bidding firm, authorizing the signatory of the bid to act for and on behalf of the bidder;

(b) update the information indicated and listed in the bidding data and previously submitted with the application for prequalification, and continue to meet the minimum criteria set out in the prequalification documents, which as a minimum, would include the following ,

(i) Evidence of access to financial resources along with average annual construction turnover;

(ii) Financial predictions for the current year and the following two 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) 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;

(b) the bid and in case of a successful bid, the Form of Contract Agreement shall be signed by the authorized partner so as to be legally binding on all partners;

(c) the partner-in-charge shall always be duly authorized to deal with the procuring agency 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(a) 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 procuring agency.

(f) submission of an alternative Letter of Intent to execute a Joint Venture Agreement shall be mandatory.

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 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 IB 1.1 hereof, based on the unit rates or prices submitted by the bidder or percentage quoted above or below on the rates of Composite Schedule of Rates (CSR), as the case may be.

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 procuring agency when executed and shall be deemed to be covered by rates and prices for other items in the Bill of Quantities. In case of Composite Schedule of Rates, if the bidder fails to mention the percentage above or below, it shall be deemed to be at par with the rates of Composite Schedule of Rates.

12.3 The bid price submitted by the contractor shall include all rates and price including the taxes. All duties, taxes and other levies payable by the contractor under the contract, or for any other cause during the currency of the execution of the work of otherwise specified in the contract as on the date seven days prior to the deadline for submission of bid.

Additional / reduced duties, taxes and levies due to subsequent additions or changes in legislation shall be reimbursed / deducted as per Sub-Clause 13.7 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 13.7 of GCC. 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. Adjustment in prices quoted by bidders shall be allowed as per Sub-Para 4(ii) of section C of Instructions to bidders and bidding data.

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 procuring agency 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 selling rates published or authorized by the State Bank of Pakistan prevailing on the date, 07 (seven) 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 contract.

IB.14 Bid Validity

14.1 Bids shall remain valid for the period stipulated in the bidding data from the Date of Bid Opening specified in Clause IB.23.

14.2 In exceptional circumstances, prior to expiry of the original, the procuring agency may request the bidders extend the period of validity for a specified additional, period which shall not be for more than one third of the original period of bid validity. The request and the responses thereto shall be made in writing. A bidder may refuse the request without forfeiting of the bid security. In case, a bidder agreed to the request, shall not be required or permitted to modify the 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, pay order 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 in favour of the procuring agency, which should commensurate with the bid validity period. The bank guarantee for bid security shall be acceptable in the manner as provided at Annexure BS-1.

15.3 Any bid not accompanied by an acceptable Bid Security shall be rejected by the procuring agency as non-responsive.

17.2 The bidders are requested to submit questions, if any, in writing so as to reach the procuring agency 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 bidders. Any modification of the bidding documents listed in Sub-Clause IB 7.1 hereof which may become necessary as a result of the pre-bid meeting shall be made by the procuring agency 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 Alteration is not to be made neither 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 without alterations and shall provide an original copy along with photocopies as per the requirement of the procuring agency specified in the bidding data. The original as well as copies of the document shall be clearly marked as "ORIGINAL" and "COPY", as the case may be. If there is any discrepancy between original and copy(ies) then 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(s) duly authorized to sign on behalf of the bidder pursuant to Sub- Clause IB 11.1(a) hereof. All pages of the bid shall be initialed and stamped by the person(s) signing the bid.

IB.20 Deadline for Submission of Bids

20.1 (a) Bids must be received by the procuring agency at the address specified not 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 shall 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 procuring agency may, at its discretion, extend the deadline for submission of bids by issuing an amendment in accordance with IB.09. In such case all rights and obligations of the procuring agency and the bidders shall remain the same as mentioned in the original deadline.

IB.21 Late Bids

21.1 (a) Any bid received by the procuring agency after the deadline for submission of bids prescribed in Clause IB 20 shall 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 submit the bid in time.

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 procuring agency 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 to sub-clauses IB 22.1 and IB 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 procuring agency 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 or their representatives who are in attendance shall sign an attendance sheet.

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 Procuring agency shall read aloud the name of the bidder, total bid Price and price of any Alternate Proposal(s), if any, discounts, bid modifications, substitution and withdrawals, the presence or absence of bid security, and such other details as the procuring agency may consider appropriate, and total amount of each bid, and of any alternative bids if they have been requested or permitted, shall be read aloud and recorded when opened.

23.4 Procuring agency shall prepare minutes of the bid opening, including the information disclosed to those present in accordance with the sub-clause IB 23.3.

IB.24 Process to be Confidential (SSP Rules 53)

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 in accordance with the requirements of Rule 45, which states that procuring agencies shall announce the results of bid evaluation in the form of a

report giving reasons for acceptance or rejection of bids. The report shall be hoisted on website of authority and that of procuring agency if it website exists and intimated to all bidders at least seven (7) days prior to the award of contract. 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 procuring agency'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 as per Rule 31; however mere fact of lodging a complaint shall not warrant suspension of procurement process.

IB.25 Clarification of Bids (SSP Rules 43)

25.1 To assist in the examination, evaluation and comparison of bids, the procuring agency 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 procuring agency 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 procuring agency will determine whether the bidder fulfills all codal requirements of eligibility criteria given in the tender notice such as registration with tax authorities, registration with PEC (where applicable), turnover statement, experience statement, and any other condition mentioned in the NIT and bidding document. If the bidder does not fulfills any of these conditions, it shall not be evaluated further.

26.2 Once found to be fulfilling the eligibility criteria, as mentioned in sub-clause 26.1, the bid of eligible bidders will be evaluated for technical responsiveness as per specification and criteria given in the bidding documents. Technical and financial evaluations may be carried out in accordance with single stage-single on envelope, single stage-two envelopes bidding procedures, depending on the selection procedure adopted by the procuring agency.

26.3 A bid will be considered technically responsive if it (i) has been properly signed; (ii) is accompanied by the required bid security; and (iii) conforms to all the terms, conditions

and specifications of 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 procuring agency'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.

26.4 If a bid has major deviations to the commercial requirements and technical specifications will be considered technically non responsive. As a general rule, major deviations are those that if accepted, would not fulfill the purposes for which the bid is requested, or would prevent a fair comparison or affect the ranking of the bids that are compliant with the bidding documents.

(A) Major (material) Deviations include:-

(i) has been not properly signed;

(ii) is not accompanied by the bid security of required amount and manner;

(iii) stipulating price adjustment when fixed price bids were called for,

(iv) failing to respond to specifications;

(v) failing to comply with Mile-stones/critical dates provided in bidding documents;

(vi) sub-contracting contrary to the Conditions of Contract specified in bidding documents;

(vii) refusing to bear important responsibilities and liabilities allocated in the bidding documents, such as performance guarantees and insurance coverage,

(viii) taking exception to critical provisions such as applicable law, taxes and duties and dispute resolution procedures;

(ix) a material deviation or reservation is one:

(a) which affect in any substantial way the scope, quality or performance of the works

(b) adoption/rectification whereof would affect unfairly the competitive position of other bidders presenting substantially responsive bids.

(B) Minor Deviations

Bids that offer deviations acceptable to procuring agency and which can be assigned a monetary value may be considered substantially responsive at least as to the issue of fairness. This value would however be added as an adjustment for evaluation purposes only during the detailed evaluation process.

26.5 If a bid is not substantially responsive, it will be rejected by the procuring agency, 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 procuring agency for any arithmetic errors. Errors will be corrected by the procuring agency 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 procuring agency 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 procuring agency in accordance with the above procedure for the correction of errors and with the concurrence of the bidders. The amount thus corrected 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 IB 15.6(b) hereof.

IB.28 Evaluation and Comparison of Bids

28.1 The procuring agency 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 procuring agency 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 (if any), for contingencies in the Summary Bill of Quantities, but including competitively priced Day work; and

(c) making an appropriate adjustment for any other acceptable variation or deviation.

28.3 The estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the Contract, shall not be taken into account in bid evaluation.

28.4 If the Bid of the successful bidder is seriously unbalanced in relation to the procuring agency estimate of the cost of work to be performed under the Contract, the procuring agency 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 procuring agency 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 procuring agency against financial loss in the event of default of the successful bidder under the Contract.

28.5 Bidders may be excluded if involved in "Corrupt and Fraudulent Practices" means either one or any combination of the practices given below SPP Rule2 (q);

(i) "Coercive Practices" means any impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence the actions of a party to achieve a wrongful gain or to cause a wrongful loss to another party;

(ii) "Collusive Practice" means any arrangement between two or more parties to the procurement process or contract execution, designed to achieve with or without the knowledge of procuring agency to establish prices at artificial, noncompetitive levels for any wrongful gain;

(iii) "Corrupt Practices" means the offering, giving, receiving or soliciting, directly or indirectly, of anything of value to influence the acts of another party for wrongful gain;

(iv) "Fraudulent Practice" means any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;

(v) "Obstructive Practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in a procurement process, or affect the execution of a contract or deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements before investigators in order to materially impede an investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation, or acts intended to materially impede the exercise of inspection and audit rights provided for under the Rules.

28.6 Evaluation Report (SPP Rule 45)

After the completion of evaluation process, as described in clauses IB 27 and IB 28, the procuring agency shall announce the results of bid evaluation in the form of report (available on the website of the authority) giving reasons for acceptance and rejection of bid. The report shall be hoisted on website of the authority and that of procuring agencies if its website exists and intimated to all bidders at least seven (7) days prior to the award of contract.

F. AWARD OF CONTRACT

IB.29 Award

29.1 Subject to Clauses IB.30 and IB.34 and provision of the Rule. The procuring agencies shall 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, but not necessarily the lowest submitted price, within the original or extended period of bid validity. Provided that such bidder has been determined to be eligible in accordance with the provisions of clause IB 03 and qualify pursuant to sub-clause IB 29.2.

29.2 Procuring agency, at any stage of the bid evaluation, having credible reasons for or having *prima facie* evidence of any deficiency(ies) in contractor's capacities, may require the contractors to provide information concerning their professional, technical, financial, legal or managerial competence whether already pre-qualified or not for the said project.

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

IB.30 Procuring Agency's Right to reject all Bids or Annul/Cancellation the Bidding Process (SPP Rule25)

Notwithstanding Clause IB.29 and provision of the rule; (1) A procuring agency reserve may cancel the bidding process at any time prior to the acceptance of a bid or proposal; (2) The procuring agency shall incur no liability towards bidders solely by virtue of its invoking sub-rule (1); (3) Intimation of the cancellation of bidding process shall be given promptly to all bidders and bid security shall be returned along with such intimation; (4) The procuring agency shall, upon request by any of the bidders, communicate to such bidder, grounds for cancellation of the bidding process, but is not required to justify such grounds.

IB.31 Notification/Publication of the Award of Contract (SPP Rule 25).

31.1 Prior to expiry of the period of bid validity, including extension, prescribed by the procuring agency, the procuring agency shall notify the successful bidder in writing ("Letter of Acceptance") that his Bid has been accepted. This letter shall mention the sum which the procuring agency 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, procuring agency may hold meetings to 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 procuring agency and the bidder till signing of the formal Contract Agreement.

31.4 Upon furnishing by the successful bidder of a Performance Security and signing of the contract, the procuring agency will promptly notify the name of the successful bidder to all bidders and return their bid securities accordingly.

31.5 Within seven days of the award of contract, procuring agency shall publish on the website of the Authority and on its own website if such a website exists, the results of

the bidding process, identify the bid through procurement identifying numbers, and the following information;

1) Evaluation Report;
2) Firm of Contract and letter of Award;
3) Bill of Quantities or Schedule of Requirement.

31.6 Debriefing (SPP Rule 51)

(a) A bidder may ask the procuring agency for reasons for non acceptance of his bid and may request for a debriefing meeting and procuring agency shall give him the reason for such non acceptance either in writing or by holding a debriefing meeting with such a bidder.

(b) The request bidder shall bear all the cost of attending such a debriefing.

IB.32 Performance Security (SPP Rule 39)

32.1 The successful bidder shall furnish to the procuring agency a Performance Security in the form of pay order or demand draft or bank guarantee, 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.

32.3 validity of performance security shall extend at least ninety says beyond the date of completion of contract, or as mentioned in the bidding data to cover defects liability period or maintenance period subject to final acceptance by the procuring agency.

IB.33 Signing of Contract Agreement (SPP Rule 39)

33.1 Within 14 days from the date of furnishing of acceptable Performance Security under the Conditions of Contract, the procuring agency 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 procuring agency and the successful bidder shall be executed within 14 days of the receipt of the Contract Agreement by the successful bidder from the procuring agency.

33.3 A procurement contract shall come into force when the procuring agency requires signs contract, the date on which the signature of both the procuring agency and the successful bidder affixed to the written contract. Such affixing of signature shall take place within the time prescribed in the bidding documents.

Provided that the procuring agency may reduce the maximum time limit for signing of contract, as and when required, and shall be mentioned in the bidding documents.

33.4 Stamp duty

The formal Agreement between the procuring agency and the successful bidder shall be duly stamped at rate of 0.30 % of bid price (updated from time to time) stated in Letter of Acceptance.

IB.34 General Performance of the Bidders

Procuring agency may in case of consistent poor performance of the contractor and his failure to remedy the underperforming contract may take such action as may be deemed appropriate under the circumstances of the case including the rescinding the contract and/or black listing of such contractor and debarring him from participation in future bidding process.

IB.35 Integrity Pact (SPP Rule 89)

The Bidder shall sign and stamp the Integrity Pact provided at Appendix-L to the bidding documents for all principal/local 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.

IB.37 Arbitration (SPP Rule 34)

Any dispute that is not amicably resolved shall be finally settled, unless otherwise specified in the Contract, under the Arbitration Act 1940 updated from time to time and would be held anywhere in the province of Sindh at the discretion of procuring agency.

BIDDING DATA

CONTRACT/BIDDING DATA

The following specific data for the Works to be tendered 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 No.PD/MUET/KHP/-145 dated: 05 - 06 -2014

1.1 Name and address of the procuring agency:

Mehran University of Engineering and Technology, S.Z.A Bhutto Campus Khairpur Mir's Telephone: 0243-9280314 Fax: 9280023
Email: ssahito@ymail.com

1.1 1.2 Name of the Project & Summary of the Works: **Construction of Auditorium at Mehran University of Engineering and Technology, Shaheed Z.A Bhutto Campus Khairpur Mir's'.**

2.1 Name of the Borrower/Source of Financing/Funding Agency:
Government of Sindh through Annual ,Development Programme

2.1 Amount and type of financing/Scheme Cost & Allocated Funds:

8.1 Time limit for clarification:
(05) Working days prior to last date of submission.

10.1 Bid language: **English**

11.1 (a) Prequalification Information to be updated (where applicable):

11.1 (b) Furnish and Technical Proposal (*in case of two envelope method*) or Company Profile in single stage single envelope: **N/A**

The bidder has to submit a technical proposal in sufficient detail to demonstrate the adequacy of the bid in meeting requirements for timely completion of the works.
13.1 ***Bidders to quote entirely in Pak rupees***

14.1 Period of Bid Validity: **90 days after opening of bid**

15.1 Amount of Bid Security: **2% of bid/offered cost**
Which will be returned on submission of performance bond, singing of contract agreement.

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

18.4 Number of copies of the Bid to be completed and returned:
One Original and One Copy

19.2 (a) *Procuring agency*'s address for the purpose of Bid submission:
Office of the Project Director at Mehran University of Engineering & Technology, Shaheed Z.A Bhutto Campus Khairpur Mir's.

19.2 (b) Name and Identification Number of the Contract: **Construction of Auditorium at Mehran University of Engineering and Technology, Shaheed Z.A Bhutto Campus Khairpur Mir's'.**

20.1 (a) Deadline for submission of bids:-

(b) Venue, time, and date of Bid opening: **Office of the Project Director at Mehran University of Engineering & Technology, Shaheed Z.A Bhutto Campus Khairpur Mir's, 12:30 PM, 26-05-2015.**

32.1 Standard form and amount of Performance Security acceptable to the procuring agency:

The successful bidder shall furnish to the Employer a Performance Security in the form of unconditional Bank Guarantee from a Schedule Bank, Call Deposit, Pay Order for an amount of Rs.5% (five percent) of the Contract Price stated in the Letter of Acceptance in accordance with the Conditions of Contract within a period of 14 (fourteen) days after the receipt of Letter of Acceptance.

32.3 Stamp duty

0.30 % will be paid by successful bidder as stamp duty.

FORM OF BID
AND
APPENDICES TO BID

FORM OF BID

1.1 Bid Reference No. **Construction of Auditorium at Mehran University of Engineering and Technology, Shaheed Z.A Bhutto Campus Khairpur Mir's'.**

To,

_____

_____

_____

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 Work, we/I, the undersigned, offer to execute and complete the Work 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/I 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/I submit herewith a Bid Security in the amount of Rupees _____ (Rs. _____) drawn in your favour or made payable to procuring agency and valid for a period of _____days beginning from the date, Bid is opened.

4. We/I 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/I agree to abide by this Bid for the period of _____ days from the date fixed for opening 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.

9. We undertake, if our/my bid is accepted, to execute the performance security referred to in clause 10 of Conditions of Contract for the due performance of the Contract.

10. We confirm, if our bid is accepted, that all partners of the joint venture shall be liable jointly and severally for the execution of the Contract and the composition or the constitution of the joint venture shall not be altered without the prior consent of the procuring agency.
(*please delete this in case of bid form a single bidder*)

in the capacity of _____duly authorized to sign Bids for and on behalf of
Dated this _____day of_____20_____

Signature: _____

_____
(Name of Bidder in Block Capitals)
(Seal)

Address: _____
_____
_____

Witness:

Signature: _____
Name: _____

Address. _____
_____

Occupation_____

Appendix-A to Bid

SPECIAL STIPULATIONS

Clause

Conditions of Contract

1.	Engineer's representing Consulting Firm hired by the procuring agency to issue Variation in case emergency.	3.1	Up to 2% of the Contract Price stated in the Letter of Acceptance.
2.	Amount of Performance Security	4.2	5% of contract price stated in the Letter of Acceptance in the shape of Bank Guarantee.
3.	Time for Furnishing Programme	8.3	Within 45 days from the date of receipt of Letter of Acceptance.
4.	Minimum amount of Third Party Insurance	18.3	Rs. 200,000/- per occurrence with number of occurrences unlimited.
5.	Time for Commencement	8.1	Within 14 days from the date of receipt of Engineer's Notice to Commence this shall be issued within fourteen (14) days after signing of Contract Agreement.
6.	Time for Completion (work & sections)	8.2, 10.2	_____days from the date of receipt of Engineer's Notice to Commence.
7.	Amount of Liquidated Damages/Delay Damages/Penalties	8.7	0.05% Damages per day of contract price but total amount will not be more than 10% of contract price.
8.	Defects Liability Period	11.1	365 days from the effective date of Taking Over Certificate.
9.	Percentage of Retention Money	14.2	10% of the amount of Interim/ Running Payment Certificate.
10	Limit of Retention Money	14.2	5 % of Contract Price stated in the Letter of Acceptance.
11	Minimum amount of Interim/ Running Payment Certificates.	14.2	Minimum 3% of the Contract Price
12	Time of Payment from delivery of Engineer's Interim/ Running Payment Certificate to the procuring agency.	14.7	30 days in case of local contract.
13	Mobilization Advance	14.2	10% of Contract Price stated in the Letter of Acceptance.

			in the same manner and at the same rates as if it had been carried out by the Contractor under the terms of his contract; and in that case the certificate of the Project Director as to the value of the work done shall be final and conclusive against the Contractor. (c) To measure up the work of the Contractor and to take such part thereof as shall be unexpected out of his hands, and to give it to another Contractor to complete it, in which case any expenses which may be incurred in excess of the sum which would have been paid to the original Contractor if the whole work had been executed by him (as to the amount of which excess expenses the certificates in writing of the Project Director shall be final and conclusive) shall be borne and paid by the original Contractor and shall be deducted from any money due to him by University under the contractor or otherwise or from his security deposit or the proceeds of sale thereof, or a sufficient part thereof. In the event of any of the above courses being adopted by the Project Director Contractor shall have no claim to compensation for any loss sustained by him-by reason of his having purchased or procured any materials, or entered into any engagements, or made any advance on account of or with a view to the execution of the work or the performance of the contract. And in case the contract shall be rescinded under the provision aforesaid, the

			Contractor shall not be entitled to recover or be paid any sum for any work therefore actually performed by him under this contract unless and until the Project Director shall have certified in writing the performance of such work and the amount payable in respect thereof, and he shall only be entitled to be paid the amount so certified.
16	Action when the progress of any particular position of the work is unsatisfactory.	Clause-2	If the progress of any particular portion of the work is unsatisfactory. Project Director on recommendation of Engineer, shall not withstanding that the general progress of the work is in accordance with the conditions, be entitled to take action under clause 1 (b) after giving the Contractor 10 days notice in writing. The Contractor will have no claim for compensation; for any loss sustained by him owing to such no claim for compensation, for any loss sustained by him owing to such action.
17	Contractor remains liable to pay compensation if action not taken under clause 3 and 4. power to take possession of or required removal of or sell contractor's plant	Clause-3	In any case in which any of the power conferred upon the project Director by clause 1 and 2 hereof shall have become exercisable and the same shall not have been exercised the non-exercised thereof shall not constitute a waiver of any of the conditions hereof and - such powers shall notwithstanding be exercisable in the event of any future case of default by the Contractor for which under any clause or clauses hereof he is declared liable to any compensation amounting

			if the whole of his security deposit and the liability of the Contractor for past and future compensation shall remain unaffected. In the event of the Project Director taking action under sub-clause (a) or (c) of clause 1, he may, if he so desires, take possession of all or any tools, plant, materials and stores in or upon the works, of the site thereof or belonging to the Contractor or procured by him and intended to be used for the execution of the work or any part thereof, paying or allowing for the same in account at the contract rate, or in the case of contract not being applicable, at current market rates, to be certified by the Project Director whose certificate thereof shall be final. In the alternative, the Project Director may, after giving notice in writing to the Contractor or his clerk of the work foreman or other authorized agent, required him to remove such tools, plant materials, or stores from the premises within a time to be specified in such notice, and in the event of the Contractor is failing to comply with any such requisition, the Project Director may remove them at the Contractor's expense or sell them by auction or private sale on account of the Contractor and at his risk in all respects, and the certificate of the project Director as to the expense of any such removal and the amount of the proceeds and expense of any such sale shall be final and conclusive against the Contractor.

8	Extension Of Time	Clause-4	If the Contractor shall desire an extension of the time for completion of the work on the ground of his having been unavoidable hindered in its execution or on any other ground, he shall apply in writing to the Project Director within 30 days from the date of which the execution of the work, was hindered as aforesaid or on which the ground for asking for extension arose and in any case before the date of completion of the work and the Project Director may, if in his opinion, there are reasonable grounds for granting an extension, grant such extension as he thinks necessary or proper. The decision of the Project Director in this matter shall be final. Provided that where the Contractor is hindered in the execution of the work on account of any act or omission on the part of the University or its authorized officers, the Project Director may at any time before the date of completion and on his own initiative extend the time for completion of the work for such period as he may think necessary or proper. Where time has been extended under this or any other clause of this agreement the date for completion of the work shall be the date fixed by the order giving the extension or by the aggregate of all such orders, made under this agreement. When time has been extended as aforesaid, it shall continue to be the essence of the contract and all clauses

			materials as aforesaid except for any such actually realized by the sale thereof.
20	Payment Of Intermediate Certificate To Be Regarded As Advance	Clause-6	No payment shall be made for any work, estimated to cost less than rupees ten thousand till after the whole of the work shall have been completed and a certificate of completion given. But in the case of work estimated to cost more than rupees ten thousands, the Contractor shall on submitting bill therefore, as provided in Clause-10 be entitled to receive payment proportionate to the part of the work then approved and passed by the Engineer and Project Director, whose certificate such approval and passing of the sum so payable shall be final and conclusive against the Contractor. All such intermediate payments shall be regarded as payments by way of advance against the final payments only and not as payment for work actually done and completed, and .shall not preclude the Engineer and Project Director from requiring any bad, unsound, imperfect or unskillful work to be removed or taken away and reconstructed, or re-erected, nor shall any such payment be considered as an admission of the due performance of the contract or any part thereof in any respect or the occurring of any claims; nor shall it conclude, determine, or affect in any other way the powers of the Project Director as to the final settlement and adjustment of the accounts or otherwise, or in any way

			very or effect the contract. The final bill shall be submitted y the Contractor within one month of the date fixed for the completion of the work otherwise Engineers certificate of the measurements and of the total amount payable for the work shall be final and binding on all parties.
21	payment at reduced rates of account of item of work not accepted as completed to be at the discretion of the project director	Caluse-7	The rates for several items of works estimated to cost more than 1,000.00, agreed to within shall be valid only when the item concerned is accepted as having been completed fully in accordance with the sanctioned specifications. In cases where the items of work are not accepted as so completed the Engineer may certify payment on account of such items at such reduced rates as he may consider reasonable in the preparation of final or on account bills.
22	Bills to be submitted monthly	Clause-8	A bill shall be submitted by the Contractor as frequently the progress of the work may justify for all the work executed and not included in any previous bill and the Engineer shall take or cause to be taken the; requisite measurements for the purpose of having the same verified and the claims, as far as admissible, adjusted, if possible before the expiry of 21 days from the presentation of the bill at any time depute a subordinate to measure up the said work in the presence of the Contractor or his authorized agent, whose counter signature to the measurement list will be sufficient

			warrant and the Project Director may prepare a bill from such list which shall be binding on tilted Contractor in all respects. In case the Contractor or his authorized agent is not present at the site of work at the time fixed for recording measurements, or being present, does not counter sign the measurement list, the measurements recorded by the Engineer or his authorized subordinate shall be treated by the Engineer or his authorized subordinate shall be treated as correct and binding on the Contractor unless the Contractor within seven days of date of recording such measurements submit to the Project Director a detailed letter pointing out the errors or omissions in the record measurements. In case of such disagreement, the Project Director shall held or cause to be hold the site investigations and give his decision. The decision of the Project Director shall be final.
23	Bills To Be Printed On Forms	Clause-9	The Contractor shall submit all bills on his own primed forms. The bills shall be submitted to the Engineer in triplicate who will then scrutinize these bills and forward two copies to the Project Director and retain one copy in their office. The charges to be made in the bills shall always be entered at the rates specified in the tender or in the case of any extra work ordered in pursuance of these conditions, and not mentioned or provided for in the tender at the rates hereinafter provided for such work.

24	Store Supplied By University	Clause-10	If the specification or estimate of the work provides for the use of an' special description of materials to be supplied from the store of the University or if it is required that the Contractor shall use certain stores to be provided by the Project Director such material and stores, and the prices to be charged therefore as hereinafter mentioned being so far as practicable for the convenience of the Contractor but not so as any way to control the meaning of effect of this contract specified in the schedule or memorandum hereto annexed, required from time to time to be used by him for the purpose of the contract only and the value of the full quantity of the materials and stores so supplied shall be sent off or deducted from any sums then due, or thereafter to become due to the Contractor under the contract, otherwise, or from the security deposits, or the proceed of sale thereof, if the security deposit as held in Government securities the same or a sufficient portion hereof shall in that case be sold for the absolute property of University and shall on no account remove from the site of the work, and shall at all times be open to inspection by the Project Director. Any such materials unused and perfectly good condition at the time of completion or determination of the contracts shall be returned to the University Stores, if the Project Director so requires by a notice in writing under his hand, but the Contractor shall not be entitled to

			return any such materials except with the consent of the Project Director and he shall have no claim for compensation on account of any such material supplied to him as aforesaid but remaining unused by him or for, any. wastage in or damage to any such materials.
25	Works to be executed in accordance with specifications. Drawings. Orders etc.	Clause-11	The Contractor shall execute the whole and every part of the work in he most substantial and workmanlike manner and both as regards materials and all other matters in strict accordance with the specifications lodged in the office of the Project Director and initialed by the parties, the said specification being a part of the contract. The contractor shall also conform exactly, fully and faithfully to the designs, drawings and instruction in writing relating to the work signed by the Project Director and lodged in his office and to which the Contractor shall be entitled to have access at such office or on the site of work for the purpose of inspection during office hours and the Contractor shall if he so requires, be entitled at his own expenses to make or cause to be made copies of the specifications, and of all such designs drawings and instructions as aforesaid
26	Alterations in specifications and design. Not to invalidate contracts	Clause-12	The Project Director on the recommendation of Engineer shall have power to make any alterations in, or additions to the original specifications, drawings, designs and instructions that may appear to him to be necessary or

			advisable during the progress of the work and the contractor shall be bound to carry out of the work, in accordance with any instructions in this connection which may be given to him in writing by the Project Director and such alterations shall, not invalidate the contract; and any altered or additional work which the Contractor may be directed to do in the mentioned above specified subject to the limit laid down in clause 37 below as part of the work shall be carried out by the Contractor on the same conditions in all respects on which he agreed to do the main work and at the same rate as re specified in the tender for the main work. The time for completion of the work shall be extended in the proportion that the additional work bears to the original contract work, and the certificate of the Project Director as to such proportion shall be conclusive. And if the altered or additional work includes any class of work for which no rate is specified in its contract, then such class of work shall be paid for at ( ) percent below/above the rates shown for such work in the Government of Sind Schedule of rates 2004, as amended from time to time and if such last mentioned class of work is not entered in the Government of Sind Schedule of Rates 2004 as of the date of receipt by him of the order to carry out the work, inform the Project Director through the Consultants of the rate which it is his

			intention to charge for such class of work, and if the Project Director and the Consultants are satisfied with the rate analysis, then he shall allow him that rate, but if the Owner does not agree to this rate, he shall be notified in writing be at liberty to cancel his order to carry out such class of work, and arrange to carry it out in such manner as he may consider advisable, provided always that if the Contractor shall commence work or incur any expenditure in regard thereto before the rates shall have been detonated as lastly hereinbefore mentioned then in such case he shall only be entitled to be paid in respect of the work carried out for expenditure incurred by him prior the work carried out for expenditure incurred by him prior to the date of the determination of the rate as aforesaid according to such rate or rates as shall be fixed by the Owner. In the event of a dispute, the decision of the Advisor (P&D) will be final, conclusive and binding.
27	No Claim To Any Payment Or Compensation For Alteration In Or Restriction Of Work	Clause-13	If at any time after the execution of the contract documents the Project Director shall for any reason whatsoever in the tender to be carried out at all or carried out in part by the Contractor, he shall give notice in writing of the fact to the Contractor, who shall thereupon have no claim to any payment of compensation whatsoever on account of any profit or advantage which he might have derived from the execution of the work in full but which he did not

			so derive in consequence of the full amount of the work not having been carried out, neither shall he have any claim for compensation by reason of any alterations, having been made in the original specifications, drawings, designs, and instruction, which may involve any curtailment of the work as original contemplated. Where materials have already been collected at site of the work before the receipt of the said notice to stop or curtail the work, the Contractor shall be paid for such materials at the rates determined by the Project Director provided they are not in excess of requirements and are of approved quality.
28	Time Limit For Unforeseen Claims	Clause-14	Under no circumstances whatsoever shall the contractor be entitled to any compensation from Authority on any account unless the Contractor shall have submitted a claim in writing to the Project Director within one month of the cause of such claim occurring. The Contractor shall give full details of such claim, indicating the part of the work is the subject matter of such claim, the reasons giving rise to the said claim and submit as far as possible, documentary evidence in support of the reasons and the calculations for such claim. The claim shall not be considered as valid or payable unless it has been scrutinized & accepted by the Engineer and Project Director & will become payable only to the extent upto which it has been accepted by the Advisor (P&D).

29	Action And Compensation In Case Of Bad Work	Clause-15	If at any time before the security deposit is refunded to the Contractor, it shall appear to the Project Director or his subordinate-incharge of the work, that any work lies been executed with unsound, imperfect of unskilled workmanship or with materials of inferior quality, or that any materials or articles provided by him for the execution office work are unsound, or of quality inferior to that contracted for, or are otherwise not in accordance with the contract, shall be lawful for the Project Director to intimate this fact in writing to the Contractor and then notwithstanding the fact that the work, materials or articles complained of any have been inadvertently passed, certified and paid for the Contractor shall be bound forthwith to rectify or remove and reconstruct the work so specified in whole or in part, as the case may require, or if so required shall remove the materials or articles, and provide other proper and suitable materials or articles at his own proper charge and cost; and in the event of his failing to do so within a period to be specified by the Project Director in the writing intimation aforesaid, the Contractor shall be liable to pay compensation at the rate of one percent, on the amount of the estimate for every day not exceeding ten days, during which the failure so continues, and in the case of any such failure the Project Director may rectify or remove, and re-execute the work or remove and

			order that the same may be verified, checked, inspected and measured, and correct dimensions thereof taken before the same is so covered up or planned beyond the reach of verification check, inspection & measurement, and shall not cover up or place beyond the reach of verification, check, inspection and measurement any work without the consent in writing of the Engineer and Project Director or his subordinate-incharge of the work, and if any work shall be covered up or placed beyond the reach of verification, check, inspection & measurement any work without the consent in writing of the Project Director or his subordinates incharge of the work, and if any work shall be covered up or placed beyond the reach of verification, check inspection & measurement without such notice having been given to consent obtained, the same shall be uncovered at the Contractor's expense, and in default thereof no payment or allowance shall be made for such work, or for the materials with which the same was executed.
32	Contractor Liable For Damage Done And For Imperfections For Three Months After Certificate	Clause-18	If the Contractor or his workmen, or servants shall break, deface, destroy any part of a building in which they may be working, or any building, road, fence, enclosure or overhead or underground service lines of water supply, sewerage, electricity, telephone, gas etc. or grass land or cultivated ground continuous to the premises on which the work or any part thereof is being executed, or if any

			damage shall be done to the work, while it is in progress from any cause whatever or if any part thereof in being executed, or if any damage shall be done to the work, while it is in progress from any cause whatever or if any imperfections become apparent in it within three months of the grant of a certificate of completion, final or otherwise, by the Project Director, the Contractor shall make good the same his own expense, or in default the Project Director may cause the same to be made good by other workmen, and deduct the expenses of (which the certificate of the Project Director shall be final) from any sums that may then be due or may thereafter become due to the Contractor, or from his security deposits or the proceeds of sale thereof, or of a sufficient portion thereof or any of his dues available against other works with the University or as arrears of land revenue in case no dues are available or the amount available falls short of the total recoveries.
33	Contractor to supply plant ladders. Scaffolding etc. And is liable for damages arising on provision of lights. Fencing etc.	Clause-19	The Contractor shall supply at his own cost all materials, plant, tools, appliances, implement, ladders, cordage, tackle, scaffolding and temporary work requisite or proper for the execution of the work, whether in the original, altered or substituted form, and whether included in the specification, or other documents, forming part of the contract or referred to in these conditions or not, and which

34	Measure For Prevention Of Fire	Clause-20	The Contractor shall not set fire to any standing jungle, trees, bush-wood or grass without a written permit from the Project Director. When such permit is given, and also all cases when destroying cut or dug up trees, brushwood, grass etc., by fire; the Contractor shall take necessary measures to prevent such fire spreading to otherwise damaging surrounding property. The Contractor shall make his own arrangements at his cost and expense for providing drinking water and water for domestic use of his labour employed in connection with the execution of the works as also for the use of his labour employed in connection with the execution of the works as also for use on the works itself. However, in case the Contractor is not able to make his own arrangements for water, the same could at the discretion of the Project Director be supplied by the owner in which case the recovery against the water charges at 2% of the cost of these items of work on which the water is used in the construction shall be made from the bills of the Contractor.
35	Liability Of Contractor For Any Damage Done In Or Outside Work Area	Clause-21	Compensation for all damage done intentionally or unintentionally by Contractor's labour whether in or beyond the limits of University property including any damage, caused by the spreading of fire mentioned in clause 22 shall be estimated by the Project Director or such other officer as he may appoint and the estimates of the Project

			Director shall be final and the Contractor shall be bound to pay the amount of the assessed compensation on demand failing which the same will be recovered from the Contractor as damages in the manner prescribed in clause 1 or deducted by the Project Director from any sums that may be due or become due from University of the Contractor under this contract or otherwise. The Contractor shall bear the expenses of defending any action or other legal proceedings that maybe brought by any person, party or authority for injury sustained "by him owing to neglect of precaution to prevent the spread of fire and he shall pay any damages and cost that may be awarded by the court in consequence.
36	Employment Of Female Labour	Clause-22	The employment of female labour on works in the neighborhood of soldiers' barracks should be avoided as for as possible.
37	Work On Sunday	Clause-23	No work shall be done on a Sunday or a public holiday without the prior sanction in writing of the Project Director.
38	Work not be sublet. Contractor may be rescinded & security deposit forfeited for subletting it without approval"	Clause-24	The Contractor shall not be assigned or sub-let without the written approval of the Project Director. And if the Contractor shall assign or sublet his contract, or attempt to do, or become insolvent or make any composition with his creditors or attempt to do, the Project Director may, by notice in writing rescind the contract.

			The Contractor shall keep full and true accounts in respect of the contract works in the regular course of business and shall whenever called upon by the Project Director by notice in writing, produce them for inspection by him or by any officer appointed by him in that behalf. Also if any bribe, gratuity, gifts, loan, reward or advantage pecuniary or otherwise, shall either directly or indirectly be given, promised or offered by the Contractor or any of his servants or agents to any public officer or person in the employment of University in any way relating to his office or employment or if any such officer or person shall become in any way directly or indirectly interested in the contract or if the Contractor does not keep account or fails to produce them as aforesaid, the Project Director may give notice in writing rescind the contract. In the event of a Contract being rescinded the security deposit of the Contractor shall thereupon stand forfeited and be absolutely at the disposal of University and the same consequences shall ensure as if the contract had been rescind under clause 3 hereof and in addition the Contractor shall not be entitled to recover or be paid for any work therefore actually performed under the contract.
39	Sum Payable By Way Of Compensation To Be Considered As Reasonable Compensation Without Reference To Actual Loss	Clause-25	All sums payable by a Contractor by way of compensation under any of these conditions shall be considered as a reasonable compensation to be applied to the use of University without

			reference to the actual loss or damage sustained and whether any damage has or has not been sustained.
40	Changes In The Constitution Of Firm To Be Notified	Clause-26	In the cases of a tender by partners any change in the constitution of a firm shall be forthwith notified by the Contractor to the Project Director for his information.
41	Work To Be Under Direction Of Engineer, Consultant And Project Director	Clause-27	All works to be executed under the contract shall be executed under the direction and subject to the approval in all respects of the Engineer and Project Director for the time being, who shall be entitled to direct at what point or points and in what-manner they are to be commenced, and from time to time carried on.
42	Decision Of Advisor (P&D) To Be Final	Clause-28	Except where otherwise specified in the contract and subject to The powers delegated to him by authority under the Code rules then in force, the decision of the Advisor (P&D) shall be final, conclusive, and binding on all parties to the contract upon all questions relating to the meaning of the specifications, design, drawings, and instructions hereinbefore mentioned and as to the quality of workmanship, or materials used on the work, or as to any other question claim, right, matter or the thing whatsoever in any way arising out of, or relating to the contract, design, drawings, specifications, estimates, instructions, orders of these conditions, or otherwise considering the works, or the execution, or failure to execute the same, whether arising,

			during the progress or the work, or after the completion on abandonment thereof.
43	Lump Sum In Estimates	Clause-29	When the estimate on which a tender is based includes one or more items with lump sum rates or lump sum amount the Contractor shall be entitled to payment in respect of such items on the rates entered in this contract with the detailed specifications and the analysis of the rates on which the contract price is calculated. Where part of the work is done or the specifications are altered the Contractor will submit his own rate and payment shall be controlled in the same way as if the item of work was done outside the current Government Schedule of Rates applicable in the case in accordance with the procedure laid down in Clause 14. Provided always that in case of the percent Rate tenders, no premium as quoted for the main tender as also that quoted in clause 14 (which will be the same premium as for the main tender) shall be payable for any items of work including the lump sum items or market rates which are outside the Current Government Schedule of Rates.
44	Action Where No Specification	Clause-30	In the case of any class of work for which there is no such specification as is mentioned in Rule I such work shall be carried out in accordance with the Sind P.W.D. specifications and in the event of there being no Sind P.W.D. specification, then in such case the work shall be carried out in all respects

			in accordance with the instructions and requirements of the Project Director. The payment for such items of work shall be made in accordance with the procedure laid down in Clause 14 for items of work outside the Current Government Schedule of Rates.
45	Contractors Percentage Whether Applied To Net Or Gross Amount Of Bill	Clause-31	The percentage referred to in the tender shall be deducted from/added to the gross amount of the bill before deduction the value of any stock issued.
46	Refund Of Quarry Fees And Royalties	Clause-32	All quarry fees; royalist, octroi, dues, ground rents, local and Government taxes and Rates etc. relating directly or indirectly to the execution of the works under this contract shall be paid by the contractor as a final charge and no refund on this account shall be allowed by the University.
47	Compensation under the workmen's compensation act.	Clause-33	The Contractor shall be responsible for and shall pay any compensation Act, 1923 (VIII of 1923), (hereinafter called the said Act) as amended upto date for injuries caused to the workmen. If such compensation is paid by University as principal under sub-section (1) of section 12 of the said Act on behalf of the Contractor; it shall be recoverable by University from the Contractor under sub-section (2) of the said section such, compensation shall be recovered in the manner laid down in Clause above. The contractor shall also discharge all other liabilities in relation to the current Government or local legislation with respect. to the Labour

			Laws and other Fringe benefits like Health and Insurance cover. Old Age Benefits etc. for all his labour including the administrative and supervisory staff.
48	Claim For Quantities As Per Scope Of Work Shown On Drawings	Clause-34A	The quantities of different items of work shown in the schedule B attached to this tender, are only approximate The actual quantities of different items as done at Site will be controlled by the detailed drawings and the actual requirements at site of work. No claim whatsoever will be entertained on account of excess or reduction in the scope of work as shown on the drawings.
49	----- do----	Clause-34B	Where due to the change of specification or scope or work or due to additions in size and quantum of the work the total cost of the work increases upto 30% at the cost as shown in the MEMORANDUM (Excluding those case there the total cost the increased due to any claim of the contractor or the escalation in the rates/cost subject to its sanction) the Contractor shall be bound to car y out the same at the same rates and under the same conditions as for the same at the same rates and under the same conditions as for the main tender. In case where the total cost is likely to increase beyond 30% of the amount shown in the MEMORANDUM it will be optional for the Contractor to decline to take up the additional work provided always that no work shall be

			left in incomplete or in unfinished shape irrespective of the total Cost of the work. Where, however, the Contractor agrees to take up the additional work, there shall be no financial limit to it and that the entire work shall be done at the same rates and under the same terms and conditions as the main tender.
50	Employment Of Feminine Labour	Clause-35	The Contractor shall employ any feminine; convict or other labour of a particular kind of class if ordered in writing to do so by the Project Director.
51	Claim For Compensation For Delay In The Execution Of Work	Clause-36	No compensation shall be allowed for any delay caused in the starting of the work on account of acquisition of land or, in the case of clearance works on account of any delay in accordance with the sanction to estimates.
52		Clause-37	No compensation shall be allowed for any delay in the execution of the work on account of water standing in borrow pits or compartments or on the land or the approach road etc. The rates are inclusive of hard or cracked soil, excavation mud, subsoil water or water standing in borrow pits and no claim for an extra rate shall be entertained, unless otherwise expressly specified.
53	Entering Upon Or Commencing Any Portion Of Work	Clasue-38	The Contractor shall not enter upon or commence any portion of work except with the written authority and instructions of the Project Director or of his subordinate- incharge of the work. Failing such authority the contractor shall have not claim to ask for measurements of or payment for work.

54	Minimum age of persons employed. The employment of donkeys or other animals	Clasue-39	(i) No contractor shall employ any person who is under the age of 12 years. (ii) No contractor shall employ donkeys or other animals with breeching of string or thin rope. The breeching must be at least thread should be of tape (Nawar). (iii) No animal suffering from sores, lameness or emaciation or which is immature shall be employed or the work. (iv) The Contractor shall not employ any labour who has any contagious disease or is a habitual narcotic user or is as sick and unfit for manual labour as to create a hazard for his health or life. (v) The Project Director or his subordinate is authorized to remove from the work any person or animal found working which does not satisfy these conditions and no responsibility shall be accepted by the University for any delay caused in the completion of the work by such removal. Any Contractor who does not accept these conditions shall not be allowed to tender for works and his name shall be removed from the list of Contractors.
54	Pakistan Timber To Be Used	Clause-40	As for as possible Pakistan Timbers shall be used and where for any reason this is not practicable preference shall be given to imported timber of approved origin and quality.
55	Certificate For Concessionary Freight Of Charges From The Railway	Clause-41	If any materials are required to be conveyed by rail, the Contractors will

			be granted certificates by the Project Director to the effect that the materials are required for University works thereby enabling them to have the benefit as allowed under the rules from the railway. In case, however, such a concession is withdrawn by the railway at any time', no claim shall be made against University on this account.
56	Recovery Of Dues From Contractor As Arrears Of As Land Revenue	Clause-42	Any sum due to the University by the Contractor shall be liable for recovery as arrears of Land Revenue.
57	Partnership Of M.L.As Is Forbidden	Clause-43	The Contractor shall certify that no member of Legislative Assembly is in partnership with him and that University will have the right to terminate the contract at any stage if it is discovered that a member of Legislative Assembly or Parliament is a partner in the Contract.
58	Payment Of Taxes	Clasue-44	The contractor firmly holds himself responsible to get himself registered under Income Tax and Sales Tax Rules and to pay these and all other Government and local taxes due to him from time to time in accordance with the Government instructions.
59	Interest Or Share Of University Servant In The Work	Clause-45	The Contractor shall certify that no University Servant, Government servants or a servant of a Corporate Body directly controlled by the Government has directly or indirectly any share or interest in this work.
60		Clause-46	The Contractor will not be allowed to withdraw his tender and ask For the return of earnest money before expiry of the period of three months,

			commencing from the date of opening of the tender and that if it is withdrawn in violation of this condition earnest money shall be forfeited.
61		Clause-47	Notwithstanding anything contained in any clause of this contract and further notwithstanding the fact that the final completion Certificate has been awarded to the Contractor and his 50% Security deposit refunded, the liability of the Contractor for the purpose of" Defect Liability" shall extend for the period of 12 months from the date of issue of the completion Certificate for removal including replacement of any defect found in the works due to construction or any other cause directly attributed to and a result of defective work or negligence in carrying out the work. The remaining 50% security deposit will be refunded after 12 months after removal of defects, if any.
62		Clause-48	The Contractor shall employ at his cost at the site of work for effective planning, supervision and control of the work, adequate, full time Director engineering staff and trained and experience licensed electricians and mechanics of respective trade in addition to the usual team of following scales. Work costing upto Rs. 15.0 lacs A Diploma holder. Work costing over Rs. 15.0 Lacs A Professional Engineer

			Registered with Pakistan Engineering Council. Such persons work on the job shall be deemed to the authorized agents at site of the Contractor and shall receive all orders & instructions of the Project Director, Engineer and Consultants or their authorized representatives and shall also be responsible to maintain a work-order book and other registers at Site and shall forth with take actions to carry out the orders and instructions.
63		Clause-49	If any question, difference or objection whatsoever shall arise in any way contracted with or arising out of this instrument or the meaning or objections of any part thereof, the rights, duties or liabilities of either party, then save in so far as the decision of any such matter is hereinbefore provide for as has been so decided, every such matter including whether its decisions has been otherwise provided for and or regards the right of and obligations of the parties as the result of such termination shall be referred for arbitration to such person or a board with the mutual consent of the Project Director and the Contractor and his decision shall be final and binding and where the matter involves a claim for or the payment recovery or deduction of money, only the amount, if any awarded in such arbitration shall be payable or recoverable in respect of the matter so referred.

64	Force Majeure	Clause-50	The parties shall not be considered to be at default in the execution of their contractual obligations or any of them to the extent that the execution of such obligations or any of them is delayed or omitted by cause of force Majeure. Each part will advise the other party by written notice within 30 days of the occurrence of any such case force Majeure employed therein shall mean acts of the Public enemy wars (whether declared or not) hostilities, revolutions, civil disturbances, epidemics, fires, floods, earth quakes, weather causes of similarly nature which render the performance of this agreement unfeasible and inspite of the exercise is unable to overcome.
65	Mobilization Advance	Clause-51	The Mobilization advance will be paid at the rate of 10% of the tendered cost to the contractor, without interest. This advance will be paid to the contractor against Insurance Guarantee registered with Pakistan Insurance Corp. duly recommended by the Engineer & approved by the University Authorities. The Insurance guarantee shall cover the entire period till full amount of mobilization advance is recovered. This advance shall be recoverable in four equal installments starting from the contractor's second progressive bill. Recommended Insurance Companies are as follows: 1. EFU. 2. Adamjee

			3. Jubilee General Insurance Company

CLAUSE - 52

The cost difference in the prices specified in the schedule of rates for following items shall be paid separately and as per actual consumption / quantities executed and in accordance with Notifications issued by Standing Rates Committee, Government of Sindh from time to time. N/A

Item	Rate provided in Schedule of Rates	Unit	Rate Allowed w.e.f 01-07-2011	Cost Difference payable/ recoverable w.e.f.	Remarks
M.S. Bars (Tor)					
Cement (OPC)					
Bricks 9"x4 ½"x3" (First Class)					
Deodar Wood (First Quality)					
Partal Wood					
Bitumen					
Any other item if notified by Standing Rates Committee, Government of Sindh					

Any change in the above price by Standing Rates Committee Government of Sindh during the currency of contract, the difference will be payable to or, as the case may be recoverable from the contractor. The effect of the revision of the prices will be confined to the quantity of the items which is actually consumed after the date of such revision.

CLAUSE - 53

The electric and water connection will be provided at one point respectively near the site of work. The Contractor will be responsible for further distribution where ever required including making complete arrangements for shortage of water. The cost of electric energy consumed as per prevailing tariff including service charges of WAPDA will be paid by the

contractor. The cost of water consumed in the work will be recovered from the bills of the contractor at 2% (two percent) of the cost of these items of works on which water is used.

CONTRACTOR.

Witness.

1. _____
2. _____

ENGINEER.

Witness

1. _____
2. _____

PROJECT DIRECTOR

Certified that the Tender/Agreement has been prepared/executed under our supervision and we are satisfied that it has been correctly prepared/executed.

_____

Consultants

FOREIGN CURRENCY REQUIREMENTS

1. The Bidder may indicate herein 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 _____%.

Not applicable

3. Table of Exchange Rates

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

PRICE ADJUSTMENT UNDER CLAUSE 70/13.8 OF CONDITIONS OF CONTRACT

A. Weigh ages or coefficients are used for price adjustment.

The source of indices and the weight ages or coefficients for use in the adjustment formula under Clause 13.8 shall be as follows.

(*To be filled by the procuring agency*)

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

Not applicable

Notes.

1) Indices for "(ii)" to "(vii)" are taken from the Government of Pakistan Federal Bureau of Statistics, Monthly Statistical Bulletin. The base cost indices or prices shall be those applying 15 days prior to the latest day for submission of bids. Current indices or prices shall be those applying 28 days prior to the last day of the billing period.

2) Any fluctuation in the indices or prices of materials other than those given above shall not be subject to adjustment of the Contract Price.

3) Fixed portion shown here is for typical road project, procuring agency to determine the

weight age of Fixed Portion considering only those cost elements having cost impact of seven (7) percent or more on his specific project.

B. When Escalation is allowed on the material only.
Price adjustment of following items shall be allowed.

Cost Element	Description	Base Price	Applicable index
1	2	3	
(i)	Cement – in bags		Pakistan (GoP) Bureau of Statistics (FBS) Monthly Statistical Bulletin.
(ii)	Reinforcing Steel		" " "
(iii)	Bricks		" " "
(iv)			" " "
(v)	(Composite item)		" " "
	Total five items.		

Not applicable

BILL OF QUANTITIES

A. Preamble

1. The Bill of Quantities shall be read in conjunction with the Conditions of Contract, Specifications and Drawings.

2. The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work executed and measured by the Contractor and verified by the Engineer and valued at the rates and prices entered in the priced Bill of Quantities, where applicable, and otherwise at such rates and prices as the Engineer may fix as per the Contract (in case of item not mentioned in Bill of Quantities).

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 14 days prior to deadline for submission of Bids in case of ICB/NCB respectively, 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 and shall not be paid separately.

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 13.5 of Part I, General Conditions of Contract.

BILL OF QUANTITIES

B. Work Items (Road/PHE Work)*

1. The Bill of Quantities contains the following Bills and items:

Bill No. 1	-	Earthworks
Bill No. 2	-	Hard Crust and Surface Treatment
Bill No. 3	-	Culverts and Bridges
Bill No. 4	-	Subsurface Drains [illegible] Manhole
Bill No. 5	-	Tubewell, Pumphouses and Compound Wall
Bill No. 6		Miscellaneous Items

Daywork Schedule

Summary of Quantities

2. [illegible] shall price the Bill of Quantities in Pakistani Rupees only.

* *procuring agency can add and delete the items as per its requirement.*

BILL OF QUANTITIES

B. Work Items (Buildings)*

1. The Bill of Quantities contains the following Bills and items:

Bill No. 1	-	Plinth and Foundation
Bill No. 2	-	Ground Floor
Bill No. 3	-	First and Subsequent Floors
Bill No. 4	-	Internal Water Supply and Sanitary Fittings
Bill No. 5	-	Internal [illegible]
Bill No. 6		[illegible]
Bill No. 7		External Development

Daywork Schedule
Summary Bill of Quantities

BoQ attached

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

* *procuring agency can add and delete the items as per its requirement.*

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY
SHAHEED Z. A. BHUTTO CAMPUS, KHAIRPUR MIR'S

Summary of Cost for Auditorium

A- Scheduled Items			
1	Schedule Civil Works except steel and RCC	Rs.	
	Schedule Civil Works steel	Rs.	
	Schedule Civil RCC Works	Rs.	
2	Non schedule Architectural Works	Rs.	
	Total-1	**Rs.**	
	Schedule Plumbing Works		
1	Schedule Plumbing Works SI	Rs.	
2	Non Schedule Plumbing Works	Rs.	
	Total-2	**Rs.**	
	Different cost of SR cement & Cartage		
1	Cartage	Rs.	4,418,721.02
2	Different cost of SR cement	Rs.	56,920.00
	Total-3	**Rs.**	**4,418,721.02**
	Total -1+2+3	**Rs.**	
	External development		
1	Drainage Work	Rs.	
2	External development	Rs.	
	Total- 4	Rs.	
	Special work		
1	Special items	Rs.	
	Grand Total	**Rs.**	

Project Director

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY
SHAHEED Z. A. BHUTOO CAMPUS KAHIRPUR MIR'S

BILL OF QUANTITIES FOR AUDITORIUM (CIVIL WORKS)

S.No	DESCRIPTION	QTY.	UNIT	RATE(RS)	AMOUNT(RS)
Item-01	**EXCAVATION FOR FOUNDATION**				
	Excavation in foundation of building bridges and other structures including dagbelling, dressing, refilling around structure with excavated earth watering and ramming lead up to 5 ft.				
	i) In ordinary soil.	18,370.00	%0 cft	3176.25	58,347.71
	Item 18(b) Page-4				
Item-02	**EARTH FILLING**				
	i) Filling, watering and ramming earth in floor with surplus earth from foundation lead up to one chain and lift up to 5 ft.	6,696.00	%0 cft	1512.5	10,127.70
	Item 21 Page-4				
Item-03	**EARTH FILLING**				
	i) Filling, watering and ramming earth in floor with new earth excavated from out side lead up to one chain and lift up to 5 ft.	37,501.00	%0 cft	3630.00	136,128.63
	Item .22 Page-4				
Item-04	**P.C.C (1:4:8)**				
	Cement concrete plain (1:4:8) using sulphate resistant cement type (v) including placing, compacting, finishing, curing, complete, (Including screening and washing of stone aggregate without shuttering). Footing	2,425	% cft	11288.75	273,752.19
	grade slab	1,635	% cft	11288.75	184,571.06
	Item 5(i) Page-16				
Item-05	**P.C.C (1:3:6)**				
	Cement concrete plain (1:3:6) using sulphate resistant cement type (v) including placing, compacting, finishing, curing, complete, (Including screening and washing of stone aggregate without shuttering).	1,092	% cft	12595	137,537.40
	Item 5(h) Page-16				
Item-06	**P.C.C (1:3:6)**				
	Erection and removal of centering for RCC or plain cement concrete works of pertal wood (1) vertical	1,092	% cft	3127.41	34,151.32
	Item 19 (b-ii) Page-18				
Item-07	Pacca brick work in foundation & plinth in cement sand mortar 1:6 using sulphate resistant cement type (v) .	3,998	% cft	11948.36	477,695.43
	Item 4(e) Page-21				
Item-08	**GRADED STONE**				
	Dry rammed brick or stone ballast 1½" to 2" gauge.	4,039	% cft	3327.5	134,397.73
	Item (2) Page-15				

S.No	DESCRIPTION	QTY.	UNIT	RATE(RS)	AMOUNT(RS)
Item-09	ORNAMENTAL JALI				
	Providing and fixing ornamental cement jali 2" thick (1:2:4) without steel		per sft	226.02	-
	Item 11 Page-18				
Item-10	C.I MAN HOLE COVER AND FRAME				
	Providing and fixing C.I Manhole Cover with frame i/c cost of material.	2	CWT	6985	13,970.00
	Item (j) 1 Page-35				
Item-11	**BRICK MASONRY IN SUPER STRUCTURE (ABOVE PLINTH LEVEL)**				
	Providing and laying approved first class burnt brick masonry in super structure walls at any height and any floor, laid and jointed with cement and approved source sand machine mixed mortar, masonry to be laid in course true to line, level and plumbing, protected and properly cured including scaffolding and providing deep joints to receive rendering. All work to be completed as per drawings and specifications, including P/F specified anchorage with concrete members and directed by the Engineer				
	Internal Walls				
i.	Ground Floor (Item No. 5. (i e) & 6 ii (where required)				
	4 1/2""thick and above internal/external walls in (1:4) CSM	789.06	%cft.	13,227.41	104,372.20
	9"thick and above internal/external walls in (1:6) CSM	5,980.73	%cft.	12,674.36	758,019.25
ii.	First Floor				
	4 1/2""thick and above internal/external walls in (1:4) CSM	219.84	%cft.	13,666.04	30,043.42
	9"thick and above internal/external walls in (1:6) CSM	5,087.35	%cft.	13,112.99	667,103.70
iii	) Mumty / roof level/parapet				
	4 1/2""thick and above internal/external walls in (1:4) CSM	330.00	%cft.	14,240.79	46,994.61
	9"thick and above internal/external walls in	317.00	%cft.	13,687.74	43,390.14
	Chapter No.5, Page No. 21				
Item-12	**GLAZED CERAMIC TILES DADO (MASTER / EQUIVALENT)**				
	Providing and fixing glazed ceramic tiles of size as below of approved make and texture shade in dado set over cement slurry and filling the joints with neat white cement with matching pigments including 3/4" thick base plaster of cement, sand (1:4) with curing and cleaning etc., complete as per drawings, specifications and as directed by the Engineer				
i.	Ground Floor + First Floor				

S.No	DESCRIPTION	QTY.	UNIT	RATE(RS)	AMOUNT(RS)
	b) 12"x18"/any size approved by Engineer Incharge	1,185.00	%sft.	28,299.30	335,346.71
	Chapter No.8, Page 45, Item No. 38				
Item-13	**NON SKIKD CERAMIC FLOORING TILE**				
	Laying floors of approved coloured glazed/semi glazed tile 1/4" thick laid in white cement and pigment on a bed of 3/4" thick cement mortar 1:2				
i.	Ground Floor + First Floor	625.75	%sft.	27,747.06	173,627.23
	Chapter No.8, Page 43, Item No. 25				
Item-14	**PLAIN CEMENT SAND WALL PLASTERING**				
	Providing and applying 3/4" thick plaster at any floor or at any height using approved quality sand preferably machine mixed mortar, including all bends, corners, recesses including scaffolding and hacking the concrete surfaces, arching the masonry joints and providing 8" wide GI wire mesh of 17 SWG 1"x1" size fixed with GI staples on masonry joints, concrete joints. All plaster to be finishes smooth with steel float in true to level, line and plumb and properly cured, complete as per drawings, specifications and as directed by the Engineer.				
i.	**Ground Floor, Item No. 13 a+29**				
	Internal walls/columns plaster 3/4" thick in 1:6 CSM				
	a) Ground Floor	11,190.49	%sft.	2,590.50	289,889.64
	b) First Floor	4,477.02	%sft.	2,590.50	115,977.20
	c) / Mumty		%sft.		-
ii.	**Ground Floor + First Floor, Item No. 11 (b)+29**				
	External Surfaces 1/2" thick 1:4 CSM on walls/up stand/down stand beam projection.				
	a) Ground Floor	5,599.46	%sft.	2,283.93	127,887.75
	b) First Floor	4,979.89	%sft.	2,424.90	120,757.35
	c) Parapet / Mumty	500.55	%sft.	2,580.84	12,918.39
	Chapter No.9, Page 52				
Item-15	Distempering Three Coats	15,667.51	%sft.	1,079.65	169,154.27
	Chapter 9, Page 54, Item 24 (c)				
Item-16	Preparing surface andapplying rock wall /sheild coating toprovide durable crust to wall thickness b/w 2mm to 3mm (1/8)wit acrylic co-ploymer emulsion, slected marble chips,				
	a) Plaster surface external	11,079.90	%sft	4,504.50	499,094.10
	Chapter 9, Page 56, Item 43				
Item-17	Cement pointing struck joints on walls		%sft.	1,287.44	-
	Chapter 9, Page 53, Item 19 (a)				
Item-18	**Chapter 9, Page 56, Item 45**				
	Extra labor for external surface for rock				

S.No	DESCRIPTION	QTY.	UNIT	RATE(RS)	AMOUNT(RS)
	Extra labor for external surface for rock wall/colour crete coat above 20'-0" height using long ladder (for every 10'-0" additional height)				
	i) Up to 30 feet height	4,477.02	sft.	1.97	8,819.73
	i) Up to 40 feet height	2,237.50	sft.	1.97	4,407.88
Item-19	Extra labor rate for making grooves of 1"x1/4" or 3/4" x 1/2" plastered surface with true edges both vertically and horizontally with uniform depth and with groove base smoothly finished etc. complete as per instruction of Engineer Incharge	145.00	rft.	7.71	1,117.95
	Chapter 11, Page 55, item 34				
Item-20	Extra labor for making cement plaster pattas/band where required width not less than 6" width fine finishing as directed	768.00	rft.	19.36	14,868.48
	Chapter 9, Page55, Item 35				
Item-21	**Chapter 10, Page 61, Item 24** Providing and laying deodar wood wardrobe including boxing with back shelves shutters of MDF 3/4" thick both side laminated with drawers and brass fittings such as handles piano hinges locking arrangement rod, shoe rack, complete as per approved design (except paint / polish)	123.00	sft.	2,364.63	290,849.49
Item-22	Providing and applying three coats of enamel painting (Mat finish/all rounder including cleaning, approved make premixed putty filling, sand papering and a coat of primer complete as per manufacturers standards and as directed by the Engineer				
i.	On wood surface /steel chowket three coats	365.00	%sft.	2,116.38	7,724.79
	Chapter No.11, Page 70, Item No.5 c i. & ii				
Item-23	Providing and laying French polish complete on new wood surface	288.00	%sft.	3,841.75	11,064.24
	Chapter 11, Page 71, Item 7				
Item-24	**ALUMINUM DOORS / WINDOWS / VENTILATORS** Providing and fixing 2mm sectional thickness 101 mm wide of approved color aluminum doors/windows/ventilators including 5mm thick approved glass fixed to concrete or masonry surfaces by means of plastic fisher plugs, screws for windows and expansion bolt for door etc. inclusive but not limited to hinges, Matex Japan rollers, sliding lock having press buttons, handles, stays, PVC glazing gasket, caulking compound etc., complete as per drawings and as directed by the Engineer				
i.	Door	331.00	P.sft.	1,507.66	499,035.46
ii.	Window partially fixed and partially sliding with out fly screen	657.00	P.sft.	1,647.69	1,082,532.33

S.No	DESCRIPTION	QTY.	UNIT	RATE(RS)	AMOUNT(RS)
iii.	Fixed windows and fixed fan lights **Chapter No. 18, Page 108, Item No. 83b, 84b & 85b**	16.00	P.sft.	1,449.69	23,195.04
Item-25	**ROOF TREATMENT** Second class tile roofing consisting of 4" earth and 1" mud plaster with gobrileeping over 1/2" thick cement plaster 1:6 with 34 Lbs .of hot bitumen coating sand blinded ,provided over one layer of 12" x 6" x 2" tiles laid in 1:6 mortar including 1:2 cement pointing under neath of tiles complete including curing etc.				
i.	On Roof **Chapter No.7, Page 33, Item No.2,**	7,211.00	% sft	7,607.25	548,558.80
Item-26	**POLYTHENE SHEET** Providing and laying single per layer of polythene sheet 0.13 mm thick for water proofing as per specification and instructions of Engineer Incharge				
	On Top Roof **Chapter No.7, Page 38, Item No. 38**	8,146.00	% sft	10.70	871.62
Item-27	**DAMP PROOF COURSE (2" thick) (S.R. CEMENT)** Damp proof course with cement sand & shingle/crush concrete (1:2:4) using sulphate resistant cement type (v) including 2 coats of asphaltic mixture. (Over Walls) **Item 28(b) Page-19**	585.00	% sft	3,912.85	22,890.17
Item-28	Providing and fixing approved quality mortice lock. **Chapter No10, Page 60, Item No. 21**	38.00	each	1,786.13	67,872.94
Item-29	Priming coat of chalk distemper. **Chapter 9, Page 54, Item 23**	15,667.51	%sft	442.75	69,367.90
Item-30	Providing and fixing Collapsible gate with channel framing of section 3/4" x 5/16" at 4" i/c revitted with 3/4" x 1/8" flat iron Patti placed diagonally and provided with top & bottom T-section 1"x1", 1/8" along with roller also i/c locking arrangement and fixing in floor/ceiling or wall etc., completed. **Chapter 17, Page 93, Item 32**		sft	387.04	-
Item-31	Two coats of Bitumen laid hot using 34 lbs for % S t over roof and blinded with sand at one Cft F % Sft. **Chapter 7, Page 35, Item 13**	44,100.00	%sft	1,887.40	832,343.40

S.No	DESCRIPTION	QTY.	UNIT	RATE(RS)	AMOUNT(RS)
Item-32	**ANTI-TERMITE TREATMENT** Providing Anti-termmite treatment by spraying / sprinkling / spreading Neptachlar 0.5% Emulsion as an ever all pre-construction treatment in slab type construction under the slab and along attache perches or entrances etc. complete as per directions of Engineer Incharge **Page 109, item No. 92**	7,211.00	sft.	9.74	70,235.14
	TOTAL				**8,511,010.48**
	% LESS OR MORE ON SCHEDULE RATES				
	TOTAL FOR SCHEDULE ITEMS				
	Civil Work Steel				
Item-34	**STEEL REINFORCEMENT** Fabrication of mild steel reinforcement for cement concrete including cutting, bending, laying in position, making joints fastenings, including cost of binding wire also includes removal of rust from Tor bars. **i)Ground Floor** Using Tor bar **Item 8(b) page-17**	1,524.5	per Cwt	5001.7	7,625,091.65
	TOTAL				**7,625,091.65**
	% above or below ON SCHEDULE RATES				
	TOTAL FOR SCHEDULE ITEMS				
Item-35	**REINFORCED CEMENT CONCRETE (S. R. CEMENT)** Reinforced cement concrete (1:2:4) using sulphate resistant cement type (v) or more rich to provide 6"x12" cylinder strength of 3000 psi at 28 days age (equivalent cube strength = 3750 psi) including all labor and material except the cost of steel reinforcement and its labor for bending and binding which will be paid separately. This rate also includes all kinds of forms, moulds, lifting, shuttering, curing, rendering and finishing exposed surface including screening and washing of stone aggregate.				
	i) Footing	5,744	per cft	337	1,935,728.00
	ii) Tie Beam	106	per cft	337	35,722.00
	a) grade Slab	2,158	per cft	337	727,246.00
Item-36	**REINFORCED CEMENT CONCRETE** Reinforced cement concrete (1:2:4) using sulphate resistant cement type (v) or more rich to provide 6"x12" cylinder strength of 3000 psi at 28 days age (equivalent cube strength = 3750 psi) including all labor and material except the cost of steel reinforcement and its labor for bending and binding which will be paid separately. This rate also includes all kinds of forms, moulds, lifting, shuttering, curing, rendering and finishing exposed surface including screening and washing of stone aggregate.				

S.No	DESCRIPTION	QTY.	UNIT	RATE(RS)	AMOUNT(RS)
	a) columns	2,706	per cft	337	911,922.00
	b) Beams	5,530	per cft	337	1,863,610.00
	c) Slabs	3,785	per cft	337	1,275,545.00
	d) Lintels	92	per cft	337	31,004.00
	e) Stairs	747	per cft	337	251,739.00
	f) Seats	2,380	per cft	337	802,060.00
	g) wall	1,367	per cft	337	460,679.00
	Item 6(a)(I) Page-17				
Item-37	**REINFORCED CEMENT CONCRETE (S.R CEMENT)**				
	Reinforced cement concrete (1:1½:3) or more rich to provide 6"x12" cylinder strength of 4000 psi at 28 days age (equivalent cube strength = 4500 psi) including all labor and material except the cost of steel reinforcement and its labor for bending and binding which will be paid separately. This rate also includes all kinds of forms, moulds, lifting, shuttering, curing, rendering and finishing exposed surface including screening and washing of stone aggregate.				
	Upto plinth				
	a) Columns	862	per cft	349	300,838.00
	Item 6(a)(II) Page-17				
	TOTAL				**8,596,093.00**
	At par				
	TOTAL FOR SCHEDULE ITEMS				

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BILL OF QUANTITIES FOR AUDITORIUM (ARCHITECTURAL WORKS) Non Schedule Item

S. No.	Description	Qty.	Unit	Rate (Rs.)	Amount (Rs.)
1	**Porcelain Floor Tiles**				
	Providing and laying imported matt finish Porcelain tile in size 16"x16" of approved make, colour, and shade with patches/borders pattern, laid on cement paste having addition of tile bond at 15% by weight of cement laid over 1" thick 1:3 cement sand base mortor, over existing PCC 1:2:4 (cost excluded) complete as per detail shown on the drawing, specifications, and as directed by the Engineer				
	Same as above but 16"x16" size at any floor	1,890	P.Sft		
2	**Porcelain Skirting Tiles**				
	Providing and fixing of imported porcelain skirting 4"high and 16" lenght in size of approved make,colour and shade fixed with cement paste having addition of tile bond at 15% by wieght of cement and filling the joints with neat white cement slurry with matching colour pigment including 3/4" thick base plaster of cement sand (1:4) with curing and cleaning etc, complete as shown on the drawing, specifications and as directed by the Engineer.	276	P.Rft		
3	**Lasbella Bouticsena Cream Colour Marble Tiles**				
	Providing and laying Lasbella Boutescena Cream (without streak)colour marble as per detail shown on the drawing counters / stair steps steps including landing and risers set over and including average 1" thick (1:3)CSM with cement slurry and grouting the joint with neat white cement mixed with colour pigment to match the marble colour including curing,grinding and chemical polishing etc, complete as per specifications,drawings and as directed by the Engineer.				
	A) Stairs				
	On Treads with bull nozing 3/4" thick				
	i) size 4'x12" to 15"	160	P.Sft		
	ii) size 3'x12" to 15"	169	P.Sft		
	B) Risers				
	i) size 4' - 6' x0-6" 3/4" thick for stair steps	77	P.Sft		
	ii) size 3' - 6' x0-6" 3/4" thick for stair steps	89	P.Sft		
	C) Floors (3/4" thick without bull nozing)				
	i) size 12"x12"	816	P.Sft		
	D) Marble skirting 1/2" think, 4" high	72	P.Sft		
	E) Marble on Cabinets/vanity (3/4" thick bull noze				
	i) size 5' to 6' x 3' wide	98	P.Sft		

S. No.	Description	Qty.	Unit	Rate (Rs.)	Amount (Rs.)
4	**Water Proof Plaster**				
	Providing and laying 3/4" thick (1:3) cement sand plaster mixed with pudlo or other similar approved material mixed with cement @ 2.5 kg per bag of cement, including all bends, corners, recesses and also including hacking the concrete surfaces, all plaster to be finished smooth with a coat of cement slurry with steel float in true level, line and completed as per drawings, specifications and as directed by the Engineer				
	On internal sides of overhead water tank	454	P.Sft		
5	**Carpentry and Joinery**				
a	Providing and laying flush door shutter partially glazed (5mm glass) and commercial ply 3mm thick both sides, deodar wooden shutter frame of 4" wide 1-1/4" thick styles and rails bottom rail 6" wide, mild steel (galvanized) 20 guage size 2"x6" door frame fixed with hold fasts with approved quality brass fittings and double action hinges concrete (1:2:4) or cement sand mortar (1:6) filled in door frame inlcuding 3 coats of paint of approved quality, complete in respect	147	P.Sft		
b	Providing and fixing first class deodar wood 1-1/2" thick paneled shutters with 4" wide stile, bottom rail 6" side and top and lock rail 4" wide and 20 guage 2"x6" GI mild steel moulded sheet frame and fixing in position with concrete or CSM filling in frame including 2"x5/8" and 5/8"x5/8" deodar wood architrave beading at wall / frame joints on both sides, complete with panel of 3/4" deodar wood plank and deodar wood stopper 1/2" x2"(excluding matt finish enamel paint), approved iron hinges, door stoppers, CP brass fittings, handles, approved quality lock. Complete as per drawings, specifications and as directed by the Engineer	228	P.Sft		
8	**Same as above but MS ties @ 3'-0" c/c horizontally @ 1'-6" vertically in cavity wall staggred**				
	a) Ground Floor	5,599.46	sft.		
	b) First Floor	4,979.89	sft.		
	Sub TOTAL				
	TOTAL FOR Non SCHEDULE ITEMS				

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S.No	DESCRIPTION	QTY.	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	PLUMBING WORKS (SCHEDULE ITEMS)				
1	Providing & fixing a squatting type white glazed earthenware W.C. pan with including the cost of flushing Cistern with internal fittings and flush pipe with bends & making requisite number of holes in wall, plinth and floor for pipe connection and making good in cement concrete 1:2:4.				
	ii) With 4" dia white glazed earthen ware trap & plastic thumble (item no. 1,A, chapter-1)	5	Each	5,088.20	25,441.00
2	Providing & fixing European type white glazed earthenware wash down W.C. pan complete with and including the cost of white/black-plastic seat (Best quality) and lid with C.P. brass hinges and buffers, 3 gallons white glazed earthenware low level flushing cistern with siphon fittings, 1-1/2" dia. white procelain enamelled flush bend, 3/4" dia and making requisite No. of holes in walls, plinth & floor for pipe connetion and making good in cement concrete 1:2:4 (Foreign quality) (item No.5, chapter-1)	5	Each	11,477.40	57,387.00
3	Providing & fixing 24" x 18" lavatory basin in white glazed earthenware complete with and including the cost of W.I. Or C.I. Cantilever bracket 6 inches built into wall, painted white in two coats after a primary coat of red lead paint, a pair of 1/2" dia chrome plated pillar taps, 1-1/2" dia rubber plug and chrome plated brass chain, 1-1/4" dia malleable iron or brass, brass unions making requisite number of hole in walls, plinth and floor for pipe connection and making good in cement concrete 1:2:4, standard pattern including earthen ware glazed padestal (Item No.8, chapter-1)	12	Each	4,253.70	51,044.40
4	Providing and fixing steel sink stainless local make complete with cast iron or wraught iron brackets 6 inches built in wall, 1-1/2" rubber plug chrome plated brass chain 1-1/2" c.p. brass waste, with 1-1/2" PVC waste pipe and making requisite number of holes in wall and plinth and floor for pipe connection and making good in concrete 1:2:4 40"x20" local make (item No. 19a, chapter-1)	1	Each	5,052.30	5,052.30
5	Providing and fixing c.p. brass toilet paper holder of standard size with chrome plated brass brackets complete (superior quality) (item No.2b, chapter-2)	5	Each	1,071.40	5,357.00
6	Providing and fixing urinals white or colour glazed 17" standard quality.	0	Each	-	-
7	Providing and fixing chrome plated brass towel rail complete with brackets fixing on wooden				

S.No	DESCRIPTION	QTY.	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	1) Towel rail 24" long.3/4" dia Round or square superior quality (item No.1-(III)(b), chapter-2)	10	Each	1,082.95	10,829.50
8	Providing & fixing 24" x 18" bavelled edge mirror of Belgium glass complete with 1/8" thick hardboard and c.p brass screw fixed to wooden pleat with glass shelves.				
	b) Superior quality (item No.3(b)chapter-2)	12	Each	2,376.00	28,512.00
9	Providing & fixing soap tray earthen with c.p. brass screws etc. complete (item No.5 b, chapter -2)	12	Each	497.20	5,966.40
10	Supplying & fixing in position 1/2" dia. C.P. bib cocks standard pattern. (Item No. 2-(1)(b), chapter-6)	7	Each	150.92	1,056.44
11	Supplying & fixing in position 1/2" dia tee stop of superior quality with C.P. head (item No.12b,	24	Each	889.46	21,347.04
12	Providing & fixing handle valves (China). (Item No. 3, chapter-6)				
	i) 1/2" dia	0	Each	200.42	-
	ii) 3/4 " dia	0	Each	271.92	-
	iii) 1 " dia	2	Each	365.42	730.84
	iv) 1-1/4" dia	3	Each	475.42	1,426.26
	v) 1-1/2" dia.	6	Each	640.92	3,845.52
	vi) 2" dia	6	Each	1,382.92	8,297.52
	vii) 2-1/2" dia,Gate valve, Make "ANWAR" Item 4(A)B-(vii), chapter-6.	4	Each	1,225.84	4,903.36
13	Providing G.I. Pipes, specials and clamps etc., I/c, fixing cutting and fitting complete with and including the cost of breaking through walls and roof, making good etc., painting two coats after cleaning the pipe etc., with white zinc paint with pigment to match the colour of the building and testing with water to a pressure head of 200 feet and handling (item No.1, chapter-4). fo.temr water supplu and fire water system.				
	Chapter 4 Item 01				
	i) 1/2" dia	30	P.Rft	73.21	2,196.30
	ii) 3/4" dia	115	P.Rft	95.79	11,015.85
	iii) 1" dia.	155	P.Rft	128.55	19,925.25
	iv) 1-1/4" dia	35	P.Rft	153.99	5,389.65
	v) 1-1/2" dia	230	P.Rft	188.97	43,463.10
	vi) 2" dia	150	P.Rft	233.00	34,950.00
	vii) 2-1/2" dia	25	P.Rft	310.47	7,761.75
	viii) 3" dia (FOR RAIN WATER PIPES)	310	P.Rft	360.40	111,724.00
14	Providing & fixing 6"x2" or 6"x3" C.I. Floor trap of approved self cleaning design with a C.I. Screwed down grating with or without a vent arm complete with and i/c, making requisite No. of holes in walls, plinth and floor for making pipe connection and making good in cement concrete 1:2:4 (item No. 20,chapter-1).	18	Each	2,042.43	36,763.74

S.No	DESCRIPTION	QTY.	UNIT	RATE (Rs.)	AMOUNT (Rs.)
15	Supplying and fixing pillar cock of superior quality with c.p head etc., complete (item No.16a, chapter-6).	13	Each	795.30	10,338.90
16	Providing & laying including cutting and fitting C.I. Pipes in trenches and testing with water to a pressure head of 200 feet.				
	i) 6 ' dia	0	P.Rft		
	ii) 3" dia (item 13,chapter-3).	148	P.Rft	289.25	42,809.00
	iii) 4" dia.(item-1, chapter-3)	135	P.Rft	333.29	44,994.15
17	Providing & fixing 4" dia C.I. Fittings including extra painting to match the colour of the Building.				
	a) Plain bend of required degree.	41	Each	566.70	23,234.70
	b) Equal and unequal plain branch of required degree and arms.	34	Each	702.00	23,868.00
	c) Equal and unequal plug branch of required	28	Each	270.60	7,576.80
	d) Lead caulked joint.	280	Each	341.85	95,718.00
	e) Plug bend of required degree.	15	Each	599.60	8,994.00
18	Providing & fixing 3" dia C.I. Fittings including extra painting to match the colour of the Building.				
	a) Equal and unequal plain branch of required	28	Each	591.30	16,556.40
	b) Lead caulked joint.	170	Each	315.36	53,611.20
	c) Plain bend of required degree.	28	Each	495.60	13,876.80
19	Providing and fixing of ball valve (with unsoldered copper	0	Each	-	-
	TOTAL COST OF SCHEDULE ITEMS.				**845,964.17**
	PREMIUM %BELOW / ABOVE				
	TOTAL COST OF SCHEDULE ITEMS CARRIED TO SUMMARY				

S.No	DESCRIPTION	QTY.	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	EXTERNAL WORKS (SCHEDULE ITEMS)				
	DRAINAGE SYSTEM				
1	Excavation in pipe line in trenches and pits in hard soil.	2600	%o Cft	3,900.00	10,140.00
2	Excavation in pipe line in trenches and pits in gravely soil.	1800	%o Cft	4,200.00	7,560.00
3	Providing and laying R.C.C. pipe class 'B' with collar.				
	i) 9" dia, item 2(d), chapter 11	275	P.Rft	163.00	44,825.00
	ii) 12" dia, item No. 2e, chapter 11.	96	P.Rft	286.00	27,456.00
4	Construction manhole or inspection chamber for the required dia of circular sewer of 3'-6" depth with walls of B.B. in cement mortar 1:3 and 1:3 cement plastered 1/2" thick inside of walls and 1" thick over benching and channels including fixing C.I. manhole cover with frame of clear opening 1-1/2" x 1-1/2" of 1.75 Cwt embedded in plain C.C. 1:2:4 and fixing 1" dia M.S. steps 6" wide projecting 4" from the face of wall at 1" C/C duly painted etc. complete as per specification and drawing No. D-P/1 of Public Health Circle, Southern Zone. item No. P(a) chapter-				
	Internal dia of Sewer 4" to 6".				
	internal dia of Chamber 2'-0" x 2'-0"	12	Each	14,748.00	176,976.00
5	Construction of Gully traps of 12"x12" internal size and required depth of max 18" with walls of in cement mortar 1:3 and 1:3 cement plastered 1/2" thick inside of walls including fixing of C.I.	8	Each	1,358.17	10,865.36
	TOTAL COST OF SCHEDULE ITEMS.				**277,822.36**
	PREMIUM % ABOVE/BELOW.				
	TOTAL COST OF SCHEDULE ITEMS CARRIED TO SUMMARY				

S.No	DESCRIPTION	QTY.	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	PLUMBING WORKS (NON SCHEDULE ITEMS)				
1	Providing & fixing plastic shelf with rawl plug and 1" long C.P. brass screws. (Master make).	12	Each		
2	Providing & fixing 1-1/2" dia uPVC pipe for wash basin drain .				
	i) 3 ' dia.	50	rft.		
3	Providing and fixing C.I. Cleanouts with sunk type C.P. brass screw caps including cost of making requisite number of hole in walls, plinth and floor for pipe connection and restoring damaged surfaces to original condition.				
	a) 3" dia.	5	Each		
	b) 4" dia	0	Each		
4	Providing and fixing 24 SWG C.P copper connection 18" x 3/8" with two C.P. brass nuts, etc.. complete (Asia code No. 329)	24	Each		
5	Providing and installing of c.p. bottle trap as manufactured by Master /Asia	12	Each		
6	Providing and fixing of water cooler Make" ICE BERG" or EQ. Cap: 20 Gls.	2	Each		
7	Providing and installation of fire hose cabinet Recessed type, including 100 ft. dia 1 Inch fire hose with multi throw nozzle, automatic operation valve and glass front, conforming to BS-18825 similar to "NAFFCO" UAE or Eq.	4	Each		
8	Providing and installation of Dry chemical type Fire extiguishers for fires type A, B, C & E, conforming to BS-3465, Mame, "NAFFCO" UAE or Eq.,				
	a) 4.5 Kgs.	16	Each		
	b) 2.0 Kgs.	1	Each		
9	Providing, Installation, testing and commissioning of Low pressure fire fighting pump set, comprising of followings:-				
	a) Vertical single/multistage pumps= 02 Nos.				
	* Flow = 30 GPM				
	* Head = 2- Bars (30 psi)				
	b) Automatic pump control panel				
	c) Valves, Pressure switches and all accessories required.				
	d) Suction and discharhe headers.				
	e) Mounted on commom skid				
	Similer to , Make "NAFFCO" (Non UL/FM Listed) or Eq.,	1	Set		
	TOTAL COST OF NON-SCHEDULE ITEMS.				

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY
SHAHEED Z. A. BHUTOO CAMPUS KAHIRPUR MIR'S

BILL OF QUANTITIES FOR AUDITORIUM (EXTERNAL DEVELOPMENT)

Sr. No.	Description	Qty.	Unit	Rate (Rs.)	Amount (Rs.)
1	**Excavation** Excavation in foundation of building, bridges and other structures including debelling dressing refilling around structure with excavated earthw ater and remming lead upto 5 ft. b) in oridnary soil **Chapter 1, Page 4,Item No. 18-b**	942.00	%0Cft	3,176.25	2,992.03
2	Filling, watering and ramming earth under floor with new earth excavated fromoutsiee lead upto one chain and lift upto 5 feet **Chapter 1, Page 4, Item 22**	480.00	%0Cft	3,630.00	1,742.40
3	Cement concrete plain including placing compacting, finish and curing, complete (including screening and washing of stone aggregate without shuttering h) 1:3:6 (under foot path) i) 1:4:8 under floor and in foundation **Chapter 4, Page 16, Item 5**	419.76 419.76	% Cft % Cft	12,595.00 11,288.75	52,868.77 47,385.66
4	Pacca brick work in foundation and plinth in cement sand mortar including curing complete (e) 1:6 **Chapter 5, Page 21, Item 4 (i) (e)**	477.00	% Cft	11,948.36	56,993.68
5	**Sand Filling** Sand filling under floor foot path /plinth protection and where requried including laying, levelling, dressing compacting and complete a) under Plinth Protection and floor **Chapter 5, Page 26, Item 29**	318.00	% Cft	1,141.25	3,629.18
6	**Paving Blocks** Providing and fixing cement paving blocks flooring having size of 197x97x60 (mm) of city/qudda/cobble shape with pigment and having strenght b/w 5000 psi to 8500 psi filling the joints with hill sand and laying specified manner /pattern and design etc. (over 2" sand cushion, complete **Chapter 8, Page 49, item 72**	1,272.00	P.Sft	223.97	284,889.84
7	**Dainp Proof, Chapter 4, page 19, item 28b** Dainp proof course with cement sand and shingle concrete 1:2:4 including 2 coats of asphaltic mixutre b) 2" thick	155.00	% Sft	3,912.85	6,064.92
	TOTAL				**456,566.48**
	% LESS/MORE ON SCHEDULE RATES				
	TOTAL FOR SCHEDULE ITEMS				

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY
SHAHEED Z. A. BHUTTO CAMPUS, KHAIRPUR MIR'S
CARTAGE OF MATERIAL AND ESCALATION (AS PER BASIC SCHEDULE OF RATES - 2012)
CONSTRUCTION OF AUDITORIUM

A - CONSUMPTION OF MATERIAL

	QUANTITY	UNIT	CEMENT	SAND	BAJRI	STONE	BRICKS	STEEL
C.C. 1:4:8	4479.76	CFT	530.40	2,150.00		4,245.02		
R.C.C. 1:2:4	25355.00	CFT	4,462.48	11,156.00	22,312.40			
R.C.C. 1:1-1/2:3	862.00	CFT	189.64	353.00	724.08			
C.C. 1:3:6	1511.76	CFT	197.00	665.00	1,390.82			
BRICK WORKS (1:6)	15383.08	CFT	529.00	3,953.00			207,671.58	
BRICK WORKS (1:4)	1338.90	CFT	278.00	344.00			18,075.15	
3/4" C.P (1:6)	23355.51	SFT	216.86	616.59				
1/2" C.P (1:4)	12890.65	SFT	110.86	773.00				
1" C.P (1:2)	3700.75	SFT	155.00	222.00				
STEEL	1524.50	CWT						1524.50
			6669.24	**20232.59**	**24427.30**	**4245.02**	**225746.73**	

B - CARTAGE OF MATERIAL

CEMENT	6669.24	BAG @	15633.00	PER % BAG	1,042,602
SAND	20232.59	CFT. @	7008.6	PER % CFT	1,418,021
BAJRI / CRUSH	24427.30	CFT. @	1065	PER % CFT	260,151
STONE	4245.02	CFT. @	1423.16	PER % CFT	60,413
BRICKS	225746.73	NOS. @	617.56	PER % o NOS	13,941
STEEL	1524.50	CWT @	1065.00	PER CWT	1,623,593
				TOTAL	**4,418,721**
difference Cost of S.R Ceme	1423.00	BAG @	40.00	Per Bag	56,920
				TOTAL:	**56,920**

Note: All rates have been adopted from "BASIC SCHEDULE OF RATES - 2011"

CONSULTANT

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY
SHAHEED Z. A. BHUTOO CAMPUS KAHIRPUR MIR'S

BILL OF QUANTITIES FOR AUDITORIUM (SPECIAL ITEMS)

Sr. No.	Description	Qty.	Unit	Rate (Rs.)	Amount (Rs.)
1	**False Ceiling**				
	Providing and fixing 1/2" thick gypsum board false ceiling placed over imported high grade steel walls/columns mounting main and cross "T" runners having self locking clip, holding down clip, nails and screws, sections powder coated in approved colour suspended by metal suspension system consistingof GI hangers of 10 SWG, stiffeners, expansion bolts including provisions for AC diffusers/light fixtures, fire alarm detectors, access panles, leveling, cleaning scafolding appliances tools required for completion of the work. complete including 2 coat paint as per drawings specifications and as directed by the Engineer (No deductions will be made in upto 5.00 sft opening)				
	i) 2'x2' tiles	626	P.Sft		
	ii) Gypsum board plain	3,965	P.Sft		
2	**Wood flooring**				
	Providing and laying shesham wood flooring consisting of 3/4" thick shesham wood strip upto 6' long and 4" wide ' jointed with lap joint and nailed, laid over 3/4" thick MDF board with water proofing, anti termite treatment laid over 2"x2" rough wood skelton @ 2' centre to centre pluged to RCC slab with rawal bolts complete including lacqure polish as shown on detailed drawings	964	P.Sft		
3	**Acoustical Sound Proofing**				
	Providing and fixing of acoustical ferbric panelling by using oak wood base crate frame size 1-1/2" x 1 1/2" at 18" c/c both ways and 3/4" MDF 3/4" thik foam pasted on board and covering the foam with upphosetry fabric nailed on back side board hanged in position by using G.I clamps in wooden between fixed on wall all in clusive complete as per drawing.	2,545	P.Sft		
4	**Ply wood paneling**				
	Providing and fixing of acoustical ferbric panelling by using oak wood base crate frame size 1-1/2" x 1 1/2" at 18" c/c both ways and 3/4" MDF 3/4" thick oak /ash ply veneer including L shape Oak/ash wood decorative beading including cost of ploshing and comlete in all respect.	675	P.Sft		
	Sub TOTAL				
	Total For Non Schedule Special Items				

Appendix-D to Bid

BILL OF QUANTITIES

C. Day work Schedule

General

1. Reference is made to Sub-Clause 13.6 of the General Conditions of Contract. Work shall not be executed on a day work basis except by written order of the Engineer. Bidders shall enter basic rates for day work items in the Schedules, which rates shall apply to any quantity of day work ordered by the Engineer. Nominal quantities have been indicated against each item of day work, and the extended total for day work shall be carried forward to the Bid Price.

Day work Labour

2. In calculating payments due to the Contractor for the execution of day work, the actual time of classes of labour directly employed as ordered by the Engineer and for which the Contractor is entitled to payment will be measured excluding meal breaks and rest periods. The time of foremen (if any) actually doing work with the gang will also be measured with the time of foreman or other supervisory personnel.

Not applicable

3. The Contractor shall be entitled to payment in respect of the total time that labour is employed on Day work, calculated at the basic rates entered by him in the Schedule of Day work 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 [illegible] stores, water, lighting and power; the use and repair of [illegible] ding, workshops and stores, portable power tools [illegible] plant and tools; supervision by the Contractor's staff, foremen and other supervisory personnel; and charges incidental to the foregoing.

Not applicable

Appendix-D to Bid

SCHEDULE OF DAYWORK RATES

I. Labour

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

Not applicable

Day work Material

4 The Contractor shall be entitled to payment in respect of materials used for Day work (except for materials for which the cost is included in the percentage addition to labour costs as detailed heretofore), at the basic rates entered by him in the Schedule of Day work Rates for materials together with an additional percentage payment on the basic rates to cover overhead charges and profit, as follows:

Not applicable

a) the basic rates for materials shall [illegible] the invoiced price, freight, insurance, handli[illegible] etc., and shall provide for delivery to [illegible]. The basic rates shall be stated in l[illegible]al cu[illegible] made in the currency or currencies [illegible] on [illegible]ing documentation;

b) [illegible] payment shall be quoted by the Bidder and applied to [illegible]nt local cu[illegible]ency payments made under Sub-Para(a) above; and

c) the cost of hauling materials used on work ordered to be carried out as Day work from the store or stockpile on the site to the place where it is to be used will be paid in accordance with the terms for Labour and Constructional Plant in this Schedule.

Appendix-D to Bid

SCHEDULE OF DAYWORK RATES

II. Materials

Item No.	Description	Unit	Nominal Quantity	Rate (Rs) in Figure	Rate (Rs) in Words)	Extended Amount (Rs.)
1	2	3	4	5	6	7
D201	Cement, ordinary Portland or equivalent in bags	M.Ton	200			
D202	Mild Steel reinforcing bar upto 16mm diameter to BS 4449 or equivalent	M.Ton	10[illegible]			
D203	Fine aggr[illegible]ate for [illegible]oncr[illegible] as [illegible]ec[illegible] Clause[illegible]	[illegible]	[illegible]0			
D204	------[illegible]et[illegible]------					
D222	Gelignite (Noble Special Gelatine 60 % or equivalent) including caps, fuse, wire and requisite accessories	M.Ton	10			
D223	Sub Total Allow __________ percent of subtotal for Contractor's overhead, profit, etc., in accordance with Paragraph 4(b) of Daywork Schedule __________ Total for Daywork. Materials __________ (Carried forward to Daywork Summary)					

Not applicable

Appendix-D to Bid

Daywork Constructional Plant

5. The Contractor shall be entitled to payments in respect of constructional plant already on Site and employed on Daywork at the basic rental rates entered by him in the Schedule of Daywork Rates for constructional plant. The said rates shall be deemed to include complete allowance for depreciation, interest, indemnity and insurance, repairs, maintenance, supplies, fuel, lubricants, and other consumables and all overhead, profit and administrative costs related to the use of such equipment. Payment of drivers, operators and assistants will be paid for separately as provided under the section on Day work labour.

Not applicable

6. In calculating the payment to the Contractor for constructional plant employed on Daywork only the actual working hours will be eligible for payment, except that where applicable and agreed with the Engineer, the travelling time from the part of the Site where the constructional plant was located when ordered by the Engineer to be employed on day work and the time for return journey thereto shall be included for payment.

7. The basic rental rates for constructional plant employed on Daywork shall be stated in Pakistani Rupees.

Appendix-D to Bid

BILL OF QUANTITIES

SUMMARY

		Amount (Rs.)
Bill No. 1.	Earthworks/ Plinth and Foundation	
Bill No. 2.	Culverts and Bridges/ Ground [illegible]oor	
Bill No. 3.	Subsurface Drains/ Int[illegible]al W[illegible]pply and Sanitary Fittings	
Bill No. 4.	Subsurface Drains/Pipe [illegible]ng [illegible] holes/ Internal Water Supply and Sa[illegible]tary [illegible]	
Bill No. 5.	Tube w[illegible]lls ar[illegible] Pi[illegible]s/ [illegible]nal Electrification	
Bill No. 6.	Miscel[illegible]te	
Bill No. 7	E[illegible]pp[illegible]	
	S[illegible]l of Bills	_____
	Day work	_____
	Bid Price	_____

Attached with BoQ

Note: All Provisional Sums are to be expended in whole or, in part at the direction and discretion of the Engineer in accordance with Sub-Clauses 52.4 and 58.2 of the General Conditions of Contract Part- I.

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.]

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.]

Appendix-H to Bid

CONSTRUCTION CAMP AND HOUSING FACILITIES

The Contractor in accordance with Clause 6 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.).

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

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
Ist Quarter	
2nd Quarter	
3rd Quarter	
4th Quarter	
5th Quarter	
6th Quarter	
7th Quarter	
8th Quarter	
9th Quarter	
Bid Price	

Appendix-K to Bid

ORGANIZATION CHART
FOR THE
SUPERVISORY STAFF AND LABOUR

(To be filled in by the bidder)

(INTEGRITY PACT)

DECLARATION OF FEES, COMMISSION AND BROKERAGE ETC.
PAYABLE BY CONTRACTORS
(For CONTRACTS WORTH RS. 10.00 MILLION OR MORE)

Contract No._____ Dated _____
Contract Value: _____
Contract Title: _____

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

Without limiting the generality of the foregoing, [name of Contractor] represents and warrants that it has fully declared the brokerage, commission, 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 procuring agency, except that which has been expressly declared pursuant hereto.

[name of Contractor] accept full responsibility and strict liability 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 procuring agency and has not taken any action or will not take any action to circumvent the above declaration, representation or warranty.

[name of Contractor] 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 procuring agency under any law, contract or other instrument, be voidable at the option of procuring agency.

Notwithstanding any rights and remedies exercised by procuring agency in this regard, [name of Supplier/Contractor/Consultant] agrees to indemnify procuring agency for any loss or

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

.....

[Procuring agency] [Contractor]

BID SECURITY

(Bank Guarantee)

Security Executed on _____
(Date)

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

Name of Principal (Bidder) with Address _____

_____

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

Bid Reference No. _____

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

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

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

(1) that the Bid Security shall remain in force up to and including the date 28 days after the deadline for validity of bids as stated in the Instructions to Bidders or as it may be extended by the procuring agency, notice of which extension(s) to the Surety is hereby waived;

(2) that the Bid Security of unsuccessful Bidders will be returned by the procuring agency after expiry of its validity or upon signing of the Contract Agreement; and

(3) that in the event of failure of the successful Bidder to execute the proposed Contract Agreement for such work and furnish the required Performance

Security, the entire said sum be paid immediately to the said procuring agency pursuant to Clause 15.6 of the Instruction to Bidders for the successful Bidder's failure to perform.

NOW THEREFORE, if the successful Bidder shall, within the period specified therefor, on the prescribed form presented to him for signature enter into a formal Contract with the said procuring agency in accordance with his Bid as accepted and furnish within twenty eight (28) days of his being requested to do so, a Performance Security with good and sufficient surety, as may be required, upon the form prescribed by the said procuring agency for the faithful performance and proper fulfilment of the said Contract or in the event of non-withdrawal of the said Bid within the time specified for its validity then this obligation shall be void and of no effect, but otherwise to remain in full force and effect. PROVIDED THAT the Surety shall forthwith pay the procuring agency the said sum upon first written demand of the procuring agency (without cavil or argument) and without requiring the procuring agency to prove or to show grounds or reasons for such demand, notice of which shall be sent by the procuring agency by registered post duly addressed to the Surety at its address given above.

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

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

SURETY (Bank)

WITNESS:

1

Signature

Name

Title

Corporate Secretary (Seal)

Corporate Guarantor (Seal)

2. _____

_____

Name, Title & Address

FORM OF PERFORMANCE SECURITY

(Bank Guarantee)

Guarantee No._____

Executed on _____

Expiry date _____

[Letter by the Guarantor to the procuring agency]

Name of Guarantor (Bank) with address:_____

(Scheduled Bank in Pakistan)

Name of Principal (Contractor) with address:_____

_____

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

_____

Letter of Acceptance No. _____Dated _____

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

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has accepted the procuring agency's above said Letter of Acceptance for _____ _____ (Name of Contract) for the _____

_____ (Name of Project).

NOW THEREFORE, if the Principal (Contractor) shall well and truly perform and fulfill all the undertakings, covenants, terms and conditions of the said Documents during the original terms of the said Documents and any extensions thereof that may be granted by the procuring agency, with or without notice to the Guarantor, which notice is, hereby, waived and shall also well and truly perform and fulfill all the undertakings, covenants terms and conditions of the Contract and of any and all modifications of said Documents that may hereafter be made, notice of which modifications to the Guarantor being hereby

waived, then, this obligation to be void; otherwise to remain in full force and virtue till all requirements of Clause 49, Defects Liability, of Conditions of Contract are fulfilled.

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

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

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

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

_____
Guarantor (Bank)

Witness:

1. _____

Signature _____

_____
Corporate Secretary (Seal)

Name _____

Title _____

2. _____

_____
Name, Title & Address

_____
Corporate Guarantor (Seal)

FORM OF CONTRACT AGREEMENT

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

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

NOW this Agreement witnesseth as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.

2. The following documents after incorporating addenda, if any, except those parts relating to Instructions to Bidders shall be deemed to form and be read and construed as part of this Agreement, viz:

   (a) The Contract Agreement;
   (b) The Letter of Acceptance;
   (c) The completed Form of Bid;
   (d) Special Stipulations (Appendix-A to Bid);
   (e) The Special Conditions of Contract – Part II;
   (f) The General Conditions – Part I;
   (g) The priced Bill of Quantities (Appendix-D to Bid);
   (h) The completed Appendices to Bid (B, C, E to L);
   (i) The Drawings;
   (j) The Specifications.
   (k) _____ (any other)

3. In consideration of the payments to be made by the procuring agency to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the procuring agency to execute and complete the Works and remedy defects therein in conformity and in all respects with the provisions of the Contract.

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

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

Signature of the Contactor

_____

(Seal)

Signature of Procuring agency

_____

(Seal)

Signed, Sealed and Delivered in the presence of:

Witness:

_____

(Name, Title and Address)

Witness:

_____

(Name, Title and Address)

MOBILIZATION ADVANCE GUARANTEE/BOND

Guarantee No._____ Date _____

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

(Particulars of Contract)

with _____ (hereinafter called the "Contractor").

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

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

AND WHEREAS, _____

(Scheduled Bank in Pakistan or Insurance Company acceptable to the Employer)

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

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

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

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

(Date)

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

This Guarantee shall remain valid up to the aforesaid date and shall be null and void after the aforesaid date or earlier if the advance made to the Contractor is fully adjusted against payments from Interim Payment Certificates of the Contractor provided that the Guarantor agrees that the aforesaid period of validity shall be deemed to be extended if on the above mentioned date the advance payment is not fully adjusted.

GUARANTOR

1. Signature _____
2. Name _____
3. Title _____

WITNESS

1. _____

   _____

   Corporate Secretary (Seal)

2. _____ _____

   (Name Title & Address) Corporate Guarantor(Seal)

[Notes on the Conditions of Contract

The Conditions of Contract comprise two parts.

(a) Part I – General Conditions of Contract
(b) Part II – Special Conditions of Contract

Over the years, a number of "model" General Conditions of Contract have evolved. The one used in these Standard Bidding Documents was prepared by the International Federation of Consulting Engineers (Federation Internationale des Ingenieurs-Conseils, or FIDIC), and is commonly known as the FIDIC Conditions of Contract. (The used version is the fourth edition March 2006).

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

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

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

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

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* Add the following text if the bidding documents, as issued, do not include a copy.

"Copies of the FIDIC Conditions of Contract can be obtained from:
FIDIC Secretariat
P.O. Box 86
1000 Lausanne 12
Switzerland
e-mail: fidic.pub@fidic.org – FIDIC.org/bookshop]

General Conditions

General Provisions

1.1 Definitions

In the Conditions of Contract ("these Conditions"), which include Particular Conditions, Parts A and B, and these General Conditions, the following words and expressions shall have the meanings stated. Words indicating persons or parties include corporations and other legal entities, except where the context requires otherwise.

A. **"Procuring Agency"** means the Mehran University of Engineering & Technology, Shaheed Z.A Bhutto Campus Khairpur Mir's.

B. **"Contractor"** means the persons or, firm or company, whose tender has been accepted by the Employer and includes Contractors representative, successors and permitted assignees.

C. **"Project Director"** means the authorized Officer of the University, who possess the role of Controlling and Co-ordination between University, Consultants and Contractor.

D. **"Works"** means all the works and things to be executed, supplied or done in accordance with the contract.

E **"University"**, means Mehran University of Engineering & Technology, Jamshoro.

F. **"Campus"**, means Mehran University of Engineering & Technology, Shaheed Z.A Bhutto Campus Khairpur Mir's.

1.1.1 The Contract

1.1.1.1 "Contract" means the Contract Agreement, the Letter of Acceptance, the Letter of Tender, these Conditions, the Specification, the Drawings, the Schedules, and the further documents (if any) which are listed in the Contract Agreement or in the Letter of Acceptance.

1.1.1.2 "Contract Agreement" means the contract agreement referred to in Sub- Clause 1.6 [Contract Agreement].

1.1.1.3 "Letter of Acceptance" means the letter of formal acceptance, signed by the Procuring Agency, of the Letter of Tender, including any annexed memoranda comprising agreements between and signed by both Parties. If there is no such letter of acceptance, the expression "Letter of Acceptance" means the Contract Agreement and the date of issuing or receiving the Letter of Acceptance means the date of signing the Contract Agreement.

1.1.1.4 "Letter of Tender" means the document entitled letter of tender or letter of bid, which was completed by the Contractor and includes the signed offer to the Procuring Agency for the Works.

1.1.1.5 "Specification" means the document entitled specification, as included in the Contract, and any additions and modifications to the specification in accordance with the Contract. Such document specifies the Works.

1.1.1.6 "Drawings" means the drawings of the Works, as included in the Contract, and any additional and modified drawings issued by (or on behalf of) the Procuring Agency in accordance with the Contract.

1.1.1.7 "Schedules" means the document(s) entitled schedules, completed by the Contractor and submitted with the Letter of Tender, as included in the Contract. Such document may include the Bill of Quantities, data, lists, and schedules of rates and/or prices.

1.1.1.8 "Tender" means the Letter of Tender and all other documents which the Contractor submitted with the Letter of Tender, as included in the Contract.

1.1.1.9 "Bill of Quantities", "Day work Schedule" and "Schedule of Payment Currencies" mean the documents so named (if any) which are comprised in the Schedules.

1.1.1.10 "Contract Data" means the pages completed by the Procuring Agency entitled contract data which constitute Part A of the Particular Conditions.

1.1.2 Parties and Persons

1.1.2.1 "Party" means the Employer or the Contractor, as the context requires.

1.1.2.2 "Procuring Agency" means the person named as employer in the Contract Data and the legal successors in title to this person.

1.1.2.3 "Contractor" means the person(s) named as contractor in the Letter of Tender accepted by the Employer and the legal successors in title to this person(s).

1.1.2.4 "Engineer" means the person appointed by the Procuring Agency to act as the Engineer for the purposes of the Contract and named in the Contract Data, or other person appointed from time to time by the Employer and notified to the Contractor under Sub-Clause 3.4 [Replacement of the Engineer].

1.1.2.5 "Contractor's Representative" means the person named by the Contractor in the Contract or appointed from time to time by the Contractor under Sub-Clause 4.3 [Contractor's Representative], who acts on behalf of the Contractor.

1.1.2.6 "Procuring Agency's Personnel" means the Engineer, the assistants referred to in Sub-Clause 3.2 [Delegation by the Engineer], and all other staff, labour and other employees of the

Engineer and of the Procuring Agency; and any other personnel notified to the Contractor, by the Employer or the Engineer, as Procuring Agency's Personnel.

1.1.2.7 "Contractor's Personnel" means the Contractor's Representative and all personnel whom the Contractor utilizes on Site, who may include the staff, labour and other employees of the Contractor and of each Subcontractor; and any other personnel assisting the Contractor in the execution of the Works.

1.1.2.8 "Subcontractor" means any person named in the Contract as a subcontractor, or any person appointed as a subcontractor, for a part of the Works; and the legal successors in title to each of these persons.

1.1.2.9 "DB" means the person or three persons appointed under Sub-Clause 20.2 [Appointment of the Dispute Board] or Sub-Clause 20.3 [Failure to Agree on the Composition of the Dispute Board].

1.1.2.10 "FIDIC" means the Federation International des Ingénieurs-Conseils, the international federation of consulting engineers.

1.1.2.11 "Bank" means the financing institution (if any) named in the Contract Data.

1.1.2.12 "Borrower" means the person (if any) named as the borrower in the Contract Data.

1.1.3 Dates, Tests, Periods and Completion

1.1.3.1 "Base Date" means the date 15days /10 days prior to the latest date for submission and completion of the Tender.

1.1.3.2 "Commencement Date" means the date notified under Sub-Clause 8.1 [Commencement of Works].

1.1.3.3 "Time for Completion" means the time for completing the Works or a Section (as the case may be) under Sub-Clause 8.2 [Time for Completion], as stated in the Contract Data (with any extension under Sub-Clause 8.4 [Extension of Time for Completion]), calculated from the Commencement Date.

1.1.3.4 "Tests on Completion" means the tests which are specified in the Contract or agreed by both Parties or instructed as a Variation, and which are carried out under Clause 9 [Tests on Completion] before the Works or a Section (as the case may be) are taken over by the Employer.

1.1.3.5 "Taking-Over Certificate" means a certificate issued under Clause 10 [Procuring Agency's Taking Over].

1.1.3.6 "Tests after Completion" means the tests (if any) which are specified in the Contract and which are carried out in accordance with the Specification after the Works or a Section (as the case may be) are taken over by the Procuring Agency.

1.1.3.7 "Defects Notification Period" means the period for notifying defects in the Works or a Section (as the case may be) under Sub-Clause 11.1 [Completion of Outstanding Work and Remedying Defects], which extends over twelve months except if otherwise stated in the Contract Data (with any extension under Sub-Clause 11.3 [Extension of Defects Notification Period]), calculated from

the date on which the Works or Section is completed as certified under Sub-Clause 10.1 [Taking Over of the Works and Sections].

1.1.3.8 "Performance Certificate" means the certificate issued under Sub-Clause 11.9 [Performance Certificate].

1.1.3.9 "day" means a calendar day and "year" means 365 days.

1.1.4 Money and Payments

1.1.4.1 "Accepted Contract Amount" means the amount accepted in the Letter of Acceptance for the execution and completion of the Works and the remedying of any defects.

1.1.4.2 "Contract Price" means the price defined in Sub-Clause 14.1 [The Contract Price] . and includes adjustments in accordance with the Contract.

1.1.4.3 "Cost" means all expenditure reasonably incurred (or to be incurred) by the Contractor, whether on or off the Site, including overhead and similar charges, but does not include profit.

1.1.4.4 "Final Payment Certificate" means the payment certificate issued under Sub-Clause 14.13 [Issue of Final Payment Certificate].

1.1.4.5 "Final Statement" means the statement defined in Sub-Clause 14.11 [Application for Final Payment Certificate].

1.1.4.6 "Foreign Currency" means a currency in which part (or all) of the Contract Price is payable, but not the Local Currency.

1.1.4.7 "Interim Payment Certificate" means a payment certificate issued under Clause 14 [Contract Price and Payment], other than the Final Payment Certificate.

1.1.4.8 "Local Currency" means the currency of the Country.

1.1.4.9 "Payment Certificate" means a payment certificate issued under Clause 14 [Contract Price and Payment].

1.1.4.10 "Provisional Sum" means a sum (if any) which is specified in the Contract as a provisional sum, for the execution of any part of the Works or for the supply of Plant, Materials or services under Sub-Clause 13.5 [Provisional Sums].

1.1.4.11 "Retention Money" means the accumulated retention moneys which the Procuring Agency retains under Sub-Clause 14.3 [Application for Interim Payment Certificates] and pays under Sub-Clause 14.9 [Payment of Retention Money].

1.1.4.12 "Statement" means a statement submitted by the Contractor as part of an application, under Clause 14 [Contract Price and Payment], for a payment certificate.

1.1.5 Works and Goods

1.1.5.1 "Contractor's Equipment" means all apparatus, machinery, vehicles and other things required for the execution and completion of the Works and the remedying of any defects. However, Contractor's Equipment excludes Temporary Works, Procuring Agency's Equipment (if any), Plant, Materials and any other things intended to form or forming part of the Permanent Works.

1.1.5.2 "Goods" means Contractor's Equipment, Materials, Plant and Temporary Works, or any of them as appropriate.

1.1.5.3 "Materials" means things of all kinds (other than Plant) intended to form or forming part of the Permanent Works, including the supply-only materials (if any) to be supplied by the Contractor under the Contract.

1.1.5.4 "Permanent Works" means the permanent works to be executed by the Contractor under the Contract.

1.1.5.5 "Plant" means the apparatus, machinery and vehicles intended to form or forming part of the Permanent Works, including vehicles purchased for the Procuring Agency and relating to the construction or operation of the Works.

1.1.5.6 "Section" means a part of the Works specified in the Contract Data as a Section (if any).

1.1.5.7 "Temporary Works" means all temporary works of every kind (other than Contractor's Equipment) required on Site for the execution and completion of the Permanent Works and the remedying of any defects.

1.1.5.8 "Works" mean the Permanent Works and the Temporary Works, or either of them as appropriate.

1 1.6 Other Definitions

1.1.6.1 "Contractor's Documents" means the calculations, computer programs and other software, drawings, manuals, models and other documents of a technical nature (if any) supplied by the Contractor under the Contract.

1.1.6.2 "Country" means the country in which the Site (or most of it) is located, where the Permanent Works are to be executed.

1.1.6.3 "Procuring Agency's Equipment" means the apparatus, machinery and vehicles (if any) made available by the Employer for the use of the Contractor in the execution of the Works, as stated in

the Specification; but does not include Plant which has not been taken over by the Employer.

1.1.6.4 "Force Majeure" is defined in Clause 19 [Force Majeure].

1.1.6.5 "Laws" means all national (or state) legislation, statutes, ordinances and other laws, and regulations and by-laws of any legally constituted public authority.

1.1.6.6 "Performance Security" means the security (or securities, if any) under Sub-Clause 4.2 [Performance Security].

1.1.6.7 "Site" means the places where the Permanent Works are to be executed, including storage and working areas, and to which Plant and Materials are to be delivered, and any other places as may be specified in the Contract as forming part of the Site.

1.1.6.8 "Unforeseeable" means not reasonably foreseeable by an experienced contractor by the Base Date.

1.1.6.9 "Variation" means any change to the Works, which is instructed or approved as a variation under Clause 13 [Variations and Adjustments].

1.2 Interpretation

In the Contract, except where the context requires otherwise,

(a) words indicating one gender include all genders;

(b) words indicating the singular also include the plural and words indicating the plural also include the singular;

(c) provisions including the word "agree", "agreed" or "agreement" require the agreement to be record in writing;

(d) "written" or "in writing" means hand-written, type-written, printed or electronically made, and resulting in a permanent record; and

the certifier shall send a copy to the other Party. When a notice is issued to a Party, by the other Party or the Engineer, a copy shall be sent to the Engineer or the other Party, as the case may be.

1.4 Law and Language

The Contract shall be governed by the law of the country or other jurisdiction stated in the Contract Data.

The ruling language of the Contract shall be that stated in the Contract Data.

The language for communications shall be that stated in the Contract Data. If no language is stated there, the language for communications shall be the ruling language of the Contract.

1.5 Priority of Documents

The documents forming the Contract are to be taken as mutually explanatory of one another. For the purposes of interpretation, the priority of the documents shall be in accordance with the following sequence:

(a) the Contract Agreement (if any),

(b) the Letter of Acceptance,

(c) the Tender,

(d) the Particular Conditions - Part A,

(e) the Particular Conditions - Part B,

(f) these General Conditions,

(g) the Specification,

(h) the Drawings, and

PART II - SPECIAL /PARTICULAR CONDITIONS OF CONTRACT

1.1 Definitions

1.1.1.4 "Form of Bid" is synonymous with "Letter of Tender".

1.1.1.5 "Bid" is synonymous with "Tender".

1.1.1.10 "Bidding" is synonymous with "contract". *The following paragraph is added.*

1.1.1.11 "Programme" means the programme to be submitted by the contractor in accordance with Sub-Clause 8.3 and any approved revisions thereto.

1.12.2 "Employer" is synonymous with "Procuring Agency" 1.1.2.9 "DB" is synonymous with "Committee". 1.1.3.1 Replace 28 days by 7 days in LCB and 15 days in ICB.

1.1.3.7 "Defects notification Period" is synonymous with "Defects liability Period".

1.15 Inspections and Audit by the Bank Deleted *Procuring Agency can retain this clause with or without changes, in case of contracts under Project, Bank and donor's programme. Not Applicable.*

3.1 Engineer's Duties and Authority.

The following paragraph is added after duties.

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

4.3 Contractor's Representative

The following text is to be added after last line.

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

6.10 Records of Contractor's Personnel and Equipment

The following paragraph is added.

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

The following sub-clause 7.9 is added in (GCC).

7.9 Use of Pakistani Materials and Services

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

8.1 Commencement of Works

The last para 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.

8.11 Prolonged Suspension

Replace 84 days by 120 days.

8.3 Programme

The following text is to be added after [Commencement of Works] The programme shall be submitted in the either form of Bar Chart identifying the critical activities.

13.1 Right to vary

In the last line of Para, after the word "Variation", the word "in writing" is added.

13.3 Variation procedure

In the tenth line, after the words "as soon as practicable" following is added, "and within a period not exceeding one-eighth of the completion time"

13.8 Adjustment for changes in cost

Not applicable

Similarly reduction in the cost of these materials will also be recovered from the contractor accordingly

14.1 The Contract Price

Sub-para (d) is deleted.

14.2 Advance Payment

See Special Conditions.

Mobilization Advance/Advance Payment

See Special Conditions.

14.5 Plants and Materials intended for Works

Add the following paragraph as sub-clause 14.5 (d) for Secured Advance on non – perishable materials and sub-clauses (a), (b) and (c) will be applicable for plants only :-

(I) The Contractor shall be entitled to receive from the procuring agency Secured Advance against an INDENTURE BOND in Public Works Account Form No.31 (Fin. R. Form No. 2) acceptable to the procuring agency of

such sum as the Engineer may consider proper in respect of non-perishable materials brought at the site but not yet incorporated in the Permanent Works provided that.

(i) The materials are in accordance with the specifications for the permanent works;

(ii) Such materials have been delivered to the site and are properly stored and protected against loss or damage or deterioration to the satisfaction and verification of the Engineer/Assistant Engineer but at the risk and cost of the Contractor;

(iii) The Contractor's records of the requirements, orders, receipts and use of materials are kept in a form approved by the Engineer, and such records shall be available for inspection by the Engineer;

(iv) The Contractor shall submit with his monthly statement the estimated value of the materials on site together with such documents as may be required by the Engineer for the purpose of valuation of materials and providing evidence of ownership and payment therefore;

MEHRAN UNIVERSITY OF ENGINEERING & TECHNOOGY Z.A BHUTTO CAMPUS KHAIRPUR

TENDER DOCUMENTS

NAME OF WORK

PROVIDING,LAYING,JOINTING & TESTING SEWERAGE CUM STORM WATER LINES INCLUDING RCC MANHOLE COVERS IN (PHASE-I) AT Z.A BHUTTO CAMPUS AT MUET KHAIRPUR

JUNE- 2015

Client:
MEHRAN UNIVERSITY OF ENGINEERING & TECHNOOGY Z.A BHUTTO CAMPUS KHAIRPUR

Consultants:

RCC Consultants
GROUD FLOOR RCC COMPLEX MAIN,
QASIMABAD HYDERABAD
TEL: 0-22-2652957 , 2650709
MOB-0323-2608043
RCC.CONSULTANTS@RCCGOC.COM
WWW.RCCGOC.COM

INSTRUCTIONS TO PROCURING AGENCIES

INSTRUCTIONS TO PROCURING AGENCIES
(Not to be included in Bidding Documents)

A. Basis of Documents

These Documents have been prepared as a global document intended to be used by different agencies/users according to their requirements. This document is envisaged for National Competitive Bidding (NCB), meant for use for Works costing not more than Rs. 25 Million. These documents may be tailored according to the scope of works as well as in case of contracts on International Competitive Bidding (ICB) basis, funded by international financial institutions/donors, with payments in foreign currencies. Procuring agencies are then to tailor the relevant clauses to suit their requirements including appropriate modifications in the relevant sections of the documents in the light of SPPRA Bidding Documents for Large Works.

The Procuring Agency is expected to manage the Contract itself. The role of Engineer may be added by the Procuring Agency, if the Procuring Agency wishes to engage a consultant. The role of the Engineer with specific delegated powers under various clauses of Instructions to Bidders such as clarifications of Bid Documents, Amendment of Bid Documents, evaluation of Bids etc. and to administer the Contract under various clauses of Conditions of Contract should have been specified. The Procuring Agency will be required to set out in the specifications and drawings the full scope of work including the extent of design to be done by the Contractor, if any.

B. Contents of Documents

As stated in Clause IB.4 of Instructions to Bidders, the complete Bidding Documents in addition to Invitation for Bids shall comprise items listed therein including any addendum to Bidding Documents issued in accordance with IB.6. The Standard Form of Bidding Documents (for Small Contracts) includes the following:

1. Instructions to Bidders & Bidding Data
2. Form of Bid & Schedules to Bid
3. Conditions of Contract & Contract Data
4. Standard Forms
5. Specifications
6. Drawings, if any

In addition, Instructions to procuring agencies are also provided at various locations of this document within parenthesis or as a Note(s). Procuring agencies are expected to edit or finalise this document accordingly, by filling in all the relevant blank spaces and forms as per the scope of the work, deleting all notes and instructions intended to help the bidders.

The procuring agency is required to prepare the following for completion of the Bidding Documents:

(i) Invitation for Bids

(ii) Bidding Data
(iii) Schedules to Bid (Samples)
(iv) Schedule of Prices (Format)
(v) Contract Data
(vi) Specifications
(vii) Drawings, if any

The Procuring agency's attention is drawn to the following while finalizing the Bidding Documents.

C. Notice Inviting Tender/ Invitation for Bids/ Request for Expression of Interest

The "Notice Inviting Tender" is meant for publication of tenders for calling bids in the newspapers and SPPRA Website.

The blank spaces wherever shown are required to be filled by the Procuring Agency before issuance of Bidding Documents.

The Procuring Agency may modify para 1 of Notice Inviting Tender as per its requirements. The notice should be published so as to give the interested bidders sufficient working period for preparation and submission of bids – not less than 15 days for National Competitive Bidding and 45 days for International Competitive Bidding (SPP Rule 18).

1. The eligible bidders are defined in IB.2; the text can be amended by the Procuring Agency as deemed appropriate.

2. The non-refundable fee for the sale of Bidding Documents should be nominal so as to cover printing/reproduction and mailing costs and to ensure that only bona-fide bidders shall apply (SPP Rule 20).

3. The amount of Bid Security should be a lump sum figure or a percentage, but not less than 1% and more than 5% of bid price and should be in accordance with IB.13.1 (SPP Rule 37).

4. If the venue of receipt of bids and the opening of bids is the same, the times for receipt and opening of bids are to be entered in last Para of the Notice Inviting Tender, otherwise indicate the name, address and exact location for the opening of bids. However the date for the receipt and the opening of bids shall be same (SPP Rule 41).

D. Instructions to Bidders

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

The Instructions to Bidders can be used as given. Procuring agency may have to make changes under Bidding Data.

The Procuring Agency's or Engineer's Representative, if any, shall exercise powers of the Engineer/Procuring Agency under and in connection with Clauses IB.5, IB.6, IB.16, etc. In

case an Engineer has been appointed by the Procuring Agency, the aforesaid clauses may be modified accordingly to specify the role of the Engineer by the Procuring Agency, otherwise the Engineer's reference wherever exist, except Sub-Clause 1.1.20 & Clause 15 of Conditions of Contract and Item 1.1.20 of Contract Data, shall be deleted.

E. Bidding Data

The blank spaces wherever shown in Bidding Data are required to be filled by the Engineer/Procuring Agency before issuance of Bidding Documents.

1. Contents of IB.10.3 may be retained or modified by the Procuring Agency.
2. Procuring Agency should insert required experience in IB.11.2.
3. Referring to IB.14.1, the period of bid validity may range from 30 to 90 days depending upon the size and nature of the works. Number of days shall be filled in as per Procuring Agency's requirements.
4. Contents of IB.16.3 to IB.16.8 may be retained or modified by the Procuring Agency in accordance with its requirements.

F. Schedules to Bid

Specimen of Schedules to Bid including format of Schedule of Prices are provided in this document. The Procuring Agency may add/delete/modify as per its requirement.

The blank spaces wherever shown are required to be filled by the Engineer/Procuring Agency before issuance of Bidding Documents except those required to be provided by the Contractor.

G. Conditions of Contract

The procuring agency while preparing Contract Data, shall ensure that no Clause of Conditions of Contract is deleted and that the changes included in Contract Data shall be such as not to change the spirit of the document. Any adjustment or change in clauses of Conditions of Contract to meet specific project features shall be made with care and incorporated in Contract Data.

H. Contract Data

The blank spaces wherever shown are required to be filled by the Engineer/Procuring Agency before issuance of Bidding Documents.

1. Referring to Sub-Clause 1.1.1 of Conditions of Contract, the Engineer/Procuring Agency may add, in order of priority, such other documents as to form part of the Contract, in Sub-Clause 1.3 of the Contract Data.

2. The Procuring Agency's Representative, if any, shall exercise powers of the Procuring Agency under and in connection with Sub-Clauses 1.3, 2.3, 4.2, 4.3, 5.1, 7.3, 8.2, 9.1, 9.2, 10.1, 10.2. 10.5, 11.1, 11.5, 12.1, 13.2 and 14.1 of the Conditions of Contract. In case an Engineer has been appointed by the Procuring Agency, the aforesaid clauses may be modified accordingly by the Procuring Agency.

3. The sum insured for different insurances including minimum amount of third party insurance should be assessed by the Engineer/Procuring Agency and entered in Contract Data. Such insurance cover shall be carried out with Insurance Company having at least AA rating from PACRA / JCR in the favour of the procuring agency.

4. The time for completion of the whole of the works should be assessed by the Engineer/Procuring Agency and entered in the Contract Data.

5. The Conditions of Contract contain no overall limit on the Contractor's liability. The amount of **liquidated damages** per day of delay shall be entered by the Engineer/Procuring Agency in Contract Data. Usually the liquidated damages are set between **0.05 percent and 0.10 percent per day and the maximum limit as 10 percent of contract price stated in the Letter of Acceptance.**

6. Any amendment and/or additions to the Conditions of the Contract that are specific to a given Bid/Contract should be included by the Procuring agency. This may include but not be limited to the provisions regarding the following:

   a) Terms of Payment should be prepared and incorporated in Contract Data by the Engineer/Procuring Agency.

   b) The Engineer/Procuring Agency to make sure that all taxes and duties are included by the Bidders/Contractors in their prices.

I. Specifications

To be prepared and incorporated by the Engineer/Procuring Agency

J. Drawings

To be prepared and incorporated by the Engineer/Procuring Agency, if required.

Summary of Contents

INVITATION FOR BIDS

INVITATION FOR BIDS

Bid Reference No.:PD/MUET/KHP/-145 dated:05.06.2015

1. The Procuring Agency, **Mehran University of Engineering & Technology Khairpur Mirs** invites sealed Percentage/Item Rate Tenders from contractor/firm registered in Pakistan Engineering Council in category C-6 and above for the work, **Providing, Laying, Jointing & Testing Sewerage Cum Storm Water Lines Including Rcc Manhole Covers in (Phase-I) for Z.A Bhutto Campus at Mehran University of Engineering & Technology Khairpur Mirs,** which will be completed in (03) three months.

2. A complete set of Bidding Documents may be purchased by an interested eligible bidder on submission of a written application to the office given below and upon payment of a non-refundable fee of Rupees 3000/- Bidders may acquire the Bidding Documents from the Office of the Procuring Agency, at **Mehran University of Engineering & Technology Khairpur Mirs**

3. All bids must be accompanied by a Bid Security/Earnest Money in the amount of two percentage (2%) of bid price in the form of *pay order / demand draft* and must be delivered to office and in favor of **Mehran University of Engineering & Technology Khairpur Mirs** on or before 12:00 noon, on date 26.06.2015 Bids will be opened at 12:30 P.M pm on the same day in the presence of bidder's representatives who choose to attend, at the same address. Any bid with conditional or un-accompanied of the earnest money will not be considered in the bidding process.

INSTRUCTIONS TO BIDDERS & BIDDING DATA

Notes on the Instructions to Bidders

This section of the bidding documents should provide the information necessary for bidders to prepare responsive bids, in accordance with the requirements of the Procuring Agency. It should also give information on bid submission, opening and evaluation, and on the award of contract.

Matters governing the performance of the Contract or payments under the Contract, or matters affecting the risks, rights, and obligations of the parties under the Contract are not normally included in this Section, but rather in the appropriate sections of the *Conditions of Contract* and/or *Contract Data.*

TABLE OF CONTENTS

INSTRUCTIONS TO BIDDERS

INSTRUCTIONS TO BIDDERS

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

A. GENERAL

IB.1 Scope of Bid & Source of Funds

1.1 Scope of Bid

The Procuring Agency as defined in the Bidding Data (hereinafter called "the Procuring Agency") wishes to receive Bids for the Works summarized in the Bidding Data (hereinafter referred to as "the Works").

Bidders must quote for the complete scope of work. Any Bid covering partial scope of work will be rejected as non-responsive.

1.2 Source of Funds

The Procuring Agency has arranged funds from its own sources or *Federal/ Provincial /Donor agency or any other source,* which may be indicated accordingly in bidding data towards the cost of the project/scheme.

IB.2 Eligible Bidders

2.1 Bidding is open to all firms and persons meeting the following requirements:

a) duly licensed by the Pakistan Engineering Council (PEC) in the appropriate category for value of works.

Provided that the works costing Rs. 2.5 million or less shall not require any registration with PEC .

b) duly pre-qualified with the Procuring Agency. (*Where required*).

In the event that prequalification of potential bidders has been undertaken, only bids from prequalified bidders will be considered for award of Contract.

c) if prequalification has not undertaken , the procuring agency may ask information and documents not limited to following:-
   (i) company profile;
   (ii) works of similar nature and size for each performed in last *3/5* years;
   (iii) construction equipments;
   (iv) qualification and experience of technical personnel and key site management;

(v) financial statement of last 3 years;
(vi) information regarding litigations and abandoned works if any.

IB.3 Cost of Bidding

3.1 The bidder shall bear all costs associated with the preparation and submission of its bid and the Procuring Agency will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process (SPP Rules 24 & 25).

B. BIDDING DOCUMENTS

IB.4 Contents of Bidding Documents

4.1 In addition to Invitation for Bids, the Bidding Documents are those stated below, and should be read in conjunction with any Addendum issued in accordance with Sub-Clause IB.6.1.

1. Instructions to Bidders & Bidding Data
2. Form of Bid, Qualification Information & Schedules to Bid
   Schedules to Bid comprise the following:
   (i) Schedule A: Schedule of Prices/ Bill of Quantities (BoQ).
   (ii) Schedule B: Specific Works Data
   (iii) Schedule C: Works to be Performed by Subcontractors
   (iv) Schedule D: Proposed Programme of Works
   (v) Schedule E: Method of Performing Works
   (vi) Schedule F: Integrity Pact (works costing Rs 10 million and above)
3. Conditions of Contract & Contract Data
4. Standard Forms:
   (i) Form of Bid Security,
   (ii) Form of Performance Security;
   (iii)Form of Contract Agreement;
   (iv) Form of Bank Guarantee for Advance Payment.
5. Specifications
6. Drawings, if any

IB.5 Clarification of Bidding Documents

5.1 A prospective bidder requiring any clarification(s) in respect of the Bidding Documents may notify the Engineer/Procuring Agency at the Engineer's/ Procuring Agency's address indicated in the Bidding Data.

5.2 An interested bidder, who has obtained bidding documents, may request for clarification

of contents of bidding documents in writing and procuring agency shall respond to such quarries in writing within three calendar days, provided they are received at least five calendar days prior to the date of opening of bid (SPP Rule 23-1).

IB.6 Amendment of Bidding Documents (SPP Rules 22(2) & 22).

6.1 At any time prior to the deadline for submission of Bids, the Procuring Agency may, for any reason, whether at his own initiative or in response to a clarification requested by a interested bidder, modify the Bidding Documents by issuing addendum.

6.2 Any addendum thus issued shall be part of the Bidding Documents pursuant to Sub-Clause 6.1 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 Procuring Agency.

6.3 To afford interested bidders reasonable time in which to take an addendum into account in preparing their Bids, the Procuring Agency may at its discretion extend the deadline for submission of Bids.

C. PREPARATION OF BIDS

IB.7 Language of Bid

7.1 All documents relating to the Bid shall be in the language specified in the Contract Data.

IB.8 Documents Comprising the Bid

8.1 The Bid submitted by the bidder shall comprise the following:

(a) Offer /Covering Letter
(b) Form of Bid duly filled, signed and sealed, in accordance with IB.14.3.
(c) Schedules (A to F) to Bid duly filled and initialed, in accordance with the instructions contained therein & in accordance with IB.14.3.
(d) Bid Security furnished in accordance with IB.13.
(e) Power of Attorney in accordance with IB 14.5.
(f) Documentary evidence in accordance with IB.2(c) & IB.11
(g) Documentary evidence in accordance with IB.12.

IB.9 Sufficiency of Bid

9.1 Each bidder shall satisfy himself before Bidding as to the correctness and sufficiency of his Bid and of the premium on the rates of CSR / rates and prices quoted/entered in the Schedule of Prices, which rates and prices shall except in so far as it is otherwise expressly provided in the Contract, cover all his obligations under the Contract and all matters and things necessary for the proper completion of the works.

9.2 The bidder is advised to obtain for himself at his own cost and responsibility all information that may be necessary for preparing the bid and entering into a Contract for execution of the Works.

IB.10 Bid Prices, Currency of Bid and Payment

10.1 The bidder shall fill up the Schedule of Prices (Schedule A to Bid) indicating the percentage above or below the Composite Schedule of Rates/unit rates and prices of the Works to be performed under the Contract. Prices in the Schedule of Prices/Bill of Quantities shall be quoted entirely in Pak Rupees keeping in view the instructions contained in the Preamble to Schedule of Prices.

10.2 Unless otherwise stipulated in the Conditions of Contract, prices quoted by the bidder shall remain fixed during the bidder's performance of the Contract and not subject to variation on any account.

10.3 The unit rates and prices in the Schedule of Prices or percentage above or below on the composite schedule of rates shall be quoted by the bidder in the currency as stipulated in Bidding Data.

10.4 Items for which no rate or price is entered by the Bidder will not be paid for by the Procuring Agency when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities.

IB.11 Documents Establishing Bidder's Eligibility and Qualifications

11.1 Pursuant to Clause IB.8, the bidder shall furnish, as part of its bid, documents establishing the bidder's eligibility to bid and its qualifications to perform the Contract if its bid is accepted.

11.2 Bidder must possess and provide evidence of its capability and the experience as stipulated in Bidding Data and the Qualification Criteria mentioned in the Bidding Documents.

IB.12 Documents Establishing Works' Conformity to Bidding Documents

12.1 The documentary evidence of the Works' conformity to the Bidding Documents may be in the form of literature, drawings and data and the bidder shall furnish documentation as set out in Bidding Data.

12.2 The bidder shall note that standards for workmanship, material and equipment, and references to brand names or catalogue numbers, if any, designated by the Procuring Agency in the Technical Provisions are intended to be descriptive only and not restrictive.

IB.13 Bid Security

13.1 Each bidder shall furnish, as part of his bid, at the option of the bidder, a Bid Security as percentage of bid price/estimated cost or in the amount stipulated in Bidding Data in Pak. Rupees in the form of *Deposit at Call/ Payee's Order or a Bank Guarantee* issued by a Scheduled Bank in Pakistan in favour of the Procuring Agency valid for a period up to twenty eight (28) days beyond the bid validity date (*Bid security should not be below 1%.and not exceeding 5% of bid price/estimated cost SPP Rule 37*).

13.2 Any bid not accompanied by an acceptable Bid Security shall be rejected by the Procuring Agency as non-responsive.

13.3 The bid securities of unsuccessful bidders will be returned upon award of contract to the successful bidder or on the expiry of validity of Bid Security whichever is earlier.

13.4 The Bid Security of the successful bidder will be returned when the bidder has furnished the required Performance Security, and signed the Contract Agreement (SPP Rule 37).

13.5 The Bid Security may be forfeited:

(a) if a bidder withdraws his bid during the period of bid validity; or
(b) if a bidder does not accept the correction of his Bid Price, pursuant to Sub-Clause 16.4 (b) hereof; or
(c) in the case of a successful bidder, if he fails within the specified time limit to:

(i) furnish the required Performance Security or
(ii) sign the Contract Agreement.

IB.14 Validity of Bids, Format, Signing and Submission of Bid

14.1 Bids shall remain valid for the period stipulated in the Bidding Data after the date of bid opening.

14.2 In exceptional circumstances, Procuring Agency may request the bidders to extend the period of validity for a additional period but not exceeding 1/3 of the original period.The request and the bidders' responses shall be made in writing or by cable. A Bidder may refuse the request without forfeiting the Bid Security. A Bidder agreeing to the request will not be required or permitted to otherwise modify the Bid, but will be required to extend the validity of Bid Security for the period of the extension, and in compliance with IB.13 in all respects (SPP Rule 38).

14.3 All Schedules to Bid are to be properly completed and signed.

14.4 No alteration is to be made in the Form of Bid except in filling up the blanks as directed. If any alteration be made or if these instructions be not fully complied with, the bid may be rejected.

14.5 Each bidder shall prepare Original and number of copies specified in the Bidding Data of the documents comprising the bid as described in IB.8 and clearly mark them "ORIGINAL" and "COPY" as appropriate. In the event of discrepancy between them, the original shall prevail.

14.6 The original and all copies of the bid shall be typed or written in indelible ink and shall be signed by a person or persons duly authorized to sign (in the case of copies, Photostats are also acceptable). This shall be indicated by submitting a written Power of Attorney authorising the signatory of the bidder to act for and on behalf of the bidder. All pages of the bid shall be initialed and official seal be affixed by the person or persons signing the bid.

14.7 The Bid shall be delivered in person or sent by registered mail at the address to Procuring Agency as given in Bidding Data.

D. SUBMISSION OF BID

IB.15 Deadline for Submission, Modification & Withdrawal of Bids

15.1 Bids must be received by the Procuring Agency at the address/provided in Bidding Data not later than the time and date stipulated therein.

15.2 The inner and outer envelopes shall

(a) be addressed to the Procuring Agency at the address provided in the Bidding Data;
(b) bear the name and identification number of the Contract as defined in the Bidding and Contract Data; and
(c) provide a warning not to open before the specified time and date for Bid opening as defined in the Bidding Data.
(d) in addition to the identification required in 15.2, the inner envelopes shall indicate the name and address of the Bidder to enable the Bid to be returned unopened in case it is declared late.
(e) If the outer envelope is not sealed and marked as above, the Procuring Agency will assume no responsibility for the misplacement or premature opening of the Bid.

15.3 Bids submitted through telegraph, telex, fax or e-mail shall not be considered.

15.4 Any bid received by the Procuring Agency after the deadline for submission prescribed in Bidding Data will be returned unopened to such bidder.

15.5 Any bidder may modify or withdraw his bid after bid submission provided that the modification or written notice of withdrawal is received by the Procuring Agency prior to the deadline for submission of bids.

15.6 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 pursuant to IB.13.5 (a).

E. BID OPENING AND EVALUATION

IB.16 Bid Opening, Clarification and Evaluation (SPP Rules 41, 42 & 43)

16.1 The Procuring Agency will open the bids, in the presence of bidders' representatives who choose to attend, at the time, date and in the place specified in the Bidding Data.

16.2 The bidder's name, Bid Prices, any discount, the presence or absence of Bid Security, and such other details as the Procuring Agency at its discretion may consider appropriate, will be announced by the Procuring Agency at the bid opening. The Procuring Agency will record the minutes of the bid opening. Representatives of the bidders who choose to attend shall sign the attendance sheet.

Any Bid Price or discount which is not read out and recorded at bid opening will not be taken into account in the evaluation of bid.

16.3 To assist in the examination, evaluation and comparison of Bids the Engineer/Procuring Agency may, at its discretion, ask the bidder for a clarification of its Bid. The request for clarification and the response shall be in writing and no change in the price or substance of the Bid shall be sought, offered or permitted (SPP Rule 43).

16.4 (a) Prior to the detailed evaluation, pursuant to IB.16.7 to 16.9, the Engineer/Procuring Agency will determine the substantial responsiveness of each bid to the Bidding Documents. For purpose of these instructions, a substantially responsive bid is one which conforms to all the terms and conditions of the Bidding Documents without material deviations. It will include determining the requirements listed in Bidding Data.

(b) Arithmetical errors will be rectified on the following basis:

If there is a discrepancy between the unit price and total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected. If there is a discrepancy between the words and figures the amount in words shall prevail. If there is a discrepancy between the Total Bid price entered in Form of Bid and the total shown in Schedule of Prices-Summary, the amount stated in the Form of Bid will be corrected by the Procuring Agency in accordance with the Corrected Schedule of Prices.

If the bidder does not accept the corrected amount of Bid, his Bid will be rejected and his Bid Security forfeited.

16.5 A Bid determined as substantially non-responsive will be rejected and will not subsequently be made responsive by the bidder by correction of the non-conformity.

16.6 Any minor informality or non-conformity or irregularity in a Bid which does not constitute a material deviation **(major deviation)** may be waived by Procuring Agency,

provided such waiver does not prejudice or affect the relative ranking of any other bidders.

(A). Major (material) Deviations include:-

(i) has been not properly signed;
(ii) is not accompanied by the bid security of required amount and manner;
(iii) stipulating price adjustment when fixed price bids were called for;
(iv) failing to respond to specifications;
(v) failing to comply with Mile-stones/Critical dates provided in Bidding Documents;
(vi) sub-contracting contrary to the Conditions of Contract specified in Bidding Documents;
(vii) refusing to bear important responsibilities and liabilities allocated in the Bidding Documents, such as performance guarantees and insurance coverage;
(viii) taking exception to critical provisions such as applicable law, taxes and duties and dispute resolution procedures;
(ix) a material deviation or reservation is one :
  (a) which affect in any substantial way the scope, quality or performance of the works;
  (b) adoption/rectification whereof would affect unfairly the competitive position of other bidders presenting substantially responsive bids.

(B) Minor Deviations

Bids that offer deviations acceptable to the Procuring Agency and which can be assigned a monetary value may be considered substantially responsive at least as to the issue of fairness. This value would however be added as an adjustment for evaluation purposes only during the detailed evaluation process.

16.7 The Engineer/Procuring Agency will evaluate and compare only the bids previously determined to be substantially responsive pursuant to IB.16.4 to 16.6 as per requirements given hereunder. Bids will be evaluated for complete scope of works. The prices will be compared on the basis of the Evaluated Bid Price pursuant to IB.16.8 herein below.

Technical Evaluation: It will be examined in detail whether the works offered by the bidder complies with the Technical Provisions of the Bidding Documents. For this purpose, the bidder's data submitted with the bid in Schedule B to Bid will be compared with technical features/criteria of the works detailed in the Technical Provisions. Other technical information submitted with the bid regarding the Scope of Work will also be reviewed.

16.8 Evaluated Bid Price

In evaluating the bids, the Engineer/Procuring Agency will determine for each bid in addition to the Bid Price, the following factors (adjustments) in the manner and to the extent indicated below to determine the Evaluated Bid Price:

(i) making any correction for arithmetic errors pursuant to IB.16.4 hereof.

(ii) discount, if any, offered by the bidders as also read out and recorded at the time of bid opening.

(iii) excluding **provisional sums** and the provisions for **contingencies** in the Bill of Quantities **if any**, but including **Day work,** where priced competitively.

IB.17 Process to be Confidential

17.1 Subject to IB.16.3 heretofore, no bidder shall contact Engineer/Procuring Agency on any matter relating to its Bid from the time of the Bid opening to the time the bid evaluation result is announced by the Procuring Agency. The evaluation result shall be announced at least seven (07) days prior to award of Contract (SPP Rule 45). 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.

17.2 Any effort by a bidder to influence Engineer/Procuring Agency in the Bid evaluation, Bid comparison or Contract Award decisions may result in the rejection of his Bid. Whereas any bidder feeling aggrieved, may lodge a written complaint to Complaint Redressal Committee as per terms and conditions mentioned in SPP Rules 31 & 32. However, mere fact of lodging a complaint shall not warrant suspension of procurement process.

17.3 Bidders may be excluded if involved in **"Corrupt and Fraudulent Practices"** means either one or any combination of the practices given below SPP Rule2(q);

(i) "**Coercive Practice**" means any impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence the actions of a party to achieve a wrongful gain or to cause a wrongful loss to another party;

(ii) "**Collusive Practice**" means any arrangement between two or more parties to the procurement process or contract execution, designed to achieve with or without the knowledge of the procuring agency to establish prices at artificial, noncompetitive levels for any wrongful gain;

(iii) **"Corrupt Practice"** means the offering, giving, receiving or soliciting, directly or indirectly, of anything of value to influence the acts of another party for wrongful gain;

(iv) "**Fraudulent Practice"** means any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;

(v) **"Obstructive Practice"** means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in a procurement process, or affect the execution of a contract or deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements before investigators in order to materially impede an investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation, or acts intended to materially impede the exercise of inspection and audit rights provided for under the Rules.

F. AWARD OF CONTRACT

IB.18. Post Qualification

18.1 The Procuring Agency, at any stage of the bid evaluation, having credible reasons for or *prima facie* evidence of any defect in contractor's capacities, may require the 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.

18.2 The determination will take into account the bidder's financial and technical capabilities. It will be based upon an examination of the documentary evidence of the bidders' qualifications submitted under B.11, as well as such other information required in the Bidding Documents.

IB.19 Award Criteria & Procuring Agency's Right

19.1 Subject to IB.19.2, the Procuring Agency 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 qualified to satisfactory perform the Contract in accordance with the provisions of the IB.18.

19.2 Not withstanding IB.19.1, the Procuring Agency 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 to inform the affected bidders of the grounds for the Procuring Agency's action except that the grounds for its rejection of all bids shall upon request be communicated, to any bidder who submitted a bid, without justification of the grounds. Notice of the rejection of all the bids shall be given promptly to all the bidders (SPP Rule 25).

IB.20 Notification of Award & Signing of Contract Agreement

20.1 Prior to expiration of the period of bid validity prescribed by the Procuring Agency, the Procuring Agency will notify the successful bidder in writing ("Letter of Acceptance") that his bid has been accepted (SPP Rule 49)

20.2 Within seven (07) days from the date of furnishing of acceptable Performance Security under the Conditions of Contract, the Procuring Agency will send the successful bidder the Form of Contract Agreement provided in the Bidding Documents, incorporating all agreements between the parties.

20.3 The formal Agreement between the Procuring Agency and the successful bidder duly stamped at rate of ----% of bid price(updated from time to time) stated in Letter of Acceptance shall be executed within seven (07) days of the receipt of Form of Contract Agreement by the successful bidder from the Procuring Agency.

IB.21 Performance Security

21.1 The successful bidder shall furnish to the Procuring Agency a Performance Security in the Form and the amount stipulated in the Conditions of Contract within a period of fourteen (14) days after the receipt of Letter of Acceptance (SPP 39).

21.2 Failure of the successful bidder to comply with the requirements of Sub-Clauses IB.20.2 & 20.3 or 21.1 or Clause IB.22 shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Security.

21.3 Publication of Award of Contract: within seven days of the award of contract, the procuring shall publish on the website of the authority and on its own website, if such a website exists, the results of the bidding process, identifying the bid through procurement identifying Number if any and the following information:

(1) Evaluation Report;

(2) Form of Contract and letter of Award;

(3) Bill of Quantities or Schedule of Requirements. (SPP Rule 50)

IB.22 Integrity Pact The Bidder shall sign and stamp the Form of Integrity Pact provided at Schedule-F to Bid in the Bidding Document for all Sindh Government procurement contracts exceeding Rupees ten (10) million. Failure to provide such Integrity Pact shall make the bid non-responsive (SPP Rule 89).

BIDDING DATA

The following specific data for the works to be tendered 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 Procuring Agency: Mehran University of Engineering & Technology Khairpur Mirs**

Brief Description of Works: This work consists of **Providing, , Providing, Laying, Jointing & Testing Water Supply Distribution Network for Z.A Bhutto Campus at Mehran University of Engineering & Technology Khairpur Mirs,**

5.1 (a) Procuring Agency's address: Mehran University of Engineering & Technology Khairpur Mirs,

(b) Engineer's address:

RCC Consultants
Ground Floor RCC Complex Main
Road, Qasimabad Hyderabad
Phones No 022-2652957,
Fax no 022-2655833
E-mail: rcc.consultants@rccgoc.com

10.3 Bid shall be quoted entirely in Pak. Rupees. The payment shall be made in Pak. Rupees.

11.2 The bidder has the financial, technical and constructional capability necessary to perform the Contract as follows:
i. Financial capacity: (must have annual average turnover of Rs 10 Million of last 05 years);
ii. Technical capacity: Category of registration with PEC C-6 or above

12.1 (a) A detailed description of the Works, essential technical and performance characteristics.

(b) Complete set of technical information, description data, literature and drawings as required in accordance with BOQ, Specific Works Data. This will include but not be limited to a sufficient number of drawings, photographs, catalogues, illustrations and such other information as is necessary to illustrate clearly the significant characteristics such as general construction dimensions and other relevant information about the works to be performed.

13.1 Amount of Bid Security/Earnest Money: 2% of total bid amount

14.1 Period of Bid Validity: 90 days

14.4 Number of Copies of the Bid to be submitted: One original only.

14.6 (a) Procuring Agency's Address for the Purpose of Bid Submission:

Project Director Mehran University of Engineering & Technology Khairpur Mir's

15.1 Deadline for Submission of Bids: Time: 12:00 Noon

16.1 Venue, Time, and Date of Bid Opening

Venue: Project Director Mehran University of Engineering & Technology Khairpur Mir's

Time: 12:30 p.m

Date: 26.06.2015

16.4 Responsiveness of Bids

(i) Bid is valid till required period,

(ii) Bid prices are firm during currency of contract/Fixed Price Contract;
(iii) Completion period offered is within specified limits,
(iv) Bidder is eligible to Bid and possesses the requisite experience, capability and qualification.
(v) Bid does not deviate from basic technical requirements and
(vi) Bids are generally in order, etc.

(a) **Fixed Price contract**: In these contracts no escalation will be provided during currency of the contract.

(b) **Price adjustment contract**: In these contracts escalation will be paid only on those items and in the manner as notified by Finance Department, Government of Sindh, after bid opening during currency of the contract. **(NOT APPLICABLE)**

FORM OF BID AND SCHEDULES TO BID

FORM OF BID
(LETTER OF OFFER)

Bid Reference No. _____

_____

_____

(Name of Works)

To:

_____

_____

_____

Gentlemen,

1. Having examined the Bidding Documents including Instructions to Bidders, Bidding Data, Conditions of Contract, Contract Data, Specifications, Drawings, if any, Schedule of Prices and Addenda Nos. _____ for the execution of the above-named works, we, the undersigned, being a company doing business under the name of and address _____ _____ and being duly incorporated under the laws of Pakistan hereby offer to execute and complete such works and remedy any defects therein in conformity with the said Documents including Addenda thereto for the Total Bid Price of Rs_____(Rupees_____) or such other sum as may be ascertained in accordance with the said Documents.

2. We understand that all the Schedules 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 _____ _____ drawn in your favour or made payable to you and valid for a period of twenty eight (28) days beyond the period of validity of Bid.

4. We undertake, if our Bid is accepted, to commence the Works and to deliver and complete the Works comprised in the Contract within the time(s) stated in Contract Data.

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 undertake, if our Bid is accepted, to execute the Performance Security

referred to in Conditions of Contract for the due performance of the Contract.

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

9. We do hereby declare that the Bid is made without any collusion, comparison of figures or arrangement with any other person or persons making a bid for the Works.

Dated this _____day of _____, 20

Signature _____

in the capacity of _____duly authorized to sign bid for and on behalf of _____

(Name of Bidder in Block Capitals)

(Seal)

Address

_____

_____

_____

Witness:

(Signature)_____

Name:_____

Address: _____

_____

[SCHEDULES TO BID INCLUDE THE FOLLOWING:

- Schedule A to Bid: Schedule of Prices
- Schedule B to Bid: Specific Works Data
- Schedule C to Bid: Works to be Performed by Subcontractors
- Schedule D to Bid: Proposed Program of Works
- Schedule E to Bid: Method of Performing Works
- Schedule F to Bid: Integrity Pact]

SCHEDULE – A TO BID

SCHEDULE OF PRICES

* *[To be prepared by the Engineer/Procuring Agency]*

PREAMBLE TO SCHEDULE OF PRICES

1. General

1.1 The Schedule of Prices shall be read in conjunction with the Conditions of Contract, Contract Data together with the Specifications and Drawings, if any.

1.2 The Contract shall be for the whole of the works as described in these Bidding Documents. Bids must be for the complete scope of works.

2. Description

2.1 The general directions and descriptions of works and materials are not necessarily repeated nor summarized in the Schedule of Prices. References to the relevant sections of the Bidding Documents shall be made before entering prices against each item in the Schedule of Prices.

3. Units & Abbreviations

3.1 Units of measurement, symbols and abbreviations expressed in the Bidding Documents shall comply with the Systeme Internationale d' Unites (SI Units).

_____

_____

(Note: The abbreviations to be used in the Schedule of Prices to be defined by the Procuring Agency).

4. Rates and Prices

4.1 Except as otherwise expressly provided under the Conditions of Contract, the rates and amounts entered in the Schedule of Prices shall be the rates at which the Contractor shall be paid and shall be the full inclusive value of the works set forth or implied in the Contract; except for the amounts reimbursable, if any to the Contractor under the Contract.

4.2 Unless otherwise stipulated in the Contract Data, the premium, rates and prices entered by the bidder shall not be subject to adjustment during the performance of the Contract.

4.3 All duties, taxes and other levies payable by the Contractor shall be included in the rates and prices.

4.4 The whole cost of complying with the provisions of the Contract shall be included in the items provided in the Schedule of Prices, 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 and no separate payment will be made for those items.

The rates, prices and amounts shall be entered against each item in the Schedule of Prices. Any item against which no rate or price is entered by the bidder will not be paid for by the Procuring Agency when executed and shall be deemed covered by the rates and prices for other items in the Schedule of Prices.

4.5 (a) The bidder shall be deemed to have obtained all information as to and all requirements related thereto which may affect the bid price.

(b) The Contractor shall be responsible to make complete arrangements for the transportation of the plant to the site. Such cost shall be inbuilt in his quoted rates.

4.6 The Contractor shall provide for all parts of the Works to be completed in every respect. Notwithstanding that any details, accessories, etc. required for the complete installation and satisfactory operation of the Works, are not specifically mentioned in the Specifications, such details shall be considered as included in the Contract Price.

5. Bid Prices

5.1 Break-up of Bid Prices

The various elements of Bid Prices shall be quoted as detailed by the Procuring Agency in the format of Schedule of Prices. The bidder shall recognize such elements of the costs which he expects to incur the performance of the Works and shall include all such costs in the rates and amounts entered in the Schedule of Prices.

5.2 Total Bid Price

The total of bid prices in the Schedule of Prices shall be entered in the Summary of Bid Prices.

6. Provisional Sums and Day work

6.1 Provisional Sums included and so designated in the Schedule of Prices if any, shall be expended in whole or in part at the direction and discretion of the Engineer/Procuring Agency. The Contractor will only receive payment in respect of Provisional Sums, if he has been instructed by the Engineer/Procuring Agency to utilize such sums.

6.2 Day work rates in the contractor's bid are to be used for small additional amounts of work and only when the Engineer have given written instructions in advance for additional work to be paid for in that way.

SCHEDULE OF PRICES – SUMMARY OF BID PRICES (Sample)

Bill No.	Description	Total Amount (Rs)
	(A) Building Work	
1.	Civil works	
2	Internal sanitary and water supply	
3	Electrification	
4	External Development works	
5	Miscellaneous Items	
	(B) Road Work.	
1.	Earthwork	
2.	Hard Crust and Surface Treatment	
3.	Culverts and Bridges	
4.	Miscellaneous Items	
	(C) Public Health Engineering Works.	
1.	Earthwork	
2.	Subsurface Drains	
3.	Pipe Laying and Man holes	
4.	Tube wells, Pump houses	
5.	Compound wall	
6.	Miscellaneous Items	
	Total Bid Price (The amount to be entered in Paragraph 1 of the Form of Bid) (In words).	

NOT APPLICABLE

SCHEDULE OF PRICES

Item No.	Description	Quantity	Unit Rate(Rs)	Total Amount (Rs)
	I. (Civil works)			
1.				
2.				
3.				
	II.Internal sanitary and water supply.			
1.				
2.				
3.				
	III. Electrification.			
1.				
2.				
3.				
	IV. External Development works.			
1.				
2.				
3.				
	V. Miscellaneous Items			
1.				
2.				
3.				
Total *(to be carried to Summary of Bid Price)*				

Add/ Deduct the percentage quoted above/below on the prices of items based on Composite Schedule of Rates.

NOT APPLICABLE

SCHEDULE - B TO BID

*SPECIFIC WORKS DATA

(To be prepared and incorporated by the Procuring Agency)

NOT APPLICABLE

(Note: The Procuring Agency shall spell out the information & data required to be filled out by the bidder and to furnish complementary information).

SCHEDULE – C TO BID

WORKS TO BE PERFORMED BY SUBCONTRACTORS*

The bidder will do the work with his own forces except the work listed below which he intends to sub-contract.

Items of Works to be Sub-Contracted	Name and address of Sub-Contractors	Statement of similar works previously executed. *(attach evidence)*

Note:

* *The Procuring Agency should decide whether to allow subcontracting or not.*

In case Procuring Agency decides to allow subcontracting then following conditions shall be complied with:

1. No change of Sub-Contractors shall be made by the bidder without prior approval of the Procuring Agency.

2. The truthfulness and accuracy of the statement as to the experience of Sub-Contractors is guaranteed by the bidder. The Procuring Agency's judgment shall be final as to the evaluation of the experience of Sub-Contractors submitted by the bidder.

3. Statement of similar works shall include description, location & value of works, year completed and name & address of the clients.

SCHEDULE – D TO BID

PROPOSED PROGRAMME OF WORKS

Bidder shall provide a programme in a bar-chart or Program Evaluation and Review Techr ique (PERT) or Critical Path Method (CPM) showing the sequence of work items by which he proposes to complete the works of the entire Contract. The programme should indicate the sequence of work items and the period of time during which he proposes to comp ete the works including the activities like designing, schedule of submittal of drawings, ordering and procurement of materials, manufacturing, delivering, construction of civil works, erection, testing and commissioning of works to be supplied under the Contract.

SCHEDULE – E TO BID

METHOD OF PERFORMING WORKS

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

- The sequence and methods in which he proposes to carry out the Works, including the number of shifts per day and hours per shift, he expects to work.
- A list of all major items of construction and plant erection, tools and vehicles proposed to be used in delivering/carrying out the works at site.
- The procedure for installation of equipment and transportation of equipment and materials to the site.
- Organisation chart indicating head office & field office personnel involved in management, supervision and engineering of the Works to be done under the Contract.

SCHEDULE – F TO BID

(INTEGRITY PACT)

DECLARATION OF FEES, COMMISSION AND BROKERAGE ETC PAYABLE BY CONTRACTORS
(FOR CONTRACTS WORTH RS. 10.00 MILLION OR MORE)

Contract No._____ Dated _____
Contract Value: _____
Contract Title: _____

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

Without limiting the generality of the foregoing, [name of Contractor] represents and warrants that it has fully declared the brokerage, commission, 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, from Procuring Agency (PA) except that which has been expressly declared pursuant hereto.

[name of Contractor] accepts full responsibility and strict liability 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 PA and has not taken any action or will not take any action to circumvent the above declaration, representation or warranty.

[name of Contractor] 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 PA under any law, contract or other instrument, be voidable at the option of PA.

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

.....
[Procuring Agency]

[Contractor]

CONDITIONS OF CONTRACT

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CONDITIONS OF CONTRACT

CONDITIONS OF CONTRACT

1. GENERAL PROVISIONS

1.1 Definitions

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

The Contract

1.1.1 "Contract" means the Contract Agreement and the other documents listed in the Contract Data.

1.1.2 "Specifications" means the document as listed in the Contract Data, including Procuring Agency's requirements in respect of design to be carried out by the Contractor (if any), and any Variation to such document.

1.1.3 "Drawings" means the Procuring Agency's drawings of the Works as listed in the Contract Data, and any Variation to such drawings.

Persons

1.1.4 "Procuring Agency" means the person named in the Contract Data and the legal successors in title to this person, but not (except with the consent of the Contractor) any assignee.

1.1.5 "Contractor" means the person named in the Contract Data and the legal successors in title to this person, but not (except with the consent of the Procuring Agency) any assignee.

1.1.6 "Party" means either the Procuring Agency or the Contractor.

Dates, Times and Periods

1.1.7 "Commencement Date" means the date fourteen (14) days after the date the Contract comes into effect or any other date named in the Contract Data.

1.1.8 "Day" means a calendar day

1.1.9 "Time for Completion" means the time for completing the Works as stated in the Contract Data (or as extended under Sub-Clause 7.3), calculated from the Commencement Date.

Money and Payments

1.1.10 "Cost" means all expenditure properly incurred (or to be incurred) by the Contractor, whether on or off the Site, including overheads and similar charges but

does not include any allowance for profit.

Other Definitions

1.1.11 "Contractor's Equipment" means all machinery, apparatus and other things required for the execution of the Works but does not include Materials or Plant intended to form part of the Works.

1.1.12 "Country" means the Islamic Republic of Pakistan.

1.1.13 "Procuring Agency's Risks" means those matters listed in Sub-Clause 6.1.

1.1.14 "Force Majeure" means an event or circumstance which makes performance of a Party's obligations illegal or impracticable and which is beyond that Party's reasonable control.

1.1.15 'Materials" means things of all kinds (other than Plant) to be supplied and incorporated in the Works by the Contractor.

1.1.16 "Plant" means the machinery and apparatus intended to form or forming part of the Works.

1.1.17 "Site" means the places provided by the Procuring Agency where the Works are to be executed, and any other places specified in the Contract as forming part of the Site.

1.1.18 "Variation" means a change which is instructed by the Engineer/Procuring Agency under Sub-Clause 10.1.

1.1.19 'Works" means any or all the works whether Supply, Installation, Construction etc. and design (if any) to be performed by the Contractor including temporary works and any variation thereof.

1.1.20 "Engineer" means the person notified by the Procuring Agency to act as Engineer for the purpose of the Contract and named as such in Contract Data.

1.2 **Interpretation**

Words importing persons or parties shall include firms and organisations. Words importing singular or one gender shall include plural or the other gender where the context requires.

1.3 **Priority of Documents**

The documents forming the Contract are to be taken as mutually explanatory of one another. If an ambiguity or discrepancy is found in the documents, the priority of the documents shall be in accordance with the order as listed in the Contract Data.

1.4 **Law**

The law of the Contract is the relevant Law of Islamic Republic of Pakistan.

1.5 **Communications**

All Communications related to the Contract shall be in English language.

1.6 **Statutory Obligations**

The Contractor shall comply with the Laws of Islamic Republic of Pakistan and shall give all notices and pay all fees and other charges in respect of the Works.

2. THE PROCURING AGENCY

2.1 **Provision of Site**

The Procuring Agency shall provide the Site and right of access thereto at the times stated in the Contract Data.
Site Investigation Reports are those that were included in the bidding documents and are factual and interpretative reports about the surface and subsurface conditions at the Site.

2.2 **Permits etc.**

The Procuring Agency shall, if requested by the Contractor, assist him in applying for permits, licences or approvals which are required for the Works.

2.3 **Engineer's/Procuring Agency's Instructions**

The Contractor shall comply with all instructions given by the Procuring Agency or the Engineer, if notified by the Procuring Agency, in respect of the Works including the suspension of all or part of the works.

2.4 **Approvals**

No approval or consent or absence of comment by the Engineer/Procuring Agency shall affect the Contractor's obligations.

3. ENGINEER'S/PROCURING AGENCY'S REPRESENTATIVES

3.1 **Authorised Person**

The Procuring Agency shall appoint a duly authorized person to act for him and on his behalf for the purposes of this Contract. Such authorized person shall be duly identified in the Contract Data or otherwise notified in writing to the Contractor as soon as he is so appointed. In either case the Procuring Agency shall notify the Contractor, in writing, the precise scope of the authority of such authorized person at the time of his appointment.

3.2 **Engineer's/Procuring Agency's Representative**

The name and address of Engineer's/Procuring Agency's Representative is given in Contract Data. However the Contractor shall be notified by the Engineer/Procuring Agency, the delegated duties and authority before the Commencement of works.

4. THE CONTRACTOR

4.1 **General Obligations**

The Contractor shall carry out the works properly and in accordance with the Contract. The Contractor shall provide all supervision, labour, Materials, Plant and Contractor's Equipment which may be required

4.2 **Contractor's Representative**

The Contractor shall appoint a representative at site on full time basis to supervise the execution of work and to receive instructions on behalf of the Contractor but only after obtaining the consent of the Procuring Agency for such appointment which consent shall not be withheld without plausible reason(s) by the Procuring Agency. Such authorized representative may be substituted/ replaced by the Contractor at any time during the Contract Period but only after obtaining the consent of the Procuring Agency as aforesaid.

4.3 **Subcontracting**

The Contractor shall not subcontract the whole of the works. The Contractor shall not subcontract any part of the works without the consent of the Procuring Agency.

4.4 **Performance Security**

The Contractor shall furnish to the Procuring Agency within fourteen (14) days after receipt of Letter of Acceptance a Performance Security at the option of the bidder, in the form of Payee's order /Bank Draft or Bank Guarantee from scheduled bank for the amount and validity specified in Contract Data.

5. DESIGN BY CONTRACTOR

5.1 **Contractor's Design**

The Contractor shall carry out design to the extent specified, as referred to in the Contract Data. The Contractor shall promptly submit to the Engineer/Procuring Agency all designs prepared by him, within fourteen (14) days of receipt the Engineer/Procuring Agency shall notify any comments or, if the design submitted is not in accordance with the Contract, shall reject it stating the reasons. The

Contractor shall not construct any element of the works designed by him within fourteen (14) days after the design has been submitted to the Engineer/Procuring Agency or which has been rejected. Design that has been rejected shall be promptly amended and resubmitted. The Contractor shall resubmit all designs commented on taking these comments into account as necessary.

5.2 **Responsibility for Design**

The Contractor shall remain responsible for his bided design and the design under this Clause, both of which shall be fit for the intended purposes defined in the Contract and he shall also remain responsible for any infringement of any patent or copyright in respect of the same. The Engineer/Procuring Agency shall be responsible for the Specifications and Drawings.

6. PROCURING AGENCY'S RISKS

6.1 **The Procuring Agency's Risks**

The Procuring Agency's Risks are:-

a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies, within the Country;

b) rebellion, terrorism, revolution, insurrection, military or usurped power, or civil war, within the Country;

c) riot, commotion or disorder by persons other than the Contractor's personnel and other employees including the personnel and employees of Sub-Contractors, affecting the Site and/or the Works;

d) 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 of such an assembly, except to the extent to which the Contractor/Sub-Contractors may be responsible for the use of any radio-active material;

e) Pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds;

f) use or occupation by the Procuring Agency of any part of the Works, except as may be specified in the Contract;

g) late handing over of sites, anomalies in drawings, late delivery of designs and drawings of any part of the Works by the Procuring Agency's personnel or by others for whom the Procuring Agency is responsible;

h) a suspension under Sub-Clause 2.3 unless it is attributable to the Contractor's failure; and

i) physical obstructions or physical conditions other than climatic conditions, encountered on the Site during the performance of the Works, for which the Contractor immediately notified to the Procuring Agency and accepted by the Procuring Agency.

7. TIME FOR COMPLETION

7.1 Execution of the Works

The Contractor shall commence the Works on the Commencement Date and shall proceed expeditiously and without delay and shall complete the Works, subject to Sub-Clause 7.3 below, within the Time for Completion.

7.2 Programme

Within the time stated in the Contract Data, the Contractor shall submit to the Engineer/Procuring Agency a programme for the Works in the form stated in the Contract Data.

7.3 Extension of Time

The Contractor shall, within such time as may be reasonable under the circumstances, notify the Procuring Agency/Engineer of any event(s) falling within the scope of Sub-Clause 6.1 or 10.3 of these Conditions of Contract and request the Procuring Agency/Engineer for a reasonable extension in the time for the completion of works. Subject to the aforesaid, the Procuring Agency/Engineer shall determine such reasonable extension in the time for the completion of works as may be justified in the light of the details/particulars supplied by the Contractor in connection with the such determination by the Procuring Agency/Engineer within such period as may be prescribed by the Procuring Agency/Engineer for the same; and the Procuring Agency may extend the time for completion as determined.

7.4 Late Completion

If the Contractor fails to complete the Works within the Time for Completion, the Contractor's only liability to the Procuring Agency for such failure shall be to pay the amount as **liquidity damages** stated in the Contract Data for each day for which he fails to complete the Works.

8. TAKING-OVER

8.1 Completion

The Contractor may notify the Engineer/Procuring Agency when he considers that the Works are complete.

8.2 **Taking-Over Notice**

Within fourteen (14) days of the receipt of the said notice of completion from the Contractor the Procuring Agency/Engineer shall either takeover the completed works and issue a Certificate of Completion to that effect or shall notify the Contractor his reasons for not taking-over the works. While issuing the Certificate of Completion as aforesaid, the Procuring Agency/Engineer may identify any outstanding items of work which the Contractor shall undertake during the Maintenances Period.

9. REMEDYING DEFECTS

9.1 **Remedying Defects**

The Contractor shall for a period stated in the Contract Data from the date of issue of the Certificate of Completion carry out, at no cost to the Procuring Agency, repair and rectification work which is necessitated by the earlier execution of poor quality of work or use of below specifications material in the execution of Works and which is so identified by the Procuring Agency/Engineer in writing within the said period. Upon expiry of the said period, and subject to the Contractor's faithfully performing his aforesaid obligations, the Procuring Agency/Engineer shall issue a Maintenance Certificate whereupon all obligations of the Contractor under this Contract shall come to an end.

Failure to remedy any such defects or complete outstanding work within a reasonable time shall entitle the Procuring Agency to carry out all necessary works at the Contractor's cost. However, the cost of remedying defects not attributable to the Contractor shall be valued as a Variation.

9.2 **Uncovering and Testing**

The Engineer/Procuring Agency may give instruction as to the uncovering and/or testing of any work. Unless as a result of an uncovering and/or testing it is established that the Contractor's design, materials, plant or workmanship are not in accordance with the Contract, the Contractor shall be paid for such uncovering and/or testing as a Variation in accordance with Sub-Clause 10.2.

10. VARIATIONS AND CLAIMS

10.1 **Right to Vary**

The Procuring Agency/Engineer may issue Variation Order(s) in writing. Where for any reason it has not been possible for the Procuring Agency/Engineer to issue such Variations Order(s), the Contractor may confirm any verbal orders given by the Procuring Agency/Engineer in writing and if the same are not refuted/denied by the Procuring Agency/Engineer within ten (10) days of the receipt of such confirmation the same shall be deemed to be a Variation Orders for the purposes of this Sub-Clause.

10.2 **Valuation of Variations**

Variations shall be valued as follows:

a) at a lump sum price agreed between the Parties, or

b) where appropriate, at rates in the Contract, or

c) in the absence of appropriate rates, the rates in the Contract shall be used as the basis for valuation, or failing which

d) at appropriate new rates, as may be agreed or which the Engineer/Procuring Agency considers appropriate, or

e) if the Engineer/Procuring Agency so instructs, at day work rates set out in the Contract Data for which the Contractor shall keep records of hours of labour and Contractor's Equipment, and of Materials, used.

10.3 **Changes in the Quantities.**

a) If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25 percent, provided the change exceeds 1 percent of the Initial Contract Price, the Procuring Agency/Engineer shall adjust the rate to allow for the change and will be valued as per sub clause 10.2.

b) The Engineer shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 15 percent, except with the prior approval of the Procuring Agency.

c) If requested by the Engineer, the contractor shall provide the Engineer with a detailed cost breakdown of any rate in the Bill of Quantities.

10.4 **Early Warning**

The Contractor shall notify the Engineer/Procuring Agency in writing as soon as he is aware of any circumstance which may delay or disrupt the Works, or which may give rise to a claim for additional payment.

To the extent of the Contractor's failure to notify, which results to the Engineer/Procuring Agency being unable to keep all relevant records or not taking steps to minimise any delay, disruption, or Cost, or the value of any Variation, the Contractor's entitlement to extension of the Time for Completion or additional payment shall be reduced/rejected.

10.5 **Valuation of Claims**

If the Contractor incurs Cost as a result of any of the Procuring Agency's Risks, the Contractor shall be entitled to the amount of such Cost. If as a result of any

Procuring Agency's Risk, it is necessary to change the Works, this shall be dealt with as a Variation subject to Contractor's notification for intention of claim to the Engineer/Procuring Agency within fourteen (14) days of the occurrence of cause.

10.6 **Variation and Claim Procedure**

The Contractor shall submit to the Engineer/Procuring Agency an itemised detailed breakdown of the value of variations and claims within twenty eight (28) days of the instruction or of the event giving rise to the claim. The Engineer/Procuring Agency shall check and if possible agree the value. In the absence of agreement, the Procuring Agency shall determine the value.

11. CONTRACT PRICE AND PAYMENT

11.1 (a) **Terms of Payments**

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 11.3, be paid by the Procuring Agency to the Contractor within 30 days after such Interim Payment Certificate has been jointly verified by Procuring Agency and Contractor, or, in the case of the Final Certificate referred to in Sub Clause 11.5, within 60days after such Final Payment Certificate has been jointly verified by Procuring Agency and Contractor;

Provided that the Interim Payment shall be caused in thirty (30) days and Final Payment in 60 days in case of foreign funded project. In the event of the failure of the Procuring Agency to make payment within 90 days then Procuring Agency shall pay to the Contractor compensation at the 28 days rate of KIBOR+2% per annum in local currency and LIBOR+1% for foreign currency, upon all sums unpaid from the date by which the same should have been paid.

(b) **Valuation of the Works**

The Works shall be valued as provided for in the Contract Data, subject to Clause 10.

11.2 **Monthly Statements**

The Contractor shall be entitled to be paid at monthly intervals:

a) the value of the Works executed less to the cumulative amount paid previously; and
b) value of secured advance on the materials and valuation of variations (if any).

The Contractor shall submit each month to the Engineer/Procuring Agency a statement showing the amounts to which he considers himself entitled.

11.3 **Interim Payments**

Within a period not exceeding seven (07) days from the date of submission of a statement for interim payment by the Contractor, the Engineer shall verify the same and within a period not exceeding thirty (30/60) days from the said date of submission by the Contractor, the Procuring Agency shall pay to the Contractor the sum subject to adjustment for deduction of the advance payments and retention money.

11.4 **Retention**

Retention money shall be paid by the Procuring Agency to the Contractor within fourteen (14) days after either the expiry of the period stated in the Contract Data, or the remedying of notified defects, or the completion of outstanding work, all as referred to in Sub-Clause 9.1, whichever is the later.

11.5 **Final Payment**

Within twenty one (21) days from the date of issuance of the Maintenance Certificate the Contractor shall submit a final account to the Engineer to verify and the Engineer shall verify the same within fourteen (14) days from the date of submission and forward the same to the Procuring Agency together with any documentation reasonably required to enable the Procuring Agency to ascertain the final contract value.

Within sixty (60) days from the date of receipt of the verified final account from the Engineer, the Procuring Agency shall pay to the Contractor any amount due to the Contractor. While making such payment the Procuring Agency may, for reasons to be given to the Contractor in writing, withhold any part or parts of the verified amount.

11.6 **Currency**

Payment shall be in the currency stated in the Contract Data.

12. DEFAULT

12.1 **Defaults by Contractor**

If the Contractor abandons the Works, refuses or fails to comply with a valid instruction of the Engineer/Procuring Agency or fails to proceed expeditiously and without delay, or is, despite a written complaint, in breach of the Contract, the Procuring Agency may give notice referring to this Sub-Clause and stating the default.

If the Contractor has not taken all practicable steps to remedy the default within fourteen (14) days after receipt of the Procuring Agency's notice, the Procuring Agency may by a second notice given within a further twenty one (21) days, terminate the Contract. The Contractor shall then demobilize from the Site leaving behind any Contractor's Equipment which the Procuring Agency instructs, in the second notice, to be used for the completion of the Works at the risk and cost of the Contractor.

12.2 **Defaults by Procuring Agency**

If the Procuring Agency fails to pay in accordance with the Contract, or is, despite a written complaint, in breach of the Contract, the Contractor may give notice referring to this Sub-Clause and stating the default. If the default is not remedied within fourteen (14) days after the Procuring Agency's receipt of this notice, the Contractor may suspend the execution of all or parts of the Works.

If the default is not remedied within twenty eight (28) days after the Procuring Agency's receipt of the Contractor's notice, the Contractor may by a second notice given within a further twenty one (21) days, terminate the Contract. The Contractor shall then demobilise from the Site.

12.3 **Insolvency**

If a Party is declared insolvent under any applicable law, the other Party may by notice terminate the Contract immediately. The Contractor shall then demobilise from the site leaving behind, in the case of the Contractor's insolvency, any Contractor's Equipment which the Procuring Agency instructs in the notice is to be used for the completion of the Works.

12.4 **Payment upon Termination**

After termination, the Contractor shall be entitled to payment of the unpaid balance of the value of the works executed and of the Materials and Plant reasonably delivered to the site, adjusted by the following:

a) any sums to which the Contractor is entitled under Sub-Clause 10.4,

b) any sums to which the Procuring Agency is entitled,

c) if the Procuring Agency has terminated under Sub-Clause 12.1 or 12.3, the Procuring Agency shall be entitled to a sum equivalent to twenty percent (20%) of the value of parts of the Works not executed at the date of the termination, and

d) if the Contractor has terminated under Sub-Clause 12.2 or 12.3, the Contractor shall be entitled to the cost of his demobilisation together with a sum equivalent to ten percent (10%) of the value of parts of the works not executed at the date of termination.

The net balance due shall be paid or repaid within twenty eight (28) days of the notice of termination.

13. RISKS AND RESPONSIBILITIES

13.1 **Contractor's Care of the Works**

Subject to Sub-Clause 9.1, the Contractor shall take full responsibility for the care

of the Works from the Commencement Date until the date of the Procuring Agency's/Engineer's issuance of Certificate of Completion under Sub-Clause 8.2. Responsibility shall then pass to the Procuring Agency. If any loss or damage happens to the Works during the above period, the Contractor shall rectify such loss or damage so that the Works conform with the Contract.

Unless the loss or damage happens as a result of any of the Procuring Agency's Risks, the Contractor shall indemnify the Procuring Agency, or his agents against all claims loss, damage and expense arising out of the Works.

13.2 **Force Majeure**

If Force Majeure occurs, the Contractor shall notify the Engineer/Procuring Agency immediately. If necessary, the Contractor may suspend the execution of the Works and, to the extent agreed with the Procuring Agency demobilize the Contractor's Equipment.

If the event continues for a period of eighty four (84) days, either Party may then give notice of termination which shall take effect twenty eight (28) days after the giving of the notice.

After termination, the Contractor shall be entitled to payment of the unpaid balance of the value of the Works executed and of the Materials and Plant reasonably delivered to the Site, adjusted by the following:

a) any sums to which the Contractor is entitled under Sub-Clause 10.4,

b) the cost of his demobilization, and

c) less any sums to which the Procuring Agency is entitled.

The net balance due shall be paid or repaid within thirty five (35) days of the notice of termination.

14. INSURANCE

14.1 **Arrangements**

The Contractor shall, prior to commencing the Works, effect insurances of the types, in the amounts and naming as insured the persons stipulated in the Contract Data except for items (a) to (e) and (i) of the Procuring Agency's Risks under Sub-Clause 6.1. The policies shall be issued by insurers and in terms approved by the Procuring Agency. The Contractor shall provide the Engineer/Procuring Agency with evidence that any required policy is in force and that the premiums have been paid.

14.2 **Default**

If the Contractor fails to effect or keep in force any of the insurances referred to in the previous Sub-Clause, or fails to provide satisfactory evidence, policies or receipts, the Procuring Agency may, without prejudice to any other right or

remedy, effect insurance for the cover relevant to such as a default and pay the premiums due and recover the same plus a sum in percentage given in Contractor Data from any other amounts due to the Contractor.

15. RESOLUTION OF DISPUTES

15.1 Engineer's Decision

If a dispute of any kind whatsoever arises between the Procuring Agency and the Contractor in connection with the works, 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 twenty eight (28) days after the day on which he received such reference, the Engineer shall give notice of his decision to the Procuring Agency (Superintending Engineer) and the Contractor.

Unless the Contract has already been repudiated or terminated, the Contractor shall, in every case, continue to proceed with the work with all due diligence, and the Contractor and the Procuring Agency (Superintending Engineer)shall give effect forthwith to every such decision of the Engineer unless and until the same shall be revised, as hereinafter provided in an arbitral award.

15.2 Notice of Dissatisfaction

If a Party is dissatisfied with the decision of the Engineer of consultant or if no decision is given within the time set out in Sub-Clause 15.1 here above, the Party may give notice of dissatisfaction referring to this Sub-Clause within fourteen (14) days of receipt of the decision or the expiry of the time for the decision. If no notice of dissatisfaction is given within the specified time, the decision shall be final and binding on the Parties. If notice of dissatisfaction is given within the specified time, the decision shall be binding on the Parties who shall give effect to it without delay unless and until the decision of the Engineer is revised by an arbitrator.

If a contractor is dissatisfied with the decision of the Engineer of the department or decision is not given in time then he can approach Superintending Engineer within 14 days, in case of dissatisfaction with decision of Superintending Engineer or not decided within 28 days, then arbitration process would be adopted as per clause 15.3.

15.3 Arbitration

A dispute which has been the subject of a notice of dissatisfaction shall be finally settled as per provisions of Arbitration Act 1940 (Act No. X of 1940) and Rules made there under and any statutory modifications thereto. Any hearing shall be held at the place specified in the Contract Data and in the language referred to in Sub-Clause 1.5.

16 INTEGRITY PACT

16.1 If the Contractor or any of his Sub-Contractors, agents or servants is found to have violated or involved in violation of the Integrity Pact signed by the Contractor as Schedule-F to his Bid, then the Procuring Agency 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 Sub-Contractors, agents or servants;
(b) terminate the Contract; and
(c) recover from the Contractor any loss or damage to the Procuring Agency as a result of such termination or of any other corrupt business practices of the Contractor or any of his Sub-Contractors, agents or servants.

On termination of the Contract under Sub-Para (b) of this Sub-Clause, the Contractor shall demobilize from the site leaving behind Contractor's Equipment which the Procuring Agency instructs, in the termination notice, to be used for the completion of the works at the risk and cost of the Contractor. Payment upon such termination shall be made under Sub-Clause 12.4, in accordance with Sub-Para (c) thereof, after having deducted the amounts due to the Procuring Agency under Sub-Para (a) and (c) of this Sub-Clause.

CONTRACT DATA

Sub-Clauses of
Conditions of Contract

1.1.3 Procuring Agency's Drawings: Attached Separately at page no. ____

1.1.4 **The Procuring Agency** means — the person or entity named in the Contract Data and the legal successors in title to this person, but not (except with the consent of the Contractor) any assignee. Here P/A is **Mehran University of Engineering & Technology Khairpur Mir's**

1.1.5 **The Contractor** means a firm which is employed by the P/A. The contractor is responsible for providing all of the material, labor, equipment and services necessary for the construction of the project.

1.1.7 Commencement Date means the date of issue of Engineer's Notice/Work Order to Commence which shall be issued within fourteen (07) days of the signing of the Contract Agreement.

1.1.9 Time of Completion:- 03 Month

1.1.20 Consultants

RCC Consultants
Ground Floor RCC Complex Main Road, Qasimabad Hyderabad
Phones No 022-2652957, Fax no 022-2655833
E-mail: rcc.consultants@rccgoc.com

1.3 Documents forming the Contract listed in the order of priority:

(a) The Contract Agreement
(b) Letter of Acceptance
(c) The completed Form of Bid
(d) Contract Data
(e) Conditions of Contract
(f) Bill of Quantities (BOQ)
(g) The Drawings
(h) The Specifications
(i) Special Conditions of Contract

2.1 **Provision of Site:** On the Commencement Date

3.1 **Authorized person: Project Director Mehran University of Engineering & Technology Khairpur Mirs**

3.2 Name and address of Engineer's/Procuring Agency's representative:

Project Director Mehran University of Engineering & Technology Khairpur Mirs

4.4 **Performance Security: (Not Applicable)**

5.1 **Requirements for Contractor's design (if any):** Contractor to confirm design of any components if necessary.

7.2 **Programme:**

Time for submission: Within fourteen (07) days of the Commencement Date.

Form of programme: *Bar Chart / CPM/PERT*

7.4 Amount payable due to failure to complete shall be 0.05% per day up to a maximum of (10%) of sum stated in the Letter of Acceptance **(Not Applicable)**

7.5 Early Completion (Not Applicable)
In case of earlier completion of the Work, the Contractor is entitled to be paid bonus Up-to limit and at a rate equivalent to 50% of the relevant limit and rate of liquidated damages stated in the contract data.

9.1 Period for remedying defects (Defects Liability Period): (06) **six months**

10.2 (e) **Variation procedures: (Not Applicable)**
Day work rates_____
_____(details)

11.1 Terms of Payments

a) Mobilization Advance

(1) Procuring Agency will decide.

(i) on submission by the Contractor of a Mobilization Advance Guarantee for the full amount of the Advance in the specified form from a Scheduled Bank in Pakistan to the Procuring Agency;

(ii) Contractor will pay interest on the mobilization advance at the rate of 10% per annum on the advance; and

(iii) This Advance including the interest shall be recovered in 5 equal installments from the five (05) R.A bills and in case the number of bills is less than five (05) then 1/5th of the advance **inclusive of the interest** thereon shall be recovered from each bill and the balance together with interest be recovered from the final bill. It may be insured that there is sufficient amount in the final bill to enable recovery of the Mobilization Advance.

2) **Secured Advance on Materials**

(a) The Contractor shall be entitled to receive from the Procuring Agency Secured Advance against an INDENTURE BOND in P W Account Form No. 31(Fin.R. Form No. 2 acceptable to the Procuring Agency of such sum as the Engineer may consider proper in respect of non-perishable materials brought at the Site but not yet incorporated in the Permanent Works provided that:

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

(ii) Such materials have been delivered to the Site and are properly stored and protected against loss or damage or deterioration to the satisfaction and verification of the Engineer but at the risk and cost of the Contractor;

(iii) The Contractor's records of the requirements, orders, receipts and use of materials are kept in a form approved by the Engineer, and such records shall be available for inspection by the Engineer;

(iv) The Contractor shall submit with his monthly statement the estimated value of the materials on Site together with such documents as may be required by the Engineer for the purpose of valuation of materials and providing evidence of ownership and payment therefore;

(v) Ownership of such materials shall be deemed to vest in the Procuring Agency and these materials shall not be removed from the Site or otherwise disposed of without written permission of the Procuring Agency;

(vi) The sum payable for such materials on Site shall not exceed 75 % of the (i) landed cost of imported materials, or (ii) ex-factory / ex-warehouse price of locally manufactured or produced materials, or (iii) market price of stands other materials.

(vii) Secured Advance should not be allowed unless &until the previous advance, if an, fully recovered;

(viii) Detailed account of advances must be kept in part II of running account bill; and

(ix) Secured Advance may be permitted only against materials/quantities anticipated to be consumed / utilized on the work within a period of 3 months from the date of issue of secured advance and definitely not for full quantities of materials for the entire work/contract

(b) Recovery of Secured Advance:

(i) Secured Advance paid to the Contractor under the above provisions shall be effected from the monthly payments on actual consumption basis, but not later than period specified in the rules not more than three months (even if unutilized); other conditions.

(ii) As recoveries are made the outstanding accounts of the items concerned in Part II should be reduced b making deduction entries in the column; —deduct quantity utilized in work measured since previous bill,ll equivalent to the quantities of materials used by the contractor on items of work shown as executed in part I of the bill.

(c) Interim payments: The Contractor shall submit to the Engineer monthly statements of the estimated value of the work completed less the cumulative amount certified previously.

(i) The value of work completed comprises the value of the quantities of the items in the Bill of Quantities completed.

(ii) Value of secured advance on the materials and valuation of variations (if any).

(iii) Engineer may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

(v) Retention money and other advances are to be recovered from the bill submitted by contractor.

11.2 *(a) **Valuation of the Works:**

Measurement of executed quantities at quoted rates.

11.3 Percentage of retention: Eight percent (8%) (Bid Security)

11.6 Currency of payment: Pak Rupees

14.1 Insurances: (Not Applicable)

Type of cover

The works

Amount of cover

The sum stated in the letter of acceptance plus fifteen percent

Type of cover
Contractor's equipment

Amount of cover
Full rep acement cost

Type of cover
Third party injury to persons and damage t property

Workers:

Other cover:

14.2 Amount to be recovered (not applicable)

Premium plus_____ percent (%)

15.3 Arbitration

Place of Office of the **Project Director Mehran University of Engineering & Technology Khairpur Mirs.**

STANDARD FORMS

(Note: Standard Forms provided in this document for securities are to be issued by a bank. In case the bidder chooses to issue a bond for accompanying his bid or performance of contract or receipt of advance, the relevant format shall be tailored accordingly without changing the spirit of the Forms of securities).

FORM OF BID SECURITY
(Bank Guarantee)

Guarantee No._____
Executed on _____

(Letter by the Guarantor to the Procuring Agency)

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

Name of Principal (Bidder) with address:_____

_____

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

_____

Bid Reference No._____ Date of Bid _____

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

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted the accompanying Bid numbered and dated as above for _____ (Particulars of Bid) to the said Procuring Agency; and

WHEREAS, the Procuring Agency has required as a condition for considering the said Bid that the Principal furnishes a Bid Security in the above said sum to the Procuring Agency, conditioned as under:

(1) that the Bid Security shall remain valid for a period of twenty eight (28) days beyond the period of validity of the bid;
(2) that in the event of;

(a) the Principal withdraws his Bid during the period of validity of Bid, or

(b) the Principal does not accept the correction of his Bid Price, pursuant to Sub-Clause 16.4 (b) of Instructions to Bidders, or

(c) failure of the successful bidder to

(i) furnish the required Performance Security, in accordance with Sub-Clause IB-21.1 of Instructions to Bidders, or

(ii) sign the proposed Contract Agreement, in accordance with Sub-Clauses IB-20.2 & 20.3 of Instructions to Bidders,

the entire sum be paid immediately to the said Procuring Agency for delayed completion and not as penalty for the successful bidder's failure to perform.

NOW THEREFORE, if the successful bidder shall, within the period specified therefore, on the prescribed form presented to him for signature enter into a formal Contract Agreement with the said Procuring Agency in accordance with his Bid as accepted and furnish within fourteen (14) days of receipt of Letter of Acceptance, a Performance Security with good and sufficient surety , as may be required, upon the form prescribed by the said Procuring Agency for the faithful performance and proper fulfilment of the said Contract or in the event of non-withdrawal of the said Bid within the time specified then this obligation shall be void and of no effect, but otherwise to remain in full force and effect.

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

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

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

_____
Guarantor (Bank)

Witness:

1. _____
Corporate Secretary (Seal)

2. _____
(Name, Title & Address)

1. Signature _____

2. Name _____

3. Title _____

Corporate Guarantor (Seal)

FORM OF PERFORMANCE SECURITY
(Bank Guarantee)

Guarantee No._____
Executed on _____
Expiry Date

(Letter by the Guarantor to the Procuring Agency)

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

Name of Principal (Contractor) with address:_____
_____

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

Letter of Acceptance No._____ Dated _____

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

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has accepted the Procuring Agency's above said Letter of Acceptance for _____ _____ (Name of Contract) for the _____

_____ (Name of Project).

NOW THEREFORE, if the Principal (Contractor) shall well and truly perform and fulfill all the undertakings, covenants, terms and conditions of the said Documents during the original terms of the said Documents and any extensions thereof that may be granted by the Procuring Agency, with or without notice to the Guarantor, which notice is, hereby, waived and shall also well and truly perform and fulfill all the undertakings, covenants terms and conditions of the Contract and of any and all modifications of the said Documents that may hereafter be made, notice of which modifications to the Guarantor being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue till all requirements of Clause 9, Remedying Defects, of Conditions of Contract are fulfilled.

Our total liability under this Guarantee is limited to the sum stated above and it is a condition of any liability attaching to us under this Guarantee that the claim for payment in writing shall

be received by us within the validity period of this Guarantee, failing which we shall be discharged of our liability, if any, under this Guarantee.

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

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

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

_____
Guarantor (Bank)

Witness:

1. _____

_____
Corporate Secretary (Seal)

2. _____

_____
(Name, Title & Address)

1. Signature _____
2. Name _____
3. Title _____

_____
Corporate Guarantor (Seal)

FORM OF CONTRACT AGREEMENT

THIS CONTRACT AGREEMENT (hereinafter called the "Agreement") made on the _____ day of _____ 200 _____ between _____(hereinafter called the "Procuring Agency") of the one part and _____ (hereinafter called the "Contractor") of the other part.

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

NOW this Agreement witnesseth as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.

2. The following documents after incorporating addenda, if any except those parts relating to Instructions to Bidders, shall be deemed to form and be read and construed as part of this Agreement, viz:

   (a) The Letter of Acceptance;
   (b) The completed Form of Bid along with Schedules to Bid;
   (c) Conditions of Contract & Contract Data;
   (d) The priced Schedule of Prices/Bill of quantities (BoQ);
   (e) The Specifications; and
   (f) The Drawings

3. In consideration of the payments to be made by the Procuring Agency to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Procuring Agency to execute and complete the Works and remedy defects therein in conformity and in all respects within the provisions of the Contract.

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

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

Signature of the Contactor

(Seal)

Signature of the Procuring Agency

(Seal)

Signed, Sealed and Delivered in the presence of:

Witness:

(Name, Title and Address)

Witness:

(Name, Title and Address)

MOBILIZATION ADVANCE GUARANTEE

Guarantee No._____

Executed on_____

(Letter by the Guarantor to the Procuring Agency)

WHEREAS the _____ (hereinafter called the Procuring Agency) has entered into a Contract for _____ _____ _____ (Particulars of Contract), with _____ _____ (hereinafter called the Contractor).

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

AND WHEREAS the Procuring Agency has asked the Contractor to furnish Guarantee to secure the advance payment for the performance of his obligations under the said Contract.

AND WHEREAS _____ (Scheduled Bank) (hereinafter called the Guarantor) at the request of the Contractor and in consideration of the Procuring Agency agreeing to make the above advance to the Contractor, has agreed to furnish the said Guarantee.

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

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

This Guarantee shall come into force as soon as the advance payment has been credited to the account of the Contractor.

This Guarantee shall expire not later than _____

by which date we must have received any claims by registered letter, telegram, telex or telefax.

It is understood that you will return this Guarantee to us on expiry or after settlement of the total amount to be claimed hereunder.

_____
Guarantor (Scheduled Bank)

Witness:

1. _____

_____
Corporate Secretary (Seal)

2. _____

_____
(Name, Title & Address)

1. Signature _____

2. Name _____

3. Title _____

_____
Corporate Guarantor (Seal)

INDENTURE FOR SECURED ADVANCES.

(For use in cases in which is contract is for finished work and the contractor has entered into an agreement for the execution of a certain specified quantity of work in a given time).

This INDENTURE made the .... day of ..... ----- ..... ----------.....-197--"- BETWEEN (hereinafter called "the Contractor" which expression shall where the context so admits or implied be deemed to include his heirs, executors, administrators and assigns) of the one part and THE GOVERNOR OF SINDH (hereinafter called "the Government" of the other part).

WHEREAS by an agreement, dated (hereinafter called the said agreement, the contractor has agreed to perform the under-mentioned works (hereinafter referred to as the said work):-

(Here enter (the description of the works).[1]

AND WHEREAS the contractor has applied to the .... —..... ----- for an advance to him of Rupees ----------. (Rs. .....) on the security of materials absolutely belonging to him and brought by him to the site of the said works the subject of the said agreement for use in the construction of such of the said works as he has undertaken to execute at rates fixed for the finished work (inclusive of the cost of materials and labour and other charge) AND WHEREAS the Government has agreed to advance to the Contractor the sum of Rupees, (Rs. .....) on the security of materials the quantities and other particulars of which are detailed in Part II of Running Account Bill (E). the said works signed by the contractor

Fin R.Form.17.A

on---------- ..... — and on such covenants and conditions as are hereinafter contained and the Government has reserved to itself the option of marking any further advance or advances on the security of other materials brought by the Contractor to the site of the said works.

NOW THIS INDENTURE WTTNESSETH that in pursuance of the said agreement and in consideration of the sum of Rupees.....---------- .....-.....— ..... (Rs. ------ ..... -----) on or before the execution of these presents paid to the Contractor by the Government (the receipt whereof the Contractor doth hereby acknowledge) and of such further advances (if any) as may be made to him as aforesaid (all of which advances are hereinafter collectively referred to as the said amount) the Contractor doth hereby assign unto the Government the said materials by way of security for the said amount

And doth hereby covenant and agree with the Government and declare ay follow :-

(1) That the said sum of Rupees .....-..... ----------..... ---------- (Rf. ----------) so advanced by the Government to the Contractor as aforesaid and all or any further sum or sums which may be advanced aforesaid shall be employed by the contractor in or towards expending the execution of the said works and for no other purpose whatsoever.

(2) That the materials detailed in the said Running Account Bill (B) which have been Fin R Form No. 17-A
Offered to and accepted by (he Government as security for the said amount are absolutely by the Contractors own property free from encumbrances of any kind and the Contractor will not make any application for or receive a further advance on the security of materials which are not absolutely his own property and free from encumbrances of any kind and the contractor hereby agrees, at all times, to indemnify and save harmless the Government against all claims whatsoever to any materials in respect of which an advance has been made to him as aforesaid.

(3) That the said materials detailed in the said Running Account Bill (B) and all other Fin. R. Form No. 17-A
Materials on the security of which any further advance or advances may hereafter be made as aforesaid (hereinafter called the said materials) shall be used by the Contractor solely in *the* execution of the said works in accordance with the directions of the Divisional Officer----------(hereinafter called the Divisional Officer) and in the terms of the said agreement.

(4) That the Contractor shall make at his own cost all necessary and adequate arrangement for the proper watch, safe custody and protection against all risks of the said material and that until used in construction as aforesaid the said materials shall remain at the site of the said works in the Contractor's custody and at his own risk and on his own responsibility and shall at all times be open to inspection by (he Divisional Officer or any officer authorized by him. In the event of the said materials of any part (hereof being stolen. destroyed or damaged or becoming deteriorated in a grater degree than is due to reasonable use and wear thereof Contractor will forthwith replace the same with other materials of like qualify or repair and make good the same as required by the Divisional Officer and the materials so brought to replace the said materials so repaired and made good shall also be considered as security for the said amount.

(5) 'Hurt the said materials shall not on any account be removed from the site of the said works except with the written permission of the Divisional Officer or an officer authorized by him in that behalf

(6) That the said amount shall be payable in full when or before the Contractor receives payment, from the Government of the price payable to him for the said works under the terms and provisions of the said agreement PROVIDED THAT if any intermediate payments are made to the contractor on account of work done then on the occasion of each such payment the Government will be at liberty to make a recovery from the Contractors Bill for such payment by deducting there from in the value of the said materials (hen actually used in the construction and in respect of which recovery has not been made previously the value for this purpose being determined in respect of each description of material at (he rates at which the amount of the advances made under these presents were calculated.

(7) That if the Contractor shall at any time make any default in the performance or observation in any respect of any of the terms and provisions of the said agreement or of these presents the total amount of the advance or advances that may still be owing to the Government shall immediately on the happening of such default be repayable by the Contractor to the Government together with interest thereon at twelve

percent per annum from the date or respective dates of such advance or advances to the date or repayment and with all costs, charges, damages and expenses incurred by the Government in or for the recovery thereof or the enforcement of this security or otherwise by reason of (he default of the Contractor and any moneys so becoming due and payable shall constitute a debt due from the Contractor to the Government and the Contractor hereby covenants and agrees with the Government to repay and the same respectively to it accordingly.

(8) That the Contractor hereby charges all the said materials with the repayment to the Government of the said sum of Rupees ..... - ..... (Rs.....) and any further sum or sums which may be advanced as aforesaid and all costs charges damages and expenses payable under these present PROVIDED ALWAYS and it is hereby agreed and declared that not withstanding anything in the said agreement and without prejudice to the powers contained therein if and whether the covenant for payment and repayment hereinbefore contained shall become enforceable and the money owing shall not be paid to accordingly.

Once therewith the Government may at any time thereafter adopt all or any of following courses as it may deem best ;-

(a) Seize and utilize the said materials or any part thereof in the completion of the said works on behalf of the Contractor in accordance with the provisions in that behalf contained in the said agreement debiting the Contractor with the actual cost of effecting such completion the amount due in respect of advances under these presents and crediting the Contractor with the value of work done as he had carried it out in accordance with the said agreement and at the rates thereby provided. If the balance is against the Contractor he is to pay the same to the Government on demand.

(b) Remove and sell by public auction the seized materials or any part thereof and out of the moneys arising from the sale retain all the sums aforesaid repayable to the Government under these presents and pay over the surplus (if any) to the Contractor.

(c) Deduct all or any part of the moneys owing out of the security deposit or any sum due to the Contractor under the said agreement.

(9) That except as is expressly provided by the presents interest on the aid advance shall not be payable.

(10) That in the event of any conflict between the provisions of these presents and the said agreement the provisions of these presents shall prevail and in the event of any dispute or difference arising over the construction or effect of these presents the settlement of which has not been hereinbefore expressly provided for the same shall be referred to the Superintending Engineer..... Circle whose..... decision shall be final and the provisions of the Indian Arbitration Act for the time being in force so far as they are applicable shall apply to any such reference.

In witnesses whereof the* ----- -— __ .... on behalf of the Governor of Sindh and the said .... —........................... - .... --have hereunto set their respective hands and seals the day and first above written.

Signed, sealed and delivered by* In the presence of

Seal
1st witness 2nd witness

Signed, sealed and delivered by* In the presence of

Seal

1st Witness 2nd witness

SPECIFICATIONS FOR CIVIL WORKS

SECTION - 1

1 Standard Specifications, Standard and Codes for PE (Polyethylene) Piping Systems

1.1 Standard Requirements for PE Piping Materials

Polyethylene (PE) is a complex polymer with properties that can be optimized based on the desired end use. Such modifications are effected by choice of catalyst system, polymerization conditions and, the use of a small quantity of co-monomer (a monomer or monomers other than ethylene). All these changes allow PE to be tailor made to a wide range of processing and performance requirements.

For classifying this wide array of property variations that find use in piping applications, ASTM issued standard D 3350, "Standard Specification for Polyethylene Plastic Pipe and Fittings Materials". This standard recognizes six properties that are considered important in the manufacture of PE piping, in the heat fusion joining of this material and, in defining its long-term performance capabilities. Each property is assigned into a "Cell" and, each cell consists of a number of "Classes". A cell number covers a narrow range of the larger overall range that is covered by a property "cell". These D 3350 property cells and classes are identified in Table 1.

TABLE 1

Cell Classification System from ASTM D 3350-06 [1,2]

Property	Test method	0	1	2	3	4	5	6	7	8
Density ,g/cm 3	D1505	un-specified	0.925 or lower	>0.925 – 0.940	>0.940-0.947	>0.940 – 0.955	>0.955	-	specify value	-
Melt index	D 1238	un-specified	> 1.0	1.0 to 0.4	<0.4 to 0.15	<0.15	A	-	specify value	-
Flexural modulus,mpa (psi) 2% secant	D 790	un-specified	<138 (<20,000)	138-<276(20,000 to <40,000)	278-<552 (40,000 to<80,000)	552-<758 (40,000 to <11,000)	758-<1103(110,000 to <160,000)	>1103 (>160,000)	specify value	-
Tensile strength at yield, mpa(psi)	D638	un-specified	<15 (<2000)	15-<18(2200-<2600)	18-<21(2600-<3000)	21-<24(3000-<3500)	24-<28(3500-<4000)	>28(>4000)	specify value	-
slow crack growth resistance ESCR	D1693	un-specified								

a. Condition b. Test duration hrs c. Failure, max, %			A 48 50	B 24 50	C 192 20	C 600 20	- - -	- - -	- - -	specify value
slow crack growth resistance II. PENT (hours) molded plaque, 80c 2.4Mpa, notch depth table	F1473	un-specified	-	-	-	10	30	100	500	specify value
hydrostatic strength classification I.Hydrostatic design basis, Mpa (psi)(23 degreeC	D2837	NPR	5.52 (800)	6.89(1000)	8.62 (1250)	11.03 (1600)	-	-	-	-
hydrostatic strength classification II.Minimum Required strength, Mpa (psi)(23 degreeC	ISO 12162	-	-	-	-	-	8 (1160)	10 (1450)	-	-

Notes to table1 _A: refer to 10.1.4.1(ASTM D3350 B:NPR=Not Pressure Rated

In addition, by means of a Code letter, ASTM D3350 designates whether the material includes a colorant and also, the nature of the stabilizer that is included for protecting The material against the potential damaging effects of the ultraviolet (UV) rays in sunlight. Table 2 lists the Code letters that are used in D 3350 and what they represent

TABLE 2

Code Letter Representation

Code Letter	Color and UV Stabilizer
A	Natural
B	Colored
C	Black with 2% minimum carbon black
D	Natural with UV stabilizer
E	Colored with UV stabilizer

For designating a PE material in accordance with ASTM D 3350 the cell number for each cell property is identified, and this is done in the same order as shown in Table 1. This is then followed by an appropriate Code letter to indicate color and stabilization as shown in Table 2. An example of this material designation system is presented in Table 3 for the case of a PE material having designation code PE445574C.

TABLE 3

Properties of a Cell number PE445574 Material

Designating the Applicable Property Cell(1)	Class Number or Code Letter	Corresponding Value of Property (From Table1)
1st Digit Density of PE base resin, gm/cm^3	4	>0.947-0.955
2nd Digit - Melt Index of compound, gm/10 minutes	4	<0.15
3rd Digit - Flexural Modulus of compound,psi (MPa)	5	110,000 - < 160,000 (758 - <1103)
4th Digit - Tensile Strength at Yield of compound, psi (MPa)	5	3,500 - <4,000 (24 - <28)
5th Digit - Resistance to Slow Crack Growth of compound (SCG), hrs.	7	500 minimum based on PENT test
6th Digit - Hydrostatic Design Basis for water at 73°F(23°C), psi of compound (MPa)	4	1600 (11.03)
Code Letter	C	Black with 2% minimum carbon black

A PE material that complies with the Table 3 cell designation i.e. PE445574C would be a higher density (higher crystallinity), lower melt index (higher molecular weight) material that exhibits exceptionally high resistance to slow crack growth. In addition, it offers a hydrostatic design basis (HDB) for water at 73°F (23°C) of 1600 psi (11.03 MPa). Finally, it would be black and contain a minimum of 2% carbon black.

The cell classification system provides the design engineer with a very useful tool in specifying the requirements of PE materials for piping projects.

.1.2 Standard PE Piping Material Designation Code

While all PE piping standards specify minimum material requirements based the on the cell requirements of ASTM D3350, a simpler, short-hand, ASTM recognized material designation code is commonly used for quickly identifying the most significant engineering properties of a PE pipe material. An important feature of this designation code is that it identifies the maximum recommended hydrostatic design stress (HDS) for water, at

73°F(23°C). Originally, this designation code was devised to only apply to materials intended for pressure piping. However, there is a recognition that even in non-pressure applications stresses are generated which makes it prudent to use a stress rated material. This has led to the common practice of using this material designation code for quickly identifying all PE piping materials intended for pipes of solid wall or, of profile wall construction.

This code is defined in ASTM F412, "Standard Terminology Relating to Plastic Piping Systems", under the definition for the term code, thermoplastic pipe materials designation. It consists of the ASTM approved abbreviation for the pipe material followed by four digits (e.g., PE4710). The information delivered by this code is as follows:

• The ASTM recognized abbreviation for the piping material. PE, in the case of polyethylene materials.

• The first digit identifies the density range of the base PE resin, in accordance with ASTM D3350, that is used in the material. As discussed in Chapter 3, the density of a PE polymer reflects the polymer's crystallinity which, in turn, is the principal determinant of the final material's strength and stiffness properties.

• The second digit identifies the compound's resistance to slow crack growth (SCG), also in accordance with ASTM D3350. A material's resistance to SCG relates very strongly to its long-term ductility, a property that defines the material's capacity for safely resisting the effects of localized stress intensifications.

• The last two numbers identify the compound's maximum recommended hydrostatic design stress (HDS) category [1] for water, at 73°F(23°C). This recommendation is established in consideration of various factors but, primarily the following: The capacity for safely resisting the relatively well distributed stresses that are generated only by internal pressure, and, the capacity for safely resisting add-on effects caused by localized stress intensifications.

The Standard Designation Codes for materials which are recognized as of this writing by current ASTM, AWWA, CSA and other standards are listed in Table 4. This table gives a brief explanation of the significance of the code digits. It should be recognized that a new material may be commercialized which qualifies for a code designation that has not been recognized as of this writing. For a listing of the most current recognized code designations the reader is invited to consult the periodically updated PPI publication TR-4.

TABLE 4

Standard Designation Codes for Current Commercially Available PE Piping Compositions

Standard Designation Code	What the Digits in the Code Denote		
	The 1st Digit	The 2nd Digit	last two Digits [1]

	Cell Number Based on the Density Cell In accordance with ASTM D3350 (See Table 1)	Cell Number Based on the Resistance to SCG Cell In accordance with ASTM D3350 [2] (See Table 1)	ommended ndard Recommended Standard Hydrostatic Design Stress(HDS) Category, for water, at 73°F (23°C) (psi)
PE2406	Cell number 2	Cell number 4	630
PE2708		Cell number 7	800
PE3408	Cell number 3	Cell number 4	800
PE3608		Cell number 6	
PE3708		Cell number 7	800
PE3710			1000
PE4708	Cell number 4	Cell number 7	800
PE4710			1000

(1) The last two digits code the Standard HDS Category in units of 100psi. For example, 06 is the code for 630psi and 10 is the code for 1,000psi.

(2) It should be noted that the lowest Cell number for SCG resistance for pipe is Based on research and experience a rating of at least 4 has been determined as sufficient for the safe absorption of localized stresses for properly installed PE pipe.

1.3 Codes, Standards and Recommended Practices for PE Piping Systems

There are a large number of codes, standards and practices that apply to the use of PE piping. These consensus documents cover a broad range of applications for PE pipe and fittings. Some standards pertain to the product performance requirements for a specific application, while other standards are guidelines and practices detailing how a certain type of activity is to be performed. Some are test methods that define exactly how a particular test is to be run so that a direct comparison can be made between results. There are several organizations that issue standards, codes of practice, manuals, guides, and recommendations that deal with the manufacture, testing, performance, and use of PE pipe and fittings. Some of the major ones are discussed below. A more inclusive listing can be found in the Appendix of this chapter.

1.3.1 Plastics Pipe Institute (PPI)

The Plastics Pipe Institute is a trade association dedicated to promoting the proper and effective use of plastics piping systems. The assignment of a recommended hydrostatic design basis for a thermoplastic material falls under the jurisdiction of the Hydrostatic Stress Board - HSB - of the Plastics Pipe Institute. The Hydrostatic Stress Board has the responsibility of developing policies and procedures for the recommendation of the estimated long-term strength for commercial thermoplastic piping materials. The document most widely used for this is Technical Report-3, TR-3 "Policies and Procedures for Developing Hydrostatic Design Bases (HDB), Pressure Design Bases (PDB), Strength Design Bases (SDB), and Minimum Required Strengths (MRS) for Thermoplastic Piping Materials or Pipe." The material stress ratings themselves are published in TR-4, "PPI Listing of Hydrostatic Design Bases (HDB), Strength Design Bases (SDB), Pressure Design Bases (PDB) and Minimum Required Strengths (MRS) Ratings for Thermoplastic Piping Materials or Pipe." There are many other publications pertaining to various aspects of polyethylene pipe available from PPI such as: TN's - Technical Notes, TR's - Technical Reports, Model Specifications, and White Papers on specific positions addressed by the industry.

It should be noted that while the Hydrostatic Stress Board (HSB) is a division of the Plastics Pipe Institute, involved in the development and issuance of policies, procedures, and listings of stress and pressure ratings for all thermoplastic pipe materials, PPI itself is an industry association focused on the promotion and effective and proper use of pipe primarily made from polyethylene (PE), cross linked polyethylene (PEX), and polyamide (POM) materials.

1.3.2 ASTM

ASTM International is a consensus standards writing organization, and has published standards for a multitude of materials, products, practices and applications. Those pertaining to polyethylene pipe are found in Volume 8.04 "Plastic Pipe and Building Products." ASTM employees do not write these standards; rather they are written by interested parties and experts within the industry who are members of ASTM. Most anyone can be a member of ASTM and participate in the standard writing process. Other standards, pertaining to plastics in general are found in other books within Volume 8 - 8.01, 8.02, or 8.03.

ASTM Standards pertaining to PE pipe can be a Standard Specification that defines the product requirements and performance for a specific application. It can also be a Standard Practice, which defines how a particular activity is to be performed, or a Standard Test Method, which defines how a particular test on PE pipe, fittings, or materials is to be done. While ASTM standards are mainly used in North America, many are also approved by the American National Standards Institute (ANSI) for international recognition, or are equivalent to an International Standards Organization (ISO) standard. When a manufacturer prints the ASTM Standard on a product, the manufacturer is certifying that the product meets all of the requirements of that standard.

The typical sections included in an ASTM Product Standard are:

Scope - what products and applications are covered under this standard.
Referenced Documents - what other standards or specifications are referenced in this standard.

Terminology - lists definitions that are specific to this standard.

Materials - defines material requirements for products that conform to this standard.

Requirements - details the performance requirements that the product must meet. This section will also contain dimensions.

Test Methods - details how the testing is to be performed to determine conformance to the performance requirements.

Marking - details the print that must be on the product. Includes the standard number, manufacturer's name, size, date of manufacture, and possibly the application such as "water." There may be other wording added to the print as the purchaser requires.

This is only a typical example of sections that may be included. While ASTM has defined protocol for product standards, each one may contain sections unique to that standard. Each standard should be reviewed individually for its requirements.

1.3.3 ISO

The International Organization for Standardization (ISO) is a network of national standards institutes from 140 countries working in partnership with international organizations, governments, industry, business and consumer representatives.

The ISO committee having jurisdiction for development of plastics pipe standards is Technical Committee 138. The committee's stated scope is: Standardization of pipes, fittings, valves and auxiliary equipment intended for the transport of fluids and made from all types of plastic materials, including all types of reinforced plastics. Metal fittings used with plastics pipes are also included. The main committee has seven subcommittees devoted to specific issues.

TC 138 has 35 participating countries, including the United States and Canada, and 27 observer countries. For ISO matters the United States is represented by the American National Standards Institute (ANSI). Canadian representation is through the Standards Council of Canada (SCC). The United States representation has been passed through ANSI who had delegated it down to ASTM and, who in turn, had delegated it to the Plastics Pipe Institute.

1.3.4 NSF International

NSF International plays a vital role in the use of pipe and fittings for potable

water and plumbing applications. NSF is an independent, not-for-profit organization of scientists, engineers, educators and analysts. It is a trusted neutral agency, serving government, industry and consumers in achieving solutions to problems relating to public health and the environment. NSF has three essential missions, as follows:

1. To issue standards that establish the necessary public health and safety requirements for thermoplastic piping materials and for piping products intended for use in the transport of potable water and for drainage and venting systems in plumbing applications.

2. To establish the appropriate test methods by which these requirements are evaluated.

3. To offer a certification program which affirms that a particular product which carries an NSF seal is in compliance with the applicable NSF requirements

NSF standards are developed with the active participation of public health and other regulatory officials, users and industry. The standards specify the requirements for the products, and may include requirements relating to materials, design, construction, and performance.

There are two NSF Standards that are of particular importance to the polyethylene pipe and fittings industry: Standard 14, "Plastic Piping components and Related Materials" and Standard 61, "Drinking Water System Components-Health Effects." Standard 14 includes both performance requirements from product standards and provisions for health effects covered in Standard 61. NSF Standard 14 does not contain performance requirements itself, but rather NSF will certify that a product conforms to a certain ASTM, AWWA, etc... product performance standard. In order to be certified for potable water applications under Standard 14, the product must also satisfy the toxicological requirements of Standard 61.

For products intended for potable water applications, it is also an option to be certified under Standard 61 only, without certifying the performance aspects of the product. In the early 1990's NSF separated the toxicological sections of Standard 14 into a new Standard 61. This was done for several reasons, but mainly to make it easier to bring new, innovative products to market without undue expense and time, while continuing to keep the public safe. This was a great benefit to the industry. Now manufacturers have a choice of staying with Standard 14 or switching to Standard 61. Many manufacturers who have in-house quality programs and the ability to perform the necessary tests switched to this new potable water certification option.

1.3.5 AWWA

The American Water Works Association (AWWA) is a leader in the development of water resource technology. These AWWA standards describe minimum requirements and do not contain all of the engineering and administrative information normally contained in a specification that is written for a particular project. AWWA standards usually contain options that must be evaluated by the user of the standard. Until each optional feature is specified by the user, the product or service is not fully defined. The use of AWWA standards is entirely voluntary. They are intended to represent a consensus of

the water supply industry that the product described will provide satisfactory service.

There are currently two AWWA standards that pertain to polyethylene pipe: AWWA C901, "Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inch through 3 inch, for Water Service" and AWWA C906, "Polyethylene (PE) Pressure Pipe and Fittings, 4 inch through 63 inches, for Water Distribution." Standard C901 addresses PE pressure pipe and tubing for use primarily as potable water service lines in the construction of underground distribution systems. It includes dimensions for pipe and tubing made to pressure classes of 80 psi, 100 psi, 125 psi, 160 psi and 250 psi.

This standard covers PE pipe in nominal sizes from ½ inch through 3 inch that are made to controlled outside-diameters based on iron pipe sizes i.e. (OD based IPS size) and also to controlled inside-diameter based on iron pipe sizes i.e. (ID based IPS size). It also covers tubing, ranging in size from ½ inch through 2 inch that conforms to the outside-diameter dimensions of copper tubing sizes (CTS). There are also sections on materials, testing and marking requirements; inspection and testing by manufacturer; and in-plant inspection by purchaser.

AWWA Standard C906 addresses larger diameter PE pressure pipe. The pipe is primarily intended for use in transporting potable water in either buried or aboveground installations. The standard covers 10 standard dimension ratios (SDR's) for nominal pipe sizes ranging from 4 inch through 63 inch. The available pipe sizes are limited by a maximum wall thickness of 3 inch. Pipe outside diameters (OD's) conform to the outside diameter dimensions of iron pipe sizes (IPS), ductile iron pipe size (DIPS), or those established by the International Standards Organization (ISO). Pressure class ratings range from 40 to 250 psig.

AWWA has also published a manual M55, "PE Pipe-Design and Installation". This manual is a design and installation guide for the use of polyethylene pipe in potable water applications. The manual supplements C901 and C906 and provides specific design recommendations as it relates to the use of PE pipe in potable water systems.

1.2 PE Pipe Joining Procedures

.2.1 General Provisions

PE pipe or fittings are joined to each other by heat fusion or with mechanical fittings. PE pipe may be joined to other pipe materials by means of compression fittings, flanges, or other qualified types of manufactured transition fittings. There are many types and styles of fittings available from which the user may choose. Each offers its particular advantages and limitations for each joining situation the user may encounter. Contact with the various manufacturers is advisable for guidance in proper applications and styles available for joining as described in this document. The joining methods discussed in this chapter cover both large and small diameter pipe. Large diameter PE pipe is considered to be sizes 3" IPS (3.500" OD, Iron Pipe Size) and larger. All individuals involved in the joining PE pipe systems, whether it be using the typical heat fusion

methods or employing mechanical connections, should be fully trained and qualified in accordance with applicable codes and standards and/or as recommended by the pipe or fitting manufacturer. Those assigned to making joints in PE pipe for gas applications must meet the additional requirement of compliance with U.S. Department of Transportation Pipeline Safety Regulations (10). The equipment used in the process of making heat fused joints must be designed to operate for the selected pipe and fusion procedures. Additionally, the equipment should be well maintained and capable of operating to specification.

.2.2 Thermal Heat Fusion Methods

There are three types of conventional heat fusion joints currently used in the industry; Butt, Saddle, and Socket Fusion. Additionally, electrofusion (EF) joining is available with special EF couplings and saddle fittings.

The principle of heat fusion is to heat two surfaces to a designated temperature, then fuse them together by application of a sufficient force. This force causes the melted materials to flow and mix, thereby resulting in fusion. When fused according to the pipe and/or fitting manufacturers' procedures, the joint area becomes as strong as, or stronger than, the pipe itself in both tensile and pressure properties and properly fused joints are absolutely leak proof. As soon as the joint cools to near ambient temperature, it is ready for handling. The following sections of this chapter provide a general procedural guideline for each of these heat fusion methods.

.2.3 Butt Fusion

The most widely used method for joining individual lengths of PE pipe and pipe to PE fittings is by heat fusion of the pipe butt ends as illustrated in Figure 1. This technique produces a permanent, economical and flow-efficient connection. Quality butt fusion joints are produced by using trained operators and quality butt fusion machines in good condition.

The butt fusion machine should be capable of:

- Aligning the pipe ends
- Clamping the pipes
- Facing the pipe ends parallel and square to the centerline
- Heating the pipe ends
- Applying the proper fusion force

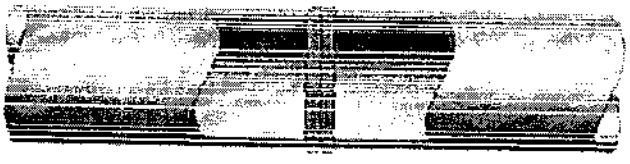


Figure 1 A Standard Butt Fusion Joint

The six steps involved in making a butt fused joint are:

1. Clean, clamp and align the pipe ends to be joined
2. Face the pipe ends to establish clean, parallel surfaces, perpendicular to the center line
3. Align the pipe ends
4. Melt the pipe interfaces
5. Join the two pipe ends together by applying the proper fusion force
6. Hold under pressure until the joint is cool

2.4 Butt Fusion of PE Pipe Products with Different Wall Thicknesses

PE pipes of the same outside diameter but having different specified wall thicknesses, that is, different DR designations, may be butt fused to each other under special conditions. Since this represents a special situation, it is subject to limitations. Therefore, the user is advised to consult with the pipe manufacturer to determine if the special procedures can be applied to the pipe components involved in the particular installation in question.

Most pipe manufacturers have detailed parameters and procedures to follow. The majority of them helped develop and have approved the PPI Technical Report TR-33 for the generic butt fusion joining procedure for PE pipe [15] and ASTM F 2620.

2.4.1 Optional Bead Removal

In some pipe systems, engineers may elect to remove the inner or outer bead of the joint. External, or both beads are removed with run-around planing tools, which are forced into the bead, then drawn around the pipe. Power planers may also be used, but care must be taken not to cut into the pipe's outside surface.

It is uncommon to remove internal beads, as they have little or no effect on flow, and removal is time-consuming. Internal beads may be removed from pipes after each fusion with a cutter fitted to a long pole. Since the fusion must be completely cooled before bead removal, assembly time is increased slightly.

2.4.2 Saddle/Conventional Fusion

The conventional technique to join a saddle to the side of a pipe, illustrated in Figure 3, consists of simultaneously heating both the external surface of the pipe and the matching surface of the "saddle" type fitting with concave and convex shaped heating tools until both surfaces reach proper fusion temperature. This may be accomplished by using a saddle fusion machine that has been designed for this purpose.

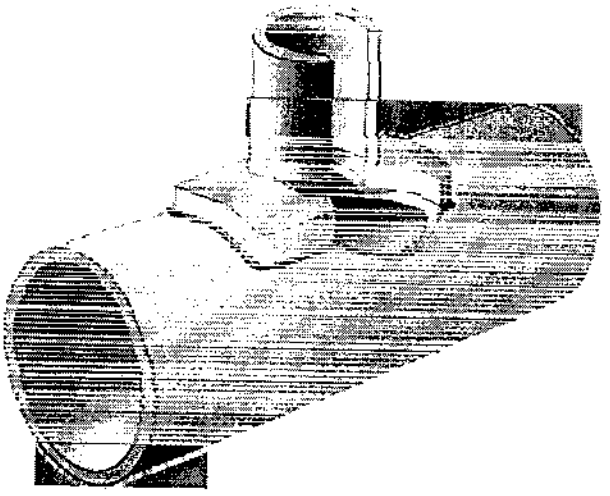


Figure 3 Standard Saddle Fusion Joint

Saddle fusion using a properly designed machine, provides the operator better alignment and force control, which is very important to fusion joint quality. The Plastics Pipe Institute recommends that saddle fusion joints be made only with a mechanical assist tool unless hand fusion is expressly allowed by the pipe and/or fitting manufacturer.[16]

There are eight basic sequential steps that are normally used to create a saddle fusion joint:

1. Clean the pipe surface area where the saddle fitting is to be located
2. Install the appropriate size heater saddle adapters
3. Install the saddle fusion machine on the pipe
4. Prepare the surfaces of the pipe and fitting in accordance with the recommended procedures
5. Align the parts
6. Heat both the pipe and the saddle fitting
7. Press and hold the parts together
8. Cool the joint and remove the fusion machine

Most pipe manufacturers have detailed parameters and procedures to follow. The majority of them helped develop and have approved the PPI Technical Report TR-41 for the generic saddle fusion joining procedure for PE pipe [16] and ASTM 2620.

2.4.3 Socket Fusion

This technique consists of simultaneously heating both the external surface of the pipe end and the internal surface of the socket fitting until the material reaches the recommended fusion temperature, inspecting the melt pattern, inserting the pipe end into the socket, and holding it in place until the joint cools. Figure 4 illustrates a typical socket fusion joint. Mechanical equipment is available to hold both the pipe and the fitting and should be used for sizes

larger than 2" CTS to help attain the increased force required and to assist in alignment. Most pipe manufacturers have detailed written procedures to follow. The majority refers to ASTM F 2620.

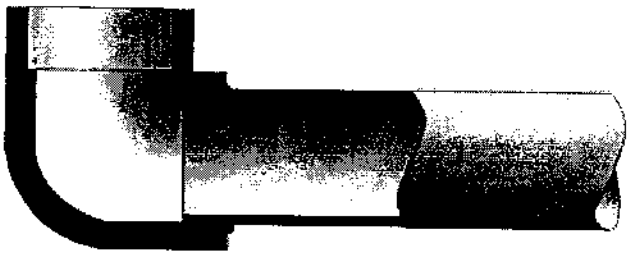


Figure 4 Standard Socket Fusion Joint

Follow these general steps when performing socket fusion:

1. Thoroughly clean the end of the pipe and the matching inside surface of the fitting

2. Square and prepare the pipe end

3. Heat the parts
4. Join the parts

5. Allow to cool

2.4.4 Equipment Selection

Select the proper size tool faces and heat the tools to the fusion temperature recommended for the material to be joined. For many years, socket fusion tools were manufactured without benefit of any industry standardization. As a result, variances of heater and socket depths and diameters, as well as depth gauges, do exist. More recently, ASTM F1056[7] was written, establishing standard dimensions for these tools. Therefore, mixing various manufacturers' heating tools or depth gauges is not recommended unless the tools are marked "F1056," indicating compliance with the ASTM specification and, thereby, consistency of tooling sizes.

2.4.5 Square and Prepare Pipe

Cut the end of the pipe square. Chamfer the pipe end for sizes 1¼"-inch diameter and larger. (Chamfering of smaller pipe sizes is acceptable and sometimes specified in the instructions.) Remove scraps, burrs, shavings, oil, or dirt from the surfaces to be joined. Clamp the cold ring on the pipe at the proper position, using the integral depth gauge pins or a separate (thimble type) depth gauge. The cold ring will assist in re- rounding the pipe and provide a stopping point for proper insertion of the pipe into the heating tool and coupling during the fusion process.

.2.4.6 Heating

Check the heater temperature. Periodically verify the proper surface temperature using a pyrometer or other surface temperature measuring device. If temperature indicating markers are used, do not use them on a surface that will come in contact with the pipe or fitting. Bring the hot clean tool faces into contact with the outside surface of the end of the pipe and with the inside

surface of the socket fitting, in accordance with pipe and fitting manufacturers' instructions.

2.4.7 Joining

Simultaneously remove the pipe and fitting from the tool using a quick "snap" action. Inspect the melt pattern for uniformity and immediately insert the pipe squarely and fully into the socket of the fitting until the fitting contacts the cold ring. Do not twist the pipe or fitting during or after the insertion, as is the practice with some joining methods for other pipe materials.

2.4.8 Cooling

Hold or block the pipe in place so that the pipe cannot come out of the joint while the mating surfaces are cooling. These cooling times are listed in the pipe or fitting manufacturer's instructions.

2.5 Electrofusion (EF)

This technique of heat fusion joining is somewhat different from the conventional fusion joining thus far described. The main difference between conventional heat fusion and electrofusion is the method by which the heat is applied. In conventional heat fusion joining, a heating tool is used to heat the pipe and fitting surfaces. The electrofusion joint is heated internally, either by a conductor at the interface of the joint or, as in one design, by a conductive polymer. Heat is created as an electric current is applied to the conductive material in the fitting. Figure 5 illustrates a typical electrofusion joint. PE pipe to pipe connections made using the electrofusion process require the use of electrofusion couplings.

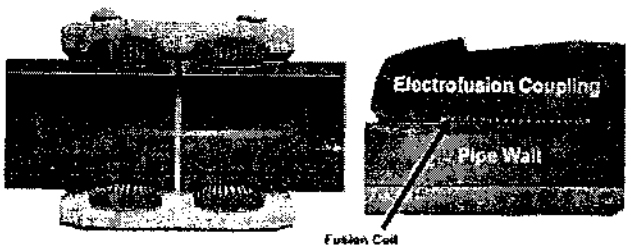


Figure 5 Typical Electrofusion Joint

General steps to be followed when performing electrofusion joining are:

1. Prepare the pipe (scrape, clean)
2. Mark the pipe
3. Align and restrain pipe and fitting per manufacturer's recommendations
4. Apply the electric current
5. Cool and remove the clamps
6. Document the fusion process

.2.5.1 Prepare the Pipe (Clean and Scrape)

Assure the pipe ends are cut square when joining using electrofusion couplings. The fusion area must be clean from dirt or contaminants. This may require the use of water or 90% isopropyl alcohol (NO ADDITIVES OR NOT DENATURED). Next, the pipe surface in the fusion must be scraped, that is material must be removed to expose clean virgin material. This may be achieved by various special purpose tools available from the fitting manufacturer.

2.5.2 Mark the Pipe

Mark the pipe for stab depth of couplings or the proper fusion location of saddles. (Caution should be taken to assure that a non-petroleum marker is used.)

2.5.3 Align and Restrain Pipe or Fitting Per the Manufacturer's Recommendations

Align and restrain fitting to pipe per manufacturer's recommendations. Place the pipe(s) and fitting in the clamping fixture to prevent movement of the pipe(s) or fitting. Give special attention to proper positioning of the fitting on the prepared pipe surfaces. Large pipe diameters may need re-rounding prior to the electrofusion process.

2.5.4 Apply Electric Current

Connect the electrofusion control box to the fitting and to the power source (see Figure 6). Apply electric current to the fitting as specified in the manufacturer's instructions. Read the barcode which is supplied with the electrofusion fitting. If the control does not do so automatically, turn off the current when the proper time has elapsed to heat the joint properly.

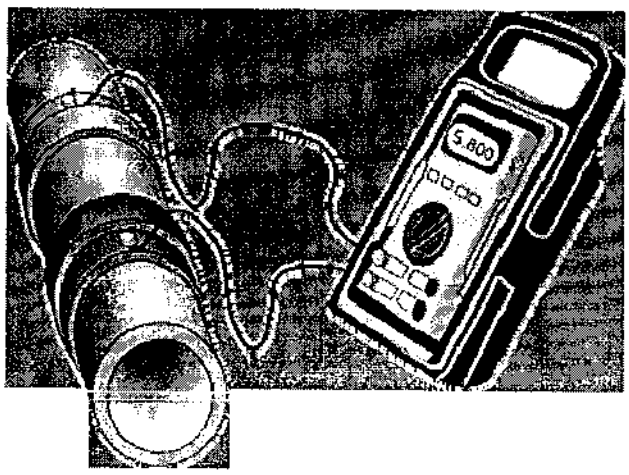


Figure 6 Typical Electrofusion Control Box and Leads with Clamps and Fittings

2.5.5 Cool Joint and Remove Clamps

Allow the joint to cool for the recommended time. If using clamps, premature removal from the clamps and any strain on a joint that has not fully cooled can be detrimental to joint performance.

Consult the fitting manufacturer for detailed parameters and procedures.

2.5.6 Documenting fusion

The Electrofusion control box that applies current to the fitting also controls

and monitors the critical parameters of fusion, (time, temperature, & pressure). The control box is a micro- processor capable of storing the specific fusion data for each joint. This information can be downloaded to a computer for documentation and inspection of the days work.

2.6 Heat Fusion Joining of Unlike PE Pipe and Fittings

Research has indicated that PE pipe and fittings made from unlike resins can be heatfused together to make satisfactory joints. Some gas companies have been heat-fusion joining unlike PEs for many years with success. Guidelines for heat fusion of unlike materials are outlined in TN 13, issued by the Plastics Pipe Institute. Refer to Plastics Pipe Institute Technical Reports TR-33 and TR-41, ASTM F 2620 and the pipe and fitting manufacturers for specific procedures.

As mentioned earlier, fusion joints, whether they involve the conventional butt, socket or saddle heat fusion assembly procedures or the electrofusion procedure, should only be made by personnel fully trained and qualified in those procedures. The equipment used shall be designed to operate for the selected pipe and fusion procedures. The equipment should be well maintained and capable of operating to specification. In addition, it is important that only the specified or recommended joining procedures be followed at all times during assembly operations.

2.7 Mechanical Connections

As in the heat fusion methods, many types of mechanical connection styles and methods are available. This section is a general description of these types of fittings.

The Plastics Pipe Institute recommends that the user be well informed about the performance attributes of the particular mechanical connector being utilized. Fitting selection is important to the performance of a piping system. Product performance and application information should be available from the fitting manufacturer to assist in the selection process as well as instructions for use and performance limits, if any. Additional information for these types of products is also contained in a variety of specifications such as ASTM F1924, F1973, and AWWA C219. PE pipe, conduit and fittings are available in outside diameter controlled Iron Pipe Sizes (IPS), Ductile Iron Pipe Sizes (DIPS), Copper Tubing Sizes (CTS) and Metric Sizes. There are also some inside diameter controlled pipe sizes (SIDR-PR). Before selecting mechanical fittings, establish which of the available piping system sizes and types are being installed to ensure proper fit and function. The pipe manufacturer can provide dimensional information, and the fitting manufacturer can advise on the correct fitting selection for the application.

.2.8 Mechanical Compression Couplings for Small Diameter Pipes

This style of fitting comes in many forms and materials. The components, as depicted in Figure 7, are generally a body; a threaded compression nut; an elastomer seal ring or O-ring; a stiffener; and, with some, a grip ring. The seal and grip rings, when compressed, grip the outside of the pipe, effecting a pressure-tight seal and, in most designs, providing pullout resistance which exceeds the yield strength of the PE pipe. It is important that the inside of the pipe wall be supported by the stiffener under the seal ring and under the gripping ring (if incorporated in the design), to avoid deflection of the pipe. A

lack of this support could result in a loss of the seal or the gripping of the pipe for pullout resistance. This fitting style is normally used in service lines for gas or water pipe 2" IPS and smaller. It is also important to consider that three categories of this type of joining device are available. One type provides a seal only, a second provides a seal and some restraint from pullout, and a third provides a seal plus full pipe restraint against pullout.

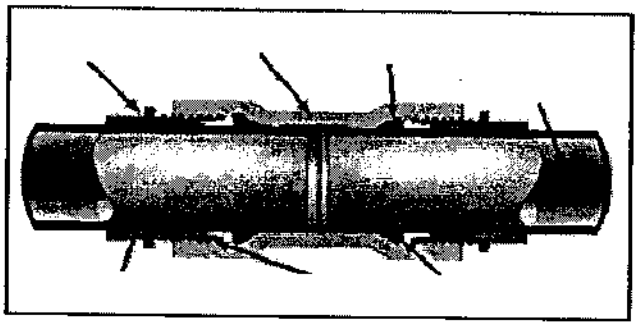


Figure 7 Typical Compression Nut Type Mechanical Coupling for Joining PE Pipe to PE Pipe

2.9 Stab Type Mechanical Fittings

Here again many styles are available. The design concept, as illustrated in Figure 8, is similar in most styles. Internally there are specially designed components including an elastomer seal, such as an "O" ring, and a gripping device to effect pressure sealing and pullout resistance capabilities. Self-contained stiffeners are included in this design. With this style fitting the operator prepares the pipe ends, marks the stab depth on the pipe, and "stabs" the pipe in to the depth prescribed for the fitting being used. These fittings are available in sizes from ½"CTS through 2" IPS and are all of ASTM D2513[2] Category I design, indicating seal and full restraint against pullout.

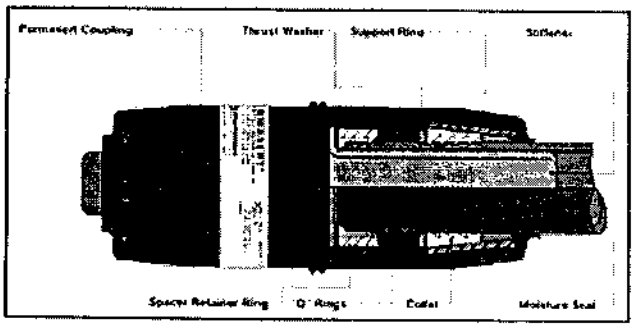


Figure 8 Stab Type Fitting

2.10 Mechanical Bolt Type Couplings

There are many styles and varieties of "Bolt Type" couplings available to join PE to PE or other types of pipe such as PVC, steel and cast iron in sizes from 1¼" IPS and larger. Components for this style of fitting are shown in Figure 9. As with the mechanical compression fittings, these couplings work on the general principle of compressing an elastomeric gasket around each pipe end to be joined, to form a seal. The gasket, when compressed against the outside of the pipe by tightening the bolts, produces a pressure seal. These

couplings may or may not incorporate a grip ring, as illustrated, that provides pullout resistance sufficient to exceed the yield strength of the PE pipe. When PE pipe is pressurized, it expands a little and shortens slightly due to Poisson's effect. In a run of PE pipe, the cumulative shortening may be enough to cause separation of unrestrained mechanical joints that are in-line with the PE pipe. This can be a particular concern where transitioning from PE pipe to Ductile Iron pipe. Joint separation can be prevented by installing external joint restraints (gripping devices or flex restraints; see Figure 16) at mechanical connections, or by installing in-line anchors or a combination of both. Additional restraint mechanisms are available to supplement the pull resistance of these types of fittings if needed. The fitting manufacturer can help guide the user with that information. Use of a stiffener is needed in this fitting style to support the pipe under the area of the seal ring and any gripping devices incorporated for pullout resistance

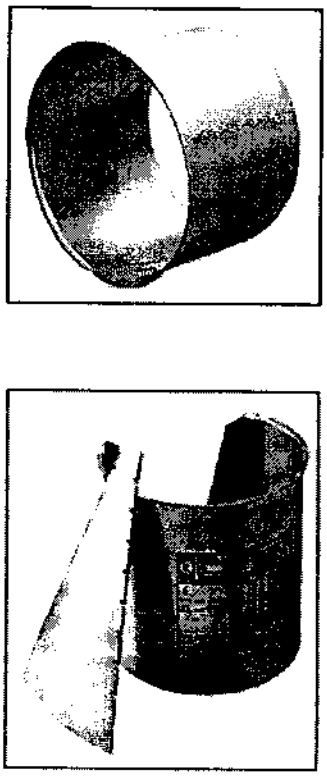


Figure 9 Mechanical Bolt Type Coupling for Joining Steel Pipe to PE or for Joining Two PE Pipes

2.11 Stiffener Installation Guidelines

When connecting PE pipe to the bell end of a ductile iron or PVC pipe, it is recommended that a stiffener be added to the ID of the pipe to insure a good connection between the seal in the bell and the pipe. Check the pipe for toe in. If it is severe, cut the pipe back to remove it. If possible, have some means to press the stiffener into place. Lubricant will minimize the insertion effort required. A detergent or silicone grease is recommended.

There are two types of stiffeners available on the market. One type is a fixed diameter stiffener that matches the ID of the pipe being repaired (see Figure 10). Caution should be used when using fixed diameter stiffeners to be sure they are sized properly to obtain the proper press fit in the PE pipe. These are mainly used with smaller diameter service lines.

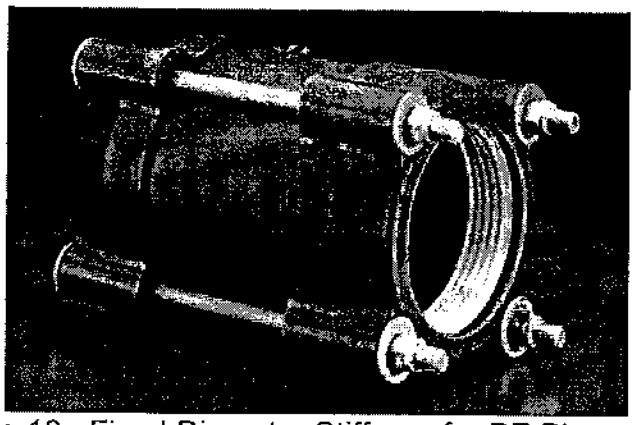


Figure 10 Fixed Diameter Stiffener for PE Pipe

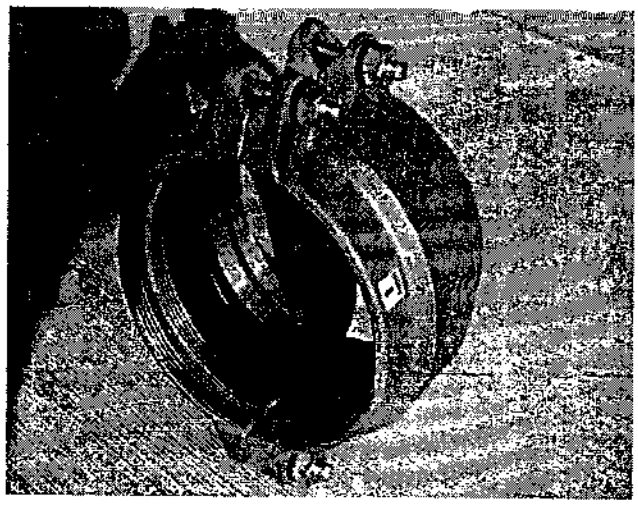
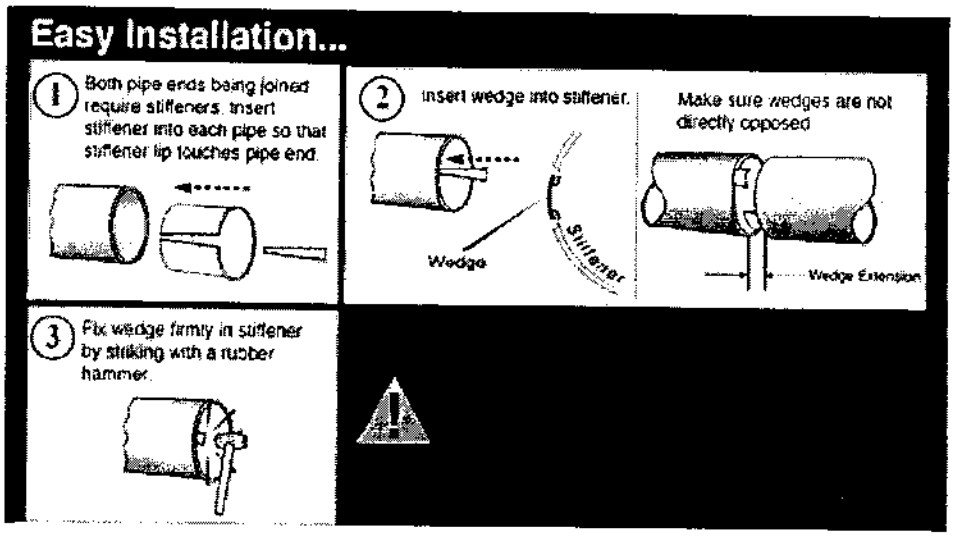


Figure 11a Split Ring Stiffener for PE Pipe

The other type of stiffener is a split ring stiffener (see Figure 11a). These are normally made of stainless steel and provide a thin yet strong pipe wall reinforcement without disturbing the flow characteristic of the pipe. The easy installation instructions are shown in Figure 11b.



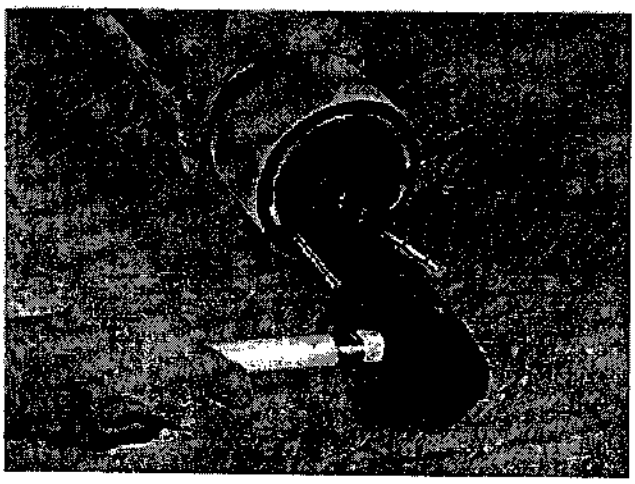


Figure 12 Install Split Ring Stiffener in PE Pipe

2.12 Flanged Connections

2.12.1 PE Flange Adapters and Stub Ends

When joining to metal or to certain other piping materials, or if a pipe section capable of disassembly is required, PE flange adapters, as depicted in Figures 13-15, are available. The "Flange Adapter" and its shorter version, the "Stub End," are designed so that one end is sized the same as the PE pipe for butt fusion to it. The other end has been especially made with a flange-type end that, provides structural support, which eliminates the need for a stiffener and, with the addition of a metal back-up ring, permits bolting to a similar flanged end connection — normally a 150-pound ANSI flange.[1]

The general procedures for joining would be:

1. Slip the metal ring onto the PE pipe section, far enough away from the end to avoid interference with operation of the butt fusion equipment.
2. If a stub end is used, first butt-fuse a short length of PE pipe to the pipe end of the stub end. If a "flange adapter" is used, the PE pipe-sized end is usually long enough that this step is unnecessary.
3. Butt fuse the flange adapter to the PE pipe segment.
4. The fusion bead may need to be removed to clear the back-up ring as it is moved against the flange.
5. Position the flanged face of the adapter at the position required so that the back-up ring previously placed on the PE pipe segment can be attached to the metal flange.
6. Install and tighten the flange bolts in a criss-cross pattern sequence (see TN 38), normally used with flange type connections, drawing the metal and PE flange faces evenly and flat. Do not use the process of tightening the flanges to draw the two sections of pipe together.

At lower pressure, typically 80 psi or less, a gasket is usually not required. At greater pressure, the serrated surface of the flange adapter helps hold the gasket in place. The flange face serration's should be individual closed concentric serration's as opposed to a continuous spiral groove which could act as a leak path. Standard Back-Up Rings are AWWA C207 Class D for 160 psi and lower pressure ratings, or Class 150 for higher pressure. Back-up ring materials are steel, primer coated steel, epoxy coated steel, or stainless steel. Ductile iron and fiberglass back-up ring materials are also available. In below ground service, coatings and cathodic protection may be appropriate to protect metal back-up rings from corrosion. One edge of the back-up ring bore must be rounded or chamfered. This edge fits against the back of the sealing surface flange.

An all-PE flange without a back-up ring is not recommended because PE flanges require uniform pressure over the entire sealing surface. Without a back-up ring, a PE flange will leak between the bolts.

Flange adapters differ from stub-ends by their overall length. A flange adapter is longer allowing it to be clamped in a fusion machine like a pipe end. The back-up ring is fitted to the flange adapter before fusion, so external fusion bead removal is not required.

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A stub end is short and requires a special stub-end holder for butt fusion. Once butt fused to the pipe, the external bead must be removed so the back-up ring can be fitted behind the sealing surface flange. In the field, flange adapters are usually preferred over stub-ends.

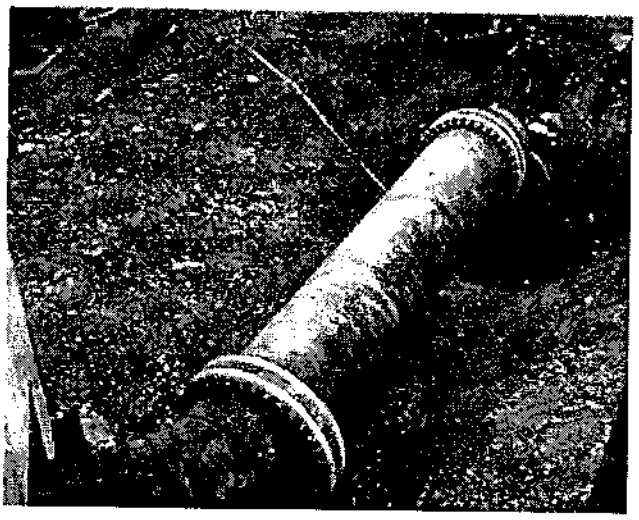

Figure 13 Flange Adapter Assembly

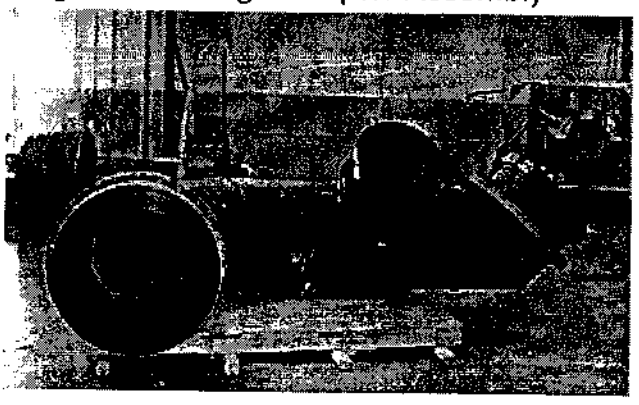

Figure 14 Fused Manifold Assembly with Flange Adapters and Back Up Rings

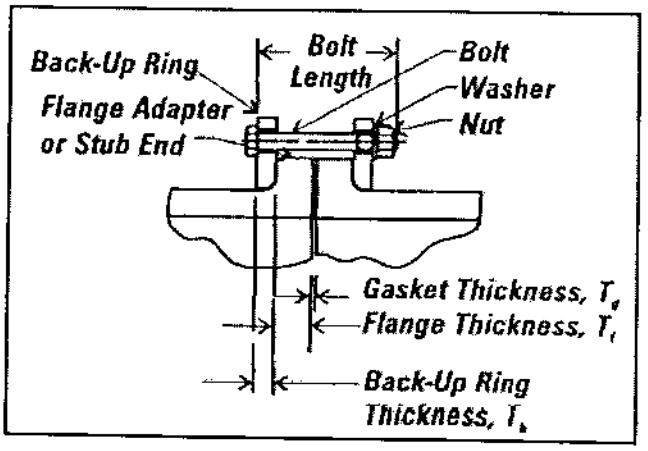

Figure 15 Flange Adapter Bolted Assembly Cross Section

2.12.2 Flange Gasket

A flange gasket may not be required between PE flanges. At lower pressures (typically 80 psi or less) the serrated flange sealing surface may be adequate. Gaskets may be needed for higher pressures and for connections between PE and non-PE flanges. If used, gasket materials should be chemically and thermally compatible with the internal fluid and the external environment, and should be of appropriate hardness, thickness and style. Elevated temperature applications may require higher temperature capability. Gasket thickness should be about 1/8"-3/16" (3-5mm) and about 60-75 Shore A hardness. Too soft or too thick gaskets may blow out under pressure. Overly hard gaskets may not seal. Common gasket styles are full-face or drop-in. Full-face style gaskets are usually applied to larger sizes, because flange bolts hold a flexible gasket in place while fitting the components together. Drop-in style gaskets are usually applied to smaller pipe sizes.

2.12.3 Flange Bolting

Mating flanges are usually joined together with hex bolts and hex nuts, or threaded studs and hex nuts. Bolting materials should have tensile strength equivalent to at least SAE Grade 3 for pressure pipe service, and to at least SAE Grade 2 for non-pressure service. Corrosion resistant materials should be considered for underground, underwater, or other corrosive environments. Flange bolts are sized 1/8" smaller than the blot hole diameter. Flat washers should be used between the nut and the back-up ring.

Flange bolts must span the entire width of the flange joint, and provide sufficient thread length to fully engage the nut.

2.12.4 Flange Assembly

Mating flanges must be aligned together before tightening. Tightening misaligned flanges can cause flange assembly failure. Surface or above grade flanges must be properly supported to avoid bending stresses. Below grade flange connections to heavy appurtenances such as valves or hydrants, or to metal pipes, require a support foundation of compacted, stable granular soil (crushed stone), or compacted cement stabilized granular backfill, or reinforced concrete. Flange connections adjacent to pipes passing through structural walls must be structurally supported to avoid shear loads.

Prior to fit-up, lubricate flange bolt threads, washers, and nuts with a non-fluid lubricant. Gasket and flange sealing surfaces must be clean and free of significant cuts or gouges. Fit the flange components together loosely. Hand-tighten bolts and re-check alignment. Adjust alignment if necessary. Flange bolts should be tightened to the same torque value by turning the nut. Tighten each bolt according to the patterns and torques recommended by the flange

manufacturer. PE and the gasket (if used) will undergo some compression set. Therefore, retightening is recommended.
about an hour or so after torquing to the final torque value the first time. In crisscross pattern sequence, retighten each bolt to the final torque value. For high pressure or environmentally sensitive or critical pipelines, a third tightening, about 4 hours after the second, is recommended.

1.3 Underground Installation of PE Piping

.3.1 Trenching

Trench collapses can occur in any soil and account for a large number of worker deaths each year. In unbraced or unsupported excavations, proper attention should be paid to sloping the trench wall to a safe angle. Consult the local codes. All trench shoring and bracing must be kept above the pipe. (If this is not possible, consult the more detailed installation recommendations.) The length of open trench required for fused pipe sections should be such that bending and lowering the pipe into the ditch does not exceed the manufacturer's minimum recommended bend radius and result in kinking. The trench width at pipe grade should be equal to the pipe outer diameter (O. D.) plus 12 inches.

.3.2 De-watering

For safe and proper construction the groundwater level in the trench should be kept below the pipe invert. This can be accomplished by deep wells, well points or sump pumps placed in the trench.

3.3 Bedding

Where the trench bottom soil can be cut and graded without difficulty, pressure pipe may be installed directly on the prepared trench bottom. For pressure pipe, the trench bottom may undulate, but must support the pipe smoothly and be free of ridges, hollows, and lumps. In other situations, bedding may be prepared from the excavated material if it is rock free and well broken up during excavation. The trench bottom should be relatively smooth and free of rock. When rocks, boulders, or large stones are encountered which may cause point loading on the pipe, they should be removed and the trench bottom padded with 4 to 6 inches of tamped bedding material. Bedding should consist of free-flowing material such as gravel, sand, silty sand, or clayey sand that is free of stones or hard particles larger than one-half inch

.3.4 Placing Pipe in Trench

PE pressure pipe up to about 8" in diameter and weighing roughly 6 lbs per ft or less can usually be placed in the trench by hand. Heavier, larger diameter pipe will require handling equipment to lift, move, and lower the pipe into the trench. Pipe must not be dumped, dropped, pushed, or rolled into the trench. Appropriate safety precautions must be observed whenever persons are in or near the trench

.3.5 Pipe Embedment

The embedment material should be a coarse grained soil, such as gravel or sand, or a coarse grained soil containing fines, such as a silty sand or clayey sand. The particle size should not exceed one-half inch for 2 to 4-inch pipe, three-quarter inch for 6 to 8-inch pipe and one inch for all other sizes. Where the embedment is angular, crushed stone may be placed around the pipe by dumping and slicing with a shovel.
Where the embedment is naturally occurring gravels, sands and mixtures with fines, the embedment should be placed in lifts, not exceeding 6 inches in thickness, and then tamped. Tamping should be accomplished by using a mechanical tamper.
Compact to at least 85 percent Standard Proctor density as defined in ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort, (12 400 ft-lbf/ft^3 (600 kN-m/m^3))." Under streets and roads, increase compaction to 95 percent Standard Proctor density.

.3.6 Leak Testing

If a leak test is required, it should be conducted in accordance with the procedure in Chapter 2 after the embedment material is placed

.3.7 Trench Backfill

The final backfill may consist of the excavated material, provided it is free from unsuitable matter such as large lumps of clay, organic material, boulders or stones larger than 8 inches, or construction debris. Where the pipe is located beneath a road, place the final backfill in lifts as mentioned earlier and compact to 95 percent Standard Proctor Density.

.3.8 Engineered Installation Guidelines for PE Pipe

There will be applications where the engineer will want to prepare a specific embedment specification. These applications would most likely include gravity flow pipes that are relatively deep, shallow cover applications where the pipe is subject to vehicular or train loading, pipes placed in unstable, soft, or wet soils, high DR pipes, and pipes in deep applications such as landfills and embankments. The Simplified Installation Guidelines do not cover these applications. What all of these applications have in common is that the soil provides a relatively significant portion of the support against the overburden soil and surface loads. Or, to say this differently, the soil provides a relatively significant portion of the deflection resistance of the pipe. In these cases, detailed attention must be paid to the native (in-situ) soil, the embedment soil, and the placement of the embedment soil. The objective of installation is to minimize pipe deflection. Profile wall pipes such as pipes manufactured to ASTM F894 are normally inspected for deflection after installation. These pipes are normally limited to gravity flow applications and very low pressure systems. Conventionally-

extruded, solid wall pipes such as "DR" classified pipes that are joined by heat fusion are normally not inspected for deflection. For instance AWWA standards C901 and C906 and manual M-55 do not call for field deflection testing of "DR" classified PE pipes.

.3.9 Deflection Control

The load carrying capability of a PE pipe, particularly a pipe with a high DR, can be greatly increased by the soil in which it is embedded. When the pipe is loaded, load is transferred from the pipe to the soil by a horizontal outward movement of the pipe wall (see Figure 2). This enhances contact between pipe and soil and mobilizes
the passive resistance of the soil. This resistance aids in preventing further pipe deformation and contributes to the support for the vertical loads. The amount of resistance found in the embedment soil is a direct consequence of the installation procedure. The stiffer the embedment materials are, the less deflection occurs. Because of this, the combination of embedment and pipe is often referred to as a pipe-soil system.

The key objective of a PE pipe installation is to limit or control deflection. (In this chapter the term "deflection" will mean a change in vertical diameter of the pipe, unless otherwise stated.) The deflection of a PE pipe is the sum total of two major components: the "installation deflection," which reflects the technique and care by which the pipe is handled and installed; and the "service deflection," which reflects the accommodation of the constructed pipe-soil system to the subsequent earth loading and other loadings.

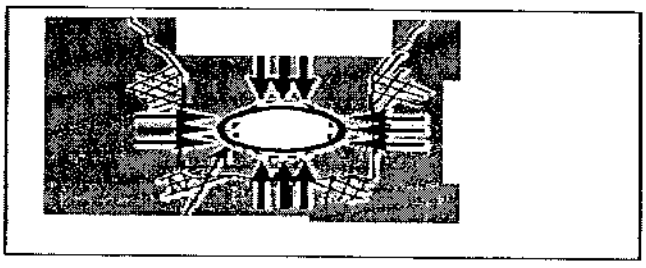

Figure 2 Mobilization of Enveloping Soil through Pipe Deformation

The "service deflection," which is usually a decrease in vertical pipe diameter, may be predicted by a number of reasonably well documented relationships, including those of Watkins and Spangler [1,2], or by use of a finite element analysis such as CANDE [1,2]. The "installation deflection" may be either an increase or decrease in vertical pipe diameter. An increase in vertical pipe diameter is referred to as "rise" and is usually a result of the forces acting on the pipe during compaction of the embedment beside it. Moderately stiff pipes such as DR17 and DR21 and stiffer pipes are usually unaffected by "rise" due to normal construction

technique. Up to a point this may be beneficial in offsetting service deflection. Installation deflection is not predictable by any mathematical formula, although there are empirical methods for accounting for it [3].

Installation deflection is subject to control by the care used in the placement and compaction of the pipe embedment material in relation to the pipe's ring stiffness. For instance, compaction forces from hand operated air or gasoline tampers normally cause little rise, even when obtaining densities of 95 percent, but driving heavy loading equipment or driven compactors on the embedment while it is being placed beside the pipe may cause severe rise even in DR17 and stiffer pipes. Commonly, deflection varies along the length of the pipeline due to variations in construction technique, soil type and loading. Field measurements illustrating this variability have been made by the U. S. Bureau of Reclamation and have been published by Howard[3]. Typically, this variation runs around ±2 percent.

3.10 *Deflection Limit*

Designing buried pipe to control deflection is discussed in Chapter 6. Field inspection of the installation procedure is generally adequate for controlling deflection of most PE fusion joined pipes. Very large diameter pipes (man entry) and gasketed jointed PE pipes are sometimes inspected for vertical deflection. Typically deflection easurements are made only after the backfill has been placed on the pipe for at least 30 days. The engineer will specify an acceptance deflection. Commonly a limit of 5 percent is used. This provides an additional safety factor as most gravity flow PE pipe can withstand higher deflection without damage.

3.11 Pipe Embedment Materials

The embedment is the material immediately surrounding the pipe. This material may be imported, such as a crushed stone, or it may be the material excavated from the trench to make room for the pipe. In this case, it is referred to as native soil.

The embedment material should provide adequate strength, stiffness, uniformity of contact and stability to minimize deformation of the pipe due to earth pressures. The earth pressure acting on the pipe varies around the pipe's circumference. The pressure on the crown or top will typically be less than the free field stress as is the pressure at the invert or bottom of the pipe. Often, the highest pressure may be acting horizontally at the spring line of the pipe, due to mobilization of passive pressure and arching. Because the earth pressure is acting around the circumference, it is important to completely envelop the pipe in embedment. (This may vary to a greater or lesser extent depending on the earth pressure, burial depth, and SDR.) To ensure that the embedment function should always be carried out under the anticipated job conditions, the design engineer will specify the permissible pipe embedment materials and their minimum acceptable density (compaction).

The properties of the in-situ (or native) soil into which the pipe is placed need not be as demanding as those for the embedment materials (unless it is used as the embedment material). The native soil may experience additional compression and deformation due to the horizontal pressure exerted by the pipe and transferred through the embedment material. This is usually a minor effect, but in some cases it can result in additional pipe deflection. This is most likely to occur where native soils are wet and loose, soft, or where native soil sloughs into the trench during excavation and is not removed. This effect is attenuated as the trench width (or width of embedment material) increases. Therefore, consideration must be given to the in-situ soil to ensure that it has adequate strength to permanently contain the embedment system. This is also discussed in a following section.

3.12 Classification and Supporting Strength of Pipe Embedment Materials

The burial of PE pipe for gravity flow applications is covered by ASTM D2321 "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewer and Other Gravity-Flow Applications." ASTM 2774, "Standard Practice for Underground Installation of Thermoplastic Pressure Piping," covers water pipe and force mains.

3.12.1 Strength of Embedment Soil

When selecting embedment material, consideration should be given to how the grain size, shape, and distribution will affect its supporting strength. The following will help guide the designer or installer in making a choice. In general, soils with large grains such as gravel have the highest stiffness and thus provide the most supporting strengths. Rounded grains tend to roll easier than angular, or sharp grains, which tend to interlock, and resist shear better. Well graded mixtures of soils (GW, SW), which contain a good representation of grains from a wide range of sizes, tend to offer more resistance than uniform graded soils (GP, SP). Aside from the grain characteristics, the density has the greatest effect on the embedment's stiffness. For instance, in a dense soil there is considerable interlocking of grains and a high degree of grain-to-grain contact. Movement within the soil mass is restricted as the volume of the soil along the surface of sliding must expand for the grains to displace. This requires a high degree of energy. In a loose soil, movement causes the grains to roll or to slide, which requires far less energy. Thus, loose soil has a lower resistance to movement. Loose soil will permit more deflection of pipe for a given load than a dense soil.

3.12.2 Embedment Classification Per ASTM D-2321

Pipe embedment materials have been grouped by ASTM D-2321, "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity -Flow Applications" into five embedment classes according to their suitability for that use. See Appendix 1 for embedment soil descriptions, classifications, and soil group symbols referred to in the following paragraphs.

3.12.3 Class I and Class II

Class I and II soils are granular and tend to provide the maximum embedment support as illustrated by the high E' values that can be achieved with them. See Chapter 6 Table 2-7 for the relationship between soil types and E' values. Class I material is generally manufactured aggregate, such as crushed stone. Class II materials consist of clean sands and gravels and are more likely to be naturally occurring soils such as river deposits. Class I and Class II materials can be blended together to obtain materials that resist migration of finer soils into the embedment zone (as will be explained below.) In addition, Class I and II materials can be placed and compacted over a wide range of moisture content more easily than can other materials. This tends to minimize pipe deflection during installation. The high permeability of open-graded Class I and II materials aids in de-watering trenches, making these materials desirable in situations such as rock cuts where water problems may be encountered. This favorable combination of characteristics leads many designers to select these materials over others when they are readily and economically available.

Maximum aggregate size of Class I and Class II materials when used next to the pipe (i. e. , bedding, haunching and initial backfill) should not be larger than those given in Table 1 below. (Larger stones up to 1½ inches have been successfully used, but they are difficult to shovel slice and compact.) The smaller the rock size, the easier it is to place in the haunches. Maximum size for the foundation material is not restricted except that it should be graded to prevent the bedding stone from migrating into it.

TABLE 1
Maximum Particle Size vs. Pipe Size

Nominal pipe size (in)	Maximum Prticle size (in)
2 to 4	½
6 to 8	¾
10 to 15	1
16 and larger	1 ½

3.12.4 Migration

When the pipe is located beneath the ground water level, consideration must be given to the possibility of loss of side support through soil migration (the conveying by ground water of finer particle soils into void spaces of coarser soils). Generally, migration can occur where the void spaces in the embedment material are sufficiently large to allow the intrusion of eroded fines from the trench

side walls.

For migration to occur, the in-situ soil must be erodible. Normally, erodible soils are fine sand and silts and special clays known as dispersive clays. (Most clays have good resistance to dispersion.) This situation is exacerbated where a significant gradient exists in the ground water from outside of the trench toward the inside of the trench; i. e. , the trench must act as a drain. (Seasonal fluctuations of the ground water level normally do not create this condition.)

For such anticipated conditions, it is desirable when using granular materials (Class I and II) to specify that they be angular and graded to minimize migration.

Rounded particles have a tendency to flow when a considerable amount of water exists and material with a high void content provides "room" for migrating particles. The Army Corps of Engineers developed the following particle size requirements for properly grading adjacent materials to minimize migration:

Where the D_{15}, D_{50} and D_{85} are the particle sizes from a particle size distribution plot at 15%, 50% and 85%, respectively, finer by weight and where D^F is the embedment soil and D^A is the adjacent in-situ soil.

Another approach to preventing migration is to use geotextile separation fabrics. The fabric is sized to allow water to flow but to hold embedment materials around the pipe.

3.12.5 Cement Stabilized Sand

One special case of Class II material is Cement Stabilized Sand. Cement Stabilized Sand, once cured, is generally considered to give the same or better supporting strength as compacted Class I material. Cement Stabilized Sand consists of sand mixed with 3 to 5 percent cement. To achieve proper density, the material is placed with compaction rather than poured as with concrete. The material must be placed moist (at or near optimum moisture content) and then compacted in lifts as a Class II material. (The optimum moisture content is that moisture content at which a material can achieve its highest density for a given level of compaction.) If desired, deflection can be reduced if the cement sand embedment material is allowed to cure overnight before placement of backfill to grade. If the trench is backfilled immediately, cement sand will give the same support as a Class II material, but the lag factor will be reduced. Cement sand is usually placed in both the primary initial and secondary initial backfill zones

3.12.6 Class III and Class IVA

Class III and Class IVA materials provide less supporting stiffness than Class I or II materials for a given density or compaction level, in part because of the increased clay content. In addition, they require greater compactive effort to

attain specified densities and their moisture content must be closely controlled within the optimum limit. Placement and compaction of Class IVA materials are especially sensitive to moisture content. If the Class IVA material is too wet, compaction equipment may sink into the material; if the soil is too dry, compaction may appear normal, but subsequent saturation with ground water may cause a collapse of the structure and lead to a loss of support. Typically, Class IVA material is limited to applications with pressure pipe at shallow cover.

3.12.7 Class IVB and Class V

Class IVB and Class V materials offer hardly any support for a buried pipe and are often difficult to properly place and compact. These materials are normally not recommended for use as pipe embedment unless the pipe has a low SDR (or high ring stiffness), there are no traffic loads, and the depth of cover is only a few feet. In many cases the pipe will float in this type of soil if the material becomes saturated.

3.12.8 Compaction of Embedment Materials

Compaction criteria for embedment materials are a normal requirement in flexible pipe construction. Compaction reduces the void space between individual grains and increases the embedment density, thereby greatly improving pipe load carrying ability while reducing deflection, settlement, and water infiltration problems. Compaction of the embedment often will increase the stiffness of the in-situ soil and provide a sort of pre-stressing for the embedment and in-situ soils. Because of these benefits compaction should be considered on all projects.

3.12.9 Density Requirements

The required degree of compaction for an installation will be set by the designer in consideration of height of cover, extent of live loading, water table elevation and soil properties. Generally, the "moderate" compaction requirements listed in Table 2-7 of chaper 6 are quite satisfactory. When compacting to tis "moderate" level, it is suggested that the minimum target values for field measured densities be set as 90 percent Standard Proctor Density. This field density requirement will ensure that the actual densities will always be within the "moderate" range presented in Table 2-7.

The Standard Proctor density of embedment materials is normally measured using ASTM D-698, "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft^3 (600 kN-m/m^3)) while the Modified Proctor density is measured using ASTM D-1557, "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3))." See Appendix 2 for a discussion of the difference between density and compaction and a discussion of the various test methods.

3.12.10 Compaction Techniques

Compaction of the embedment material should be performed by the most economical method available, consistent with providing uniform compaction and attaining the minimum specified density. Typical equipment used for compaction are hand held tamping bars (see Figure 4), gasoline driven

impact tampers ("whackers"), vibratory plates, and air driven impact tampers ("pogo sticks"). With crushed stone, some degree of densification can be achieved by the technique of shovel slicing, which consists of cutting the soil with a shovel.

Compaction of the haunching material can best be accomplished by hand with tampers or suitable power compactors, taking particular care in the latter case not to disturb the pipe from its line and grade. In 36" and larger pipe, hand tampers are often used to reach under the haunches; they are then followed up with power compaction alongside the pipe When compacting the embedment near the pipe with impact-type tampers, caution should be taken to not allow direct contact of the equipment with the pipe. Avoid use of impact tampers directly above the pipe until sufficient backfill (usually 12") has been placed to ensure no local deformation of the pipe. Compaction of the embedment material alongside the pipe should not cause pipe to lift off of grade, but if upward movement occurs, reduce the compaction level below the spring line or move the compactor away from the pipe toward the side of the trench.

Compaction of primary initial backfill should be conducted at, or near, the material's optimum moisture content. The backfill should be placed in layers, or lifts, that are brought up evenly on both sides of the pipe, otherwise the pipe could be moved off alignment. Each lift should be thoroughly compacted prior to placement of the next layer. The maximum lift height that will allow development of uniform density will vary depending on the material, its moisture content, and compactive effort. In general, maximum lifts of approximately 12 inches for Class I, 8 inches for Class II, and 6 inches for all others are adequate.

3.12.11 Compaction of Class I and II Materials

Compaction by vibration is most effective with granular (Class I and II) materials. Compaction of stone does not deform the stone but it does move it into a more compact or dense arrangement. In cases where the engineer specifies a minimum soil density of 90 percent of Standard Proctor or higher, as for installations under deep cover, mechanical compaction of Class I materials will be required. Impact tampers will also increase the density of Class I and II materials, primarily due to vibration. Impact tamping also acts to drive the embedment into the in-situ soil, which stiffens the trench wall interface. For this reason, impact compaction of Class I material should be considered for any application where the pipe will be below the ground water table or where the stability of the in-situ soil is in question.

An alternate method of achieving compaction with Class I materials is shovel slicing. Materials having been shovel sliced thoroughly will generally yield a modulus of around 1000 psi. The effectiveness of this method depends on the frequency of slicing along the length of the pipe. This technique should be limited to dry or firm (or better) in-situ soils. Where Class I materials are dumped around the pipe without any compactive effort (or shovel slicing), E's may be considerably lower than those given in the Chapter 6, Table 2-7. This is especially the case in wet or loose ground. A few passes with a vibratory compactor will increase the density and modulus of soil reaction.

Mechanical compaction of Class II materials can be aided by slight wetting.

When so doing, care must be taken not to saturate the material or flood the trench, particularly when the native trench material does not drain freely. Flooding can result in flotation of the pipe.

Compaction by saturation, also called flooding or water tamping, is sometimes used to compact Class II materials. This method of compaction rarely yields Proctor densities greater than 75 percent, and therefore it will generally not give an E' of 750 psi or higher. Flooding is only suited for those applications where the pipe has sufficient internal supporting strength for the design load and does not depend on the soil for side support. (When considering this method for embedment that must provide side support, a geotechnical engineer should be consulted.) Compaction by saturation is limited to applications where both the embedment soil and in-situ soil are free draining. Compaction should be done in lifts not exceeding the radius of the pipe or 24 inches, whichever is smaller. Only enough water should be placed to saturate the material. It should be determined through proper monitoring that the desired level of compaction is being attained in each lift. Compaction by saturation should not be used in freezing weather. Water jetting, or the introduction of water under pressure to the embedment material, should not be used with plastic pipe.

3.12.12 Compaction of Class III and IV Materials

Compaction by impact is usually most effective with Class III and Class IVa materials. The use of mechanical impact tampers is most practical and effective. Depending on the embedment material, its moisture content, and lift height, several compaction passes may be required. A maximum lift height of 6 inches should be used when compacting by impact. Embedment density should be suitably monitored to ensure that specification requirements are met.

3.12.13 Density Checks

It is prudent to routinely check density of the embedment material. Typically, several checks are made during start-up of the project to ensure that the compaction procedure is achieving the desired density. Random checks are subsequently made to verify that the materials or procedures have not changed. Checks should be made at different elevations of the embedment material to assure that the desired compaction is being achieved throughout the embedment zone.

16.3.12.14 Trench Construction

Trenches should be excavated to line and grade as indicated by contract documents and in accordance with applicable safety standards. Excavation should proceed upgrade. Excessive runs of open trench should be avoided to minimize such problems as trench flooding, caving of trench walls and the freezing of trench bottom and backfill material, and to minimize hazards to workmen and traffic. This can be accomplished by closely coordinating excavation with pipe installation and backfilling.

Principal considerations in trench construction are trench width, stability of the native soil supporting and containing the pipe and its embedment soil, stability of trench walls, and water accumulation in the trench. When encountering unstable soils or wet conditions, they should be controlled by

providing an alternate foundation, sloping or bracing the trench walls, de-watering the trench bottom, or some other such measure.

.3.12.15 Trench Width

Since flexible pipe has to support, at most, only the weight of the "prism" or vertical column of soil directly over the pipe, the precaution of keeping the trench as narrow as possible is not the concern that it is for a rigid pipe, which can be subjected to the weight of the soil beside the prism as well as the prism itself. With PE pipe, widening the trench will generally not cause a loading greater than the prism load on the pipe. Trench width in firm, stable ground is determined by the practical consideration of allowing sufficient room for the proper preparation of the trench bottom and placement and compaction of the pipe embedment materials, and the economic
consideration of the costs of excavation and of imported embedment materials. Trench width in firm, stable ground will generally be determined by the pipe size and the compacting equipment used. Table 2 below gives minimum trench width values.

The trench width may need to be increased over the values in Table 2 to allow for sufficient clearance between the trench sidewalls and the pipe for compaction equipment. Typically for large diameter pipe (18" and larger), this required clearance will vary from 12 to 18 inches. If two or more pipes are laid in the same trench, sufficient space must be provided between the pipes so that embedment material can be compacted.

TABLE 2
Minimum Trench Width in Stable Ground vs. Pipe Size

Nominal Pipe Size (in.)	MinimumTrench Width (in.)
< 3	12
3 - 24	Pipe O. D. + 12
> 24 - 63	Pipe O. D. + 24

Note to Table 2: Minimum trench widths do not apply to trenching techniques that use chain or wheel trenchers or plows to lay PE pipe. Chain and wheel trenching techniques feed PE pipe over the earth-cutting machine and lay the pipe immediately into the earth-cut. These techniques use round-bottom chain or wheel trenching machines that match pipe radius and do not require extra trench width to place embedment in the pipe haunches below the pipe springline. Plowing techniques feed smaller diameter PE pipe or tubing through a chute that is integrated into an earth plow. Plowing may not require backfilling

3.12.16 Trench Length

Table 3 lists the recommended lengths of trench openings for each placement of continuous lengths of fused pipe, assembled above the trench. When the trench sidewalls are significantly sloped, somewhat shorter trench openings may be used. When space or ground conditions do not permit these uggested trench openings, the pipe lengths may be joined within the trench, using a joining machine or flanged couplings. When bell-and-spigot jointed pipe or

flange-end pipe is used, the trench opening needs to be only long enough to accommodate placement and assembly of a single pipe length.

TABLE 3
Suggested Length of Minimum Trench Opening (Feet) for Installation of Joined Lengths of PE Pipe

Nominal Pipe Size (in.)	Depth of Trench (Feet					
	3	5	7	9	11	13
½ to 3	15	20	25	30	35	40
4 to 8	25	30	35	40	45	50
10 to 14	35	40	45	50	55	60
16 to 22	45	50	55	60	65	70
24 to 42	-	60	65	70	75	80
48	-	-	80	90	100	110

3.12.17 Stability of the Trench

Although the native soil in which PE pipe is installed need not be as strong and stiff as the pipe embedment materials, it should provide adequate support and stable containment of the embedment material so that the density of the embedment material does not diminish. If the trenching conditions present construction problems such as trench sidewalls that readily slough off or a soft trench floor that will not support workers or compaction, it is termed unstable. The instability is usually a condition of the trench and not the soil. Most often the primary cause of the instability is high groundwater, not the soil. Even soft or loose soils can provide good support for the pipe if they are confined. The problem with unstable conditions generally occurs during the installation. When the trench is opened where groundwater is present, most soils, except firm, cohesive soils (firm clays) or cemented soils, tend to slough off the trench wall. This results in a trench that keeps widening, with loose material falling into the trench floor.

Soil formations that commonly lead to unstable trenching conditions include materials with fine grain soils (silts or clays) saturated with water and uncemented sands saturated with water. In some cases, where the soil has an extremely high water content, such as with peat or with clay (or silt) having a water content beyond the liquid limit, the soil behaves "hydraulically", that is, the water in the soil controls the soil's behavior. Here, the backfill must be designed to sustain all the pressure from the pipe without support from the in-situ soil. These conditions may occur in saturated fine grained soils where the unconfined compressive strength of the soil is less than 500 psf, or in saturated, sandy soils where the standard penetration value, N, is less than 6 blows per ft. In this case, an engineering evaluation should be made to determine the necessity for special procedures such as a "wide" trench or permanent trench sheeting of the trench width.

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As mentioned above, most trench stability problems occur in trenches that are excavated below the groundwater level. (However, the designer and the contractor should keep in mind that all trenches pose the risk of collapse and therefore workers should not be in trenches that are not adequately braced or sloped.) Stability can be improved by lowering the water table through deep wells, well-points, or other such means. In some ground the permeability is such that the only option is to remove the water after it has seeped out of the trench walls. Here the contractor will use underdrains or sumps on the trench floor. De-watering should continue throughout the pipe laying operation until sufficient cover is placed over the pipe so that it will not float.

3.12 18 Stability of Trench Floor

Trench floor stability is influenced by the soils beneath the trench. The floor must be stable in order to support the bedding material. A stable bedding minimizes bending of the pipe along its horizontal axis and supports the embedment enveloping the pipe. Generally, if the trench floor can be walked on without showing foot prints it is considered stable.

In many cases the floor can be stabilized by simply dewatering. Where dewatering is not possible or where it is not effective, stabilization of the trench floor may be accomplished by various cost-effective methods which can be suited to overcome all but the most difficult soil conditions. Included among these are the use of alternate trench foundations such as wood pile or sheathing capped by a concrete mat, or wood sheathing with keyed-in plank foundation; stabilization of the soil by the use of special grout or chemicals; geofabric migration barriers; or ballasting (undercutting). A cushion of bedding material must be provided between any special foundation and the pipe. Permanently buried timber should be suitably treated.

Stabilization by ballasting (undercutting) is the removal of a sufficient quantity of undesirable material. This technique is frequently employed to stabilize randomly encountered short sections of unstable soil. The extent of required over-excavation and details of accompanying construction requirements will be determined by the engineer in consideration of the qualities of the unstable soil and the specific design requirements. The following are general guidelines:
The trench bottom should be over-excavated over the full trench width from 18 to 36 inches below the pipe grade (depending on the soil strength and pipe diameter) and then brought back to grade with a foundation of ballast material topped with Class I material. An appropriate bedding should then be placed on the foundation. The grading of the foundation material should be selected so that it acts as an impervious mat into which neither the bedding, other embedment material, nor the surrounding native soil will migrate.

These guidelines are suitable for most situations except for extremely weak soils (such as quicksands, organic silts, and peats) which may call for further overexcavation, or other special treatment.

3.12.19 Stability of Trench Walls

In order to control deflection, the embedment material must be placed from undisturbed trench sidewall to undisturbed trench sidewall. Where trench walls are unstable, it may be necessary to use trench shields, bracing, or permanent

sheeting to achieve a stable sidewall while installing the pipe. Where material sloughs into the trench it should be removed. This technique often leads to widening the trench.

Walls of trenches below the elevation of the crown of the pipe should be maintained as vertical as possible. The shape of the trench above the pipe will be determined by the stability of the trench walls, excavation depth, surface loadings near the trench, proximity of existing underground structures, presence of groundwater or runoff water, safety and practical considerations. These will determine if the trench walls may be vertical, excavated with slope or benched sides, or shored. When trench walls are shored or otherwise stabilized, the construction scheme must allow for the proper placement and compaction of pipe embedment materials. Some suggested trench construction schemes follow. The final procedure must be in compliance with all applicable safety regulations.

Sloping of trench walls in granular and cohesionless soils should be provided whenever the walls are more than about four feet in depth or otherwise required by state, local or federal regulations. For safety, if the walls are not sloped, they should be stabilized by alternate means such as shoring or bracing. The slope should be no greater than the angle of repose of the materials being excavated and should be approved by the engineer.

Shoring or bracing will frequently be required in wet fine grained cohesive type soils and clays. Bracing or sheathing that is constructed of treated timber, steel or other acceptable material may be used to stabilize trench walls either permanently or temporarily. Wherever possible, sheathing and bracing should be installed so that its bottom extends no lower than about one-quarter of the pipe diameter below the pipe crown. When so installed, pulling the sheathing will minimally disturb the embedment material and the side support it provides. Sheathing that is installed to project below the pipe spring line should be left in place unless, as with some thinner sheathing, it is designed to be pulled and removed without disturbing the embedment next to the pipe. In this case, the trench width should be increased by 12 to 24 inches depending on the pipe diameter to allow for minor disturbance to the embedment near the sheathing. Vibratory placement or extraction of sheeting is not advised. This method can cause severe disturbance to the bedding and liquefaction of the surrounding soils. Where steel sheet piling is used as sheathing and is to be removed or pulled, to minimize disturbance to the pipe embedment, it should be installed so that it is not closer than one pipe diameter or 18 inches, whichever is larger, from either side of the pipe. The void left by removal of the sheathing should be filled with embedment material.

3.12.20 Portable Trench Shield

Portable trench shields or boxes which provide a moveable safe working area for installing pipe can be used with flexible pipe. However, the installation technique of flexible pipe with the shield is not the same as it is for rigid pipe. In order to use the shield with PE pipe, all excavation of the trench below the pipe crown elevation should be done from inside of the shield. That is, the backhoe operator should dig inside of the shield and force the shield down as soil is removed. (The technique of digging out a large hole to pipe invert grade then sliding the shield into it will result in excess deflection of PE pipe and

therefore, should not be used.) After placing the pipe in the trench, embedment material should be placed in lifts and the shield vertically raised after each lift is placed so that workers can shovel embedment material under the shield to fill the void created by the shield wall.

If trench soil quality and applicable safety regulations permit, it is best to use shields that are placed with no portion of their sides extending lower than one-quarter of a pipe diameter below the pipe crown. This minimizes the amount of lifting required and precludes the possibility for disturbing embedment materials. If the sides of the trench box or shield do project below this point, then the box should be lifted vertically as described above, before moving along the trench.

The minimum inside clear width of the box, or shield, should allow for the minimum trench width requirements for the pipe to be satisfied plus an additional 12 to 24 inches depending on the pipe diameter.

3.13 Installation Procedure Guidelines

The installation procedure discussed in this section consists of trench floor preparation, providing a sufficiently stable working platform, and meeting the design grade requirements. Following pipe placement, backfill material which has been selected with regards to potential material migration, required density, depth of cover, weight of soil and surcharge loads is installed as follows:

1. Bedding material is placed and leveled
2. Haunching is placed and, if required, compacted so as not to disturb the pipe from its line and grade.
3. The remainder of the primary initial backfill is placed and, if required, compacted in lifts.
4. Secondary backfill is used to protect the pipe during the final backfilling operation and also to provide support for the top portion of the pipe.
5. The final backfill may consist of any qualifying material that satisfies road construction or other requirements and, when required, must be compacted.

3.13.1 Trench Floor Preparation

The trench floor must have sufficient stability and load-bearing capacity to present a firm working platform during construction to maintain the pipe at its required alignment and grade and sustain the weight of the fill materials placed around and over the pipe. The trench bottom should be smooth and free from sloughed sidewall material, large stones, large dirt clods, frozen material, hard or soft spots due to rocks or low-bearing-strength soils, and any other condition that could lead to non-uniform or unstable support of the pipe. The trench bottom must be kept dry during installation of the pipe and the embedment materials. All foundation and bedding materials must be placed and compacted according to the design requirements. Such materials should be selected to provide the necessary migration control when required. Over-excavation of the trench floor by more than 6 inches beyond grade requires that the over-excavation be filled with acceptable embedment material that is compacted to a density equal to that of the embedment material. If the over excavation exceeds 12 inches, it should be brought to proper grade with a

suitably graded Class I or II material that is compacted to the same density as that of the native soil but not less than the density requirements for the embedment materials.

In stable soils the trench floor should be undercut by machine and then brought up to proper grade by use of a well-leveled bedding consisting of a 4 to 6-inch layer of embedment material. This material should be compacted by mechanical means to at least 90 percent Standard Proctor Density. Class I material may be shovel sliced where the depth of cover permits.

In unstable soils that may be too soft, of low load-bearing capacity or otherwise inadequate, the trench bottom must first be stabilized by soil modification, by providing an alternate foundation, or by the removal of the undesirable material and replacement with stable foundation material. A cushion of at least 4 inches of compacted bedding should be provided between any special foundation and the pipe. Adequacy of trench bottom stability is difficult to evaluate by visual observation and is therefore best determined by soil tests or at the site during installation. However, a warning of a potentially unstable soil condition is given by a trench bottom that cannot support the weight of workmen.

Uneven soil support conditions, where the grade line traverses both soft and hard spots, requires special consideration. Ballasting is the most frequently employed technique to deal with randomly encountered short sections of soft soils.

When differential conditions of pipe support might occur, such as in transitions from manholes to trench or from hard to soft soils, a transition support region should be provided to ensure uniform pipe support and preclude the development of shear, or other concentrated loading on the pipe. The following procedure may be used:

The soil next to the more rigid support is over-excavated to a depth of not less than 12 inches over a distance of 2 pipe diameters along the pipe line; over the next 2 diameters away from the rigid support, the depth of over-excavation is gradually decreased until it meets the normal trench depth. See Figures 6 and 7. Pipe grade is then restored by the addition of granular material that is compacted. In the case of connections to manholes and buildings, the distance of over-excavation along the pipe length should be no less than required to reach undisturbed soil.

3.13.2 Backfilling and Compaction

Backfilling should follow pipe placement and assembly as closely as possible. Such practice prevents the pipe from being shifted out of line by cave-ins, protects the pipe from external damage, eliminates pipe lifting due to flooding of open trench and in very cold weather lessens the possibility of backfill material becoming frozen. The quality of the backfill materials and their placement and compaction will largely determine the pipe's ultimate deformation and alignment. Backfill material should be selected with consideration of potential material migration to, or from, the trench wall and other layers of embedment material. Under most circumstances, compaction will be required for all material placed in the trench from 6 inches beneath the pipe to at least 6 inches above the pipe.

The required density of the bedding, haunching and the primary and secondary initial backfill material will depend on several considerations such

as depth of cover, weight of soil, and surcharge loads. The minimum density for these materials should be equal to 85 percent Standard Proctor Density for Class I and II materials or 90 percent Standard Proctor Density for Class III or IVa materials. For Class II,III, and IVa materials, compaction will always be required to obtain these densities. Class I material placed by shovel slicing will generally have a minimum density of 85 percent Standard Proctor; however, its E' may not be greater than 750 psi. Just dumping Class I material into the trench may produce densities near 85 percent. However, except in shallow cover without live loads, this method will normally not provide adequate support to the pipe as voids may exist under the pipe haunches or elsewhere in the material.

3.13.3 Backfill Placement

Bedding performs a most important function in that it levels out any irregularities in the trench bottom, assuring uniform support and load distribution along the barrel of each pipe section and supports the haunching material. A mat of at least 6 inches of compacted embedment material will provide satisfactory bedding.

Haunching material must be carefully placed and compacted so as not to disturb the pipe from its line and grade while ensuring that it is in firm and intimate contact with the entire bottom surface of the pipe. Usually a vibratory compactor has less tendency to disturb the pipe than an impact tamper.

Primary initial backfill should be placed and compacted in lifts evenly placed on each side of the pipe. The lifts should not be greater than 12 inches for Class 1, 8 inches for Class II, and 6 inches for Class III and IVa materials. The primary initial backfill should extend up to at least three-quarters of the pipe diameter to perform its function of pipe side support as shown in Figure 1. If the construction does not call for the use of a secondary initial backfill, then the primary layer should extend to not less than 6 inches above the pipe crown. In any location where the pipe may be covered by existing or future groundwater, the primary initial backfill should extend up to at least 6 inches over the pipe crown for pipe up to 27-inch diameter and to at least 12 inches over the pipe for larger pipe.

Secondary initial backfill serves to protect the pipe during the final backfilling operation and to provide support to the top portion of the pipe. Secondary initial backfill should extend to 6 inches above pipe for pipe up to 24 inches and to 12 inches for larger pipe. These depths can be modified slightly depending on the depth of burial, groundwater level, and type of native soil. Compaction of this layer should be to the same extent as that specified for the primary initial backfill. If the final backfill material contains large rock (boulder or cobble size) or clumps, then 18 inches of cushion material should be provided in the secondary initial backfill. Secondary initial backfill may consist of a different material than the primary initial backfill; however, in most cases, it should be a material that will produce an E' of at least 750 psi. The final backfill may consist of any material that satisfies road construction or other requirements. The material must be free of large stones or other dense hard objects which could damage the pipe when dropped into the trench or create concentrated pipe loading. The final backfill may be placed in the trench by machines.

There should be at least one foot of cover over the pipe before compaction of

the final backfill by the use of self-powered compactors. Construction vehicles should not be driven over the pipe until a three foot cover of properly compacted material is placed over the pipe.

When backfilling on slopes, the final backfill should be well compacted if there is any risk of the newly backfilled trench becoming a "french drain." Greater compaction may be achieved by tamping the final backfill in 4 inch layers all the way from the top of the initial backfill to the ground or surface line of the trench. To prevent water from undercutting the underside of the pipe, concrete collars keyed into the trench sides and foundation may be poured around the pipe or a PE waterstop can be fabricated onto the pipe.

3.14 Sunlight Exposure

Placing pipe that has been in direct sunlight in a cooler trench will result in thermal contraction of the pipe's length. This contraction can generate force which could result in pull-out at mechanical couplings or other buried structures. Allow pipe to cool before making connections to an anchored joint, flange, or a fitting that requires protection against excessive pull-out forces. Covering the pipe with embedment will facilitate cooling.

3.15 Cold (Field) Bending

Coiled lengths and long strings of PE fused pipe may be cold bent in the field. The allowable bend ratio is determined by the pipe diameter and the dimension ratio. See Figure 8 and Table 4. Because fittings and flange connections are rigid compared to the pipe, the minimum bend radius is 100 times the pipe's outside diameter (OD), when a fitting or flange connection is present in the bend. The bend radius should be limited to 100 x OD for a distance of about 5 times the pipe diameter on either side of the fitting location.

TABLE 4
Minimum Bend Radius for PE Pipe Installed in Open Cut Trench

Dimension ration, DR	Minimum Cold Bend Radius
7, 7.3, 9	20 x Pipe OD
11, 13.5	25 x Pipe OD
17, 21	27 x Pipe OD
26	34 x Pipe OD
32.5	42 x Pipe OD
41	52 x Pipe OD
Fitting or flange present in bend	100 x Pipe OD

3.16 Installation of Pipe in Curves

Field bending involves excavating the trench to the desired bend radius, then sweeping or pulling the pipe string into the required bend and placing it in the trench. Temporary restraints may be required to bend the pipe, and to maintain the bend while placing the pipe in the trench and placing initial backfill.

Temporary blocks or restraints must be removed before installing final backfill, and any voids must be filled with compacted initial backfill material. Considerable force may be required to field bend the pipe, and the pipe may spring back forcibly if the restraints slip or are inadvertently released while bending. Observe appropriate safety precautions during field bending.

.3.17 Transition from PE Pressure Pipe to Gasket Jointed Pipe

The heat fusion joint used for PE pipe creates an essentially continuous length of pipe. When the pipe is pressurized two significant internal forces are present in the pipe. End thrust from bends or end caps is transmitted through the pipe as a longitudinal force. Hoop stress (hoop thrust) occurs due to the internal pressure. The longitudinal force tends to grow the pipe length while the hoop thrust expands the diameter (ever so slightly) and tends to contract the pipe's length in proportion to Poisson's Ratio. In an all PE pipe system the length effects from these two forces tend to cancel each other out. As a result, buried PE pipes are self-restrained and require no thrust blocking. A different situation occurs when PE pipe transitions to a type of pipe material that is joined by non-restrained gasket joints. The longitudinal force may be no longer present. The result is that hoop expansion is unbalanced and will cause contraction of the PE pipe. This contraction can result in pulling apart of gasket joints in line with the PE pipe.

Generally, it is necessary to anchor the ends of a PE pipeline that transitions into an unrestrained gasket jointed pipe system. If the gasket joints are restrained anchoring is unnecessary. See Appendix 3, "Pull-out of Mechanical Joints due to the Poisson Effect" for a complete discussion of the pull-out effect.

The transition of PE pipe to DI and PVC pipe is discussed in TN-36, "General Guidelines for Connecting PE Potable Water Pressure Pipes to DI and PVC Piping Systems.

3.18 Proper Burial of Fabricated PE Fittings

A common question is "Does the installation of heat fused PE solid wall pipe and fittings need thrust blocks?" The simple answer to this question is that heat fused PE pipe and fittings are a monolithic structure which does not require thrust blocks to restrain the longitudinal loads resulting from pipe pressurization.

Since fittings are part of the monolithic structure no thrust blocks are needed to keep the fittings from separating from the PE pipe. Bell and spigot piping systems must have thrust blocks or restrained joints to prevent separation of pipe from fittings when there is a change of direction.

Pipe movement due to elastic deformation, thermal expansion/contraction, etc. is not detrimental to PE pipe, but pipe movement or the attachment of valves or other appurtenances used with PE pipe systems can cause excessive loads. Proper backfill prevents excessive loads in most situations.

Common fittings, elbows and equal tees normally require the same backfill as specified for the pipe. When service connections are made from PE water mains, no special compaction is required. When service connections are made under an active roadway, 95% Standard Proctor density is normally required around the pipe and the service connection.

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In water systems and fire protection piping systems, reducing tees are frequently used to connect from the main to valves and hydrants. Figure 9 shows the use of concrete support pads, thrust blocks on hydrants, self restrained PE MJ adapters and sand stabilized with cement around the reducing tee. While no true thrust blocks are on the PE pipe or fittings in this arrangement, the sand stabilized with cement provides proper support for the reducing tee. Compaction of the soil around these fittings is difficult and the use of sand stabilized with cement or flowable fill is usually easy.

As with all piping systems, proper compaction of the soil around pipe and fittings is important. In water and/or fire protection systems, when in-situ embedment materials can be compacted to a Standard Proctor density of 85% for installation outside of roadways or 95% Standard Proctor density in roadways, these materials should be used. When in-situ materials do not provide proper support, then sand stabilized with cement or flowable fill should be used.

3.19 Inspection

The engineer should provide inspection commensurate with the application. Good inspection would include some or all of the following:

• Verification that all embedment materials meet the specification and verification of pipe grade and alignment,

• Verification that the correct pipe is installed (see numerical code printed on pipe),

• Observation of pipe installation, placement of embedment and backfill materials, and trench excavation methods,

• Verification that proper pipe storage and handling procedures are followed, that pipe placement in the trench, attachment of mechanical joints, fittings and appurtenances, and transitions to other pipes were done in accordance with recommended methods, that scratches or gouges do not exceed the permitted depth, and that the minimum bend radius was not exceeded,

• In the case of large diameter gravity pipes (gasket joined) inspection for deflection by either pulling a mandrel through the pipe or taking physical measurements of the pipe vertical diameter.

• In the case of pressure pipes record results of leak testing.

.4.1 Measurement and Payment

.4.2 General

The Contractor's bid amount against each Bill of Quantities item as given below shall include providing, laying, jointing, testing and commissioning and completion for all work specified herein and/or as shown on the Tender Drawing related to the item.

4.3 Polyethylene Pipe (HDPE)

4.4 Measurement:

Measurement shall be made for total running feet for each size and type of P.E Pipe acceptably supplied and laid by the Contractor.

4.5 Payment

Payment shall be made for the total running feet of each size of P.E Pipe measured, as provided above, at the Contract unit price each and shall constitute full compensation for providing, laying, testing and commissioning of the P.E Pipe including all accessories such as Pipe joints, Bends, Tees, Flanges, etc. complete.

4.6 Construction of Valve Chamber

4.7 Measurement:

Measurement shall be made for item as each no for Valve chamber including with brick work, excavation, plaster, CI cover etc acceptably supplied and laid by the Contractor.

.4.8 Payment

Payment shall be made for the No of each of valve chamber measured, as provided above, at the Contract unit price each and shall constitute full compensation for Construction of Valve chamber inside with Brick work, excavation, plaster, CI manhole cover etc. complete job.

SPECIAL NOTES

SPECIAL NOTES

1. The bill of quantities (BOQ) forming part of this contract is only approximate. Contractor to verify quantity of each item from construction drawings or through on site measurement before ordering material for that item. Any short fall or excess procurement made based only on BOQ items will be contractor's own responsibility.
2. Payment shall be made against the quantities actually executed at site according to measurement.
3. Quoted rates shall remain valid for actual value of contract varying within ± 30% of bid value and contractor has no right to claim any extra on this account. It's difficult work in under construction area, contractor to make sure that no services/ utilities are disturbed in case any utility / service are disturbed contractor to make the damage good at his own cost. Contractor to arrange access for traffic and residents through temporary bridges or detours all cost involved for such works are to be covered in the unit rates of items of works in the BOQ.
4. The contractor will place the order for all the material to be used at site and in his scope of works well in time so that delivery of these materials should not affect the schedule of completion of works. No excuse for the late delivery of the materials by other manufacturers shall be accepted in this regard.
5. The contractor shall include in his rates the cost of the cable accessories such as copper lugs, glands, cable end box etc, wherever required. Increase in rate(s), will not be possible after approval of the rate(s) and during execution of works.
6. Contractor to submit all warranty and guarantee cards for equipments and appliances installed. The test certificates of Cables to be submitted before installation.
7. Contractor to submit samples for approval and maintain at site a sample room.
8. For extra works carried out according to instructions of the Client and/or Consultants, or their representatives, the rates claimed for these works will be approved by the Client/Consultants after mutual discussion with contractor.
9. Quoted Tender documents, Tender Drawings and Addendum (if any) etc, shall be submitted on the date Tender opening.
10. Contractors/Bidders are advised to visit and understand the quantum of works involved in existing areas before filling the BOQ
11. Contractors/Bidders may contact Consultants for clarification of each and every query before filling the BOQ. No alteration in the rates will be entertained after submission / approval of the Tender documents.
12. For all works contractor to employ qualified Engineer with knowledge of surveying. The Engineer to be present during works on full time basis.
13. Only Government of Sindh notified escalations after the date of opening this tender (new escalation) on any item shall be only payable to contractor.

LIST OF APPROVED MANUFACTURERS

LIST OF APPROVED MANUFACTURES/BRANDS

(Samples subject to physical approval by consultants)

Note: This project may not require some of following materials

S/No	Description	Company
1.	Reinforcement Steel	AFCO, Mughal, Amreli, Prime, Razzaq, Metropoliton, Nawab & Ittehad
2.	Ceramic Tiles	EMCO, Shabir, Master
3.	Plastic/Vinyle enyle emulsion/Enamel (Matt or Gloss)	ICI Dulux , Burger Paint
4.	G.I Pipes	IIL, Jamal, KPM, Pioneer Steel
5.	Hardware stays, Handles (Bras)	Moosa, Pistol, Alfa, Yale, Babar
6.	Glass	Khawaja Glass, Nowshera Glass, Prince & Usmania Glass
7.	Stainless Steel Sink	Altas, Super Asia & Master
8.	Cost Iron *Spun) pipe, fitting & Fixtures	Alpine, Teepu
9.	Asbestos Pipe	Dadex
10.	UPVC Pipe & Fittings	Dadex, Beta & Galco
11.	ASTM RCC Pipes	Hume Pipe, Razia & Balochistan Pipe
12.	Sanitary Fixtures	Master, ICL-Bosch, Ceramika
13.	Flushing Tank	Golden, Rehber & Master
14.	Hot and Cold PVC Pipe	Dadex
15.	Anti Termite Water Proofing agents and concrete admixture	Termite, Biflex, Dursbin, Dyna Bond, Vanex, feb, Sika & Foscroc
16.	Acid proof Tiles	National Tiles
17.	Terrazzo Tiles	Capital Tiles, Noor Tiles
18.	Aluminum Section	Alcop, Japan Metal
19.	Wooden Door Shutter	Sterling & Interwood
20.	Light Fixtures	Phillips, ohms lighting, Britlite Engineering Company
21.	Distribution Boards	Siemens, Hussain & Co, PEL
22.	Cable & Wirers	Pakistan Cables, Newage cable, Allied cables
23.	PVC Conduit & Accessories	Beta, Galco, Dadex
24.	Steel conduits & Associates	Hilal Industries and International Industries

25.	Switches, socket etc	MK (UK) Clipsal (Aus)
26.	Fans	Pak Fan, Millat & Royal
27.	MCCB, MCB	Merlen Gerin, Siemens, Terasaki
28.	Sluice Valve	KSB Company
29.	Pumps	KSB Company, Grundfos
30.	Deep Well Turbine	KSB Company, Grundfos
31.	M.S Pipe all 6.4mm spirally welded	Indus Steel, Data Steel, Crescent Steel
32.	Non Return Valve	KSB Company
33.	Safety Valve	KSB Company
34.	PVC Pipe/Valves	Dadex
35.	Motors	Siemens
36.	Transformers	Siemens, J&P
37.	Generator	Siemens, FG Wilson
38.	Poles GI	IIL Material
39.	VCB	Alstom, PEL
40.	Cement (OPC/SR)	Dg Cement, Thatta Cement, Falcon cement
41.	External Epoxy Coating	SIKA, MBT, ICI, Burger
42.	Porcelain Tiles	Master, China
43	P.E Pipe	Dadex, Hi-Tech
44.	Kerb Stone, Hard Pavers	Envicrete, (Banu Mukhtar) Bincrete, Megnacrete
45.	Switches	Clipsal/MK(or equivalent to be approved by tendering authority/Engineer In-charge)
46.	Switches-socket outlet	Clipsal/MK(or equivalent to be approved by tendering authority/Engineer In-charge)
47.	Circuit Breakers	Make Terrasaki (Japan/Malaysia/Koria)
48.	Light Fittings / Fixtures	Philips/Sunlight (Models as per BOQ of work)
49.	Sweep ceiling Fan 56"	Millat/Asia/Pak Fans (Gujrat)
50.	Fans (wall Bracket)18"-24"	Pak Fan (Gujrat) /wahid Fan
51.	Sweep Exhaust Fan 8",12"	Millat/Asia/Pak Fans (Gujrat)
52.	Light Distribution Board of 14 SWG Steel sheets	Best Electric HYD/ Elmatec/ Baber Brothers/ Husain's & Co.
53.	Light Distribution Board as per BOQ	Best Electric HYD/ Elmatec/ Baber Brothers/ Hussain & Co.

BILL OF QUANTITIES

RCC CONSULTANTS

Drinking Water Rapid / Slow Sand Filtration Plants, Waste Water Treatment,
Solid Waste Management Water Supply, Sewerage System, Civil, Electrical, Mechanical
& Architectural Works, City Master Plans, GIS, Environmental Consultants
Phone No 022-2652957 Fax No 022-2655833
E-mail: rcc.consultants@rccgoc.com
www.rccgoc.com

Providing, Laying, Jointing and Testing Water Supply Distribution Network For Z.A Bhutto Campus, Mehran University of Engineering and Technology Khairpur Mir's.

MAIN SUMMARY SHEET

S-No	Descriptions	Amount in Rs.
1	Providing, Laying, Jointing and Testing Water Supply Distribution Network (Amount Carried from Page:121)	
	Total Amount in Rs.	

In words: ----------

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Note:

Cartage shall not be payable separately and that the bid offered, is inclusive of cost of cartage.

Any difference on steel, cement, Bitumen, wood and bricks if notified by Government of sindh after opening of this bid shall be payable based on executed quantities.

If any extra item is required during execution preference will be given to Govt. of Sindh Schedule of rates.

SIGNATURE OF BIDDER SEAL OF BIDDER

RCC CONSULTANTS

Drinking Water Rapid / Slow Sand Filtration Plants, Waste Water Treatment,
Solid Waste Management Water Supply, Sewerage System, Civil, Electrical, Mechanical
& Architectural Works, City Master Plans, GIS, Environmental Consultants
Address:- 6-Green Homes Phase-I Qasimabad Hyderabad
Phone No 022-2652957 Fax No 022-2655833
E-mail: rcc.consultants@rccgoc.com
www.rccgoc.com

Providing, Laying, Jointing and Testing Water Supply Distribution Network For Z.A Bhutto Campus, Mehran University of Engineering and Technology Khairpur Mir's.

Schedule-B

S-No	Descriptions	Quantity	Unit	Unit Rate	Amount in Rs.
A	**Schedule Items**				
1	Excavation for pipe lines in trenches and pits in soft 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 within a one chain as directed by Engineer Incharge. providing fence guards, lights flags and temporary crossings for non vehicular traffic where ever required lift upto 5 ft (1.52m) and lead upto one chain (30.50m). (PHS# 1, P# 60)	112815.00	%oCft	3,600.00	406,134.00
2	Providing, Laying & Fixing in trench including fitting, jointing & testing etc complete in all respect the high Density Polyethylene PE pipes (HDPE-100) for W/S confirming ISO 4427/DIN8074/8075 B.S 3580 & PSI 3051. PN-10 (PHSI# F 1, P# 25)				
	b) 32mm OD P.E Pipe Line	3000.00	P-Rft	36.00	108,000.00
	e) 63mm OD P.E Pipe Line	720.00	P-Rft	97.00	69,840.00
	g) 90mm OD P.E Pipe Line	6270.00	P-Rft	178.00	1,116,060.00
	k) 160mm OD P.E Pipe Line	8250.00	P-Rft	530.00	4,372,500.00
3	Providing and fixing 1/2" thick M.S flange made of MS plate having a thickness and total weight as mentioned against each items. It includes the cost of making holes, facing, welding, nuts bolts, rubber packing, white lead, fitter, cartage etc complete. (c) 6" dia (PHSI# 8, (c), Part-D MS Specials)				
	(a) 3" Dia	40	Each	945.00	37,800.00
	(c) 6" Dia	10	Each	1,520.00	15,200.00

11 9

C:\Users\SML\Desktop\Tend r of External Development\2- Wastar Supply DN.xls

S-No	Descriptions	Quantity	Unit	Unit Rate	Amount in Rs.
4	Refilling the excavated stuff in trenches 6" thick layer I/c water ramming to full compaction etc complete (PHSI# 24, P# 77)	112815.00	%oCft	2,760.00	311,369.40
5	Providing Chamber 3'x2' (915x615 mm) inside dimension 4 1/2' (1372 mm) deep as per approved design for sluice value 3" to 12" dia with 18" (457 mm) dia inside cost iron cover and frame (wt=1 cwt 3 qr) fixed in RCC 1:2:4 (102 mm) thick (with 5 Lbs steel per cft) 9" (299 mm) thick brick masonry wall set in 1:6 cement mortar 6" (1152 mm) thick cement concrete 1:3:6 in foundation 1" (25 mm) thick cement concrete 1:3:6 in foundation 1" (25 mm) thick cement concrete 1:2:4 flooring 1/2" (12.5 mm) thick cement plaster 1:3 to all inside wall surface and to top i/c providing and fixing M.S foot rest at every one foot beyond 2 1/2 ft depth curing, excavation, back filling and disposal of surplus earth etc. complete. (PHSI# Q (1), P# 49)	23	Each	18,820.00	432,860.00
				Amount of Schedule Items	**6,869,763.40**
B	**Non Schedule Items**				
6	Providing, Fixing / Jointing and Testing of approved following sizes High Density Polyethylene PE pipe fittings/ specials (HDPE-100) for W/S confirming ISO 9001:2008, PN-16 including cost of but fusion jointing etc complete in all respects as per directions of engineer incharge and specifications.				
a	Tee 160mm x 160mm x 160mm	1	Each	10,516.80	10,516.80
b	Tee 160mm x 160mm x 90mm	12	Each	10,320.00	123,840.00
c	Tee 160mm x 160mm x 63mm	1	Each	8,904.00	8,904.00
d	Cross 160mm x 160mm x 90mm x 90mm	3	Each	15,288.00	45,864.00
e	Bend 90° 160mm	1	Each	6,768.00	6,768.00
f	Bend 45° 160mm	15	Each	7,617.60	114,264.00
g	Bend 45° 90mm	32	Each	2,763.60	88,435.20
h	Bend 45° 63mm	2	Each	2,409.60	4,819.20
i	End Cap 160mm	1	Each	4,092.00	4,092.00
j	End Cap 90mm	22	Each	1,488.00	32,736.00
k	End Cap 63mm	1	Each	1,346.40	1,346.40

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S-No	Descriptions	Quantity	Unit	Unit Rate	Amount in Rs.
l	End Cap 32mm	50	Each	205.44	10,272.00
m	Stab End 160mm	3	Each	3,384.00	10,152.00
n	Stab End 90mm	50	Each	1,488.00	74,400.00
o	Stab End 60mm	2	Each	1,417.20	2,834.40
p	Clamps with nut bolts and rubber packing and including making hole in main line 90mm to 32mm	50	Each	1,810.80	90,540.00
q	Clamps with nut bolts and rubber packing and including making hole in main line 63mm to 32mm	3	Each	1,527.60	4,582.80
7	Providing and fixing following diameters imported approved quality heavy duty pattern flanged C.I sluice valve test pressure 21.0kg/sqcm or 300lbs/sq inches approved by consultants etc complete in all respects as per directions of engineer incharge.				
	(a) 90mm dia	20	Each	10,200.00	204,000.00
	(b) 160mm dia	3	Each	16,200.00	48,600.00
				Amount of Non Schedule Items	**886,966.80**

A	**Total Amount of Schedule items in Rs.**	**6,869,763.40**
	I the Contractor M/s ----------	
B	**Here by quote ----------% premium above / below the schedule items.**	----------
C	**Total Amount of Non Schedule items in Rs.**	**886,966.80**
	Total Tender Amount of A+B+C in Rs.	----------

In words: ----------

Note:

Cartage shall not be payable separately and that the bid offered, is inclusive of cost of cartage.

Any difference on steel, cement, Bitumen, wood and bricks if notified by Government of sindh after opening of this bid shall be payable based on executed quantities.

If any extra item is required during execution preference will be given to Govt. of Sindh Schedule of rates.

SIGNATURE OF BIDDER **SEAL OF BIDDER**

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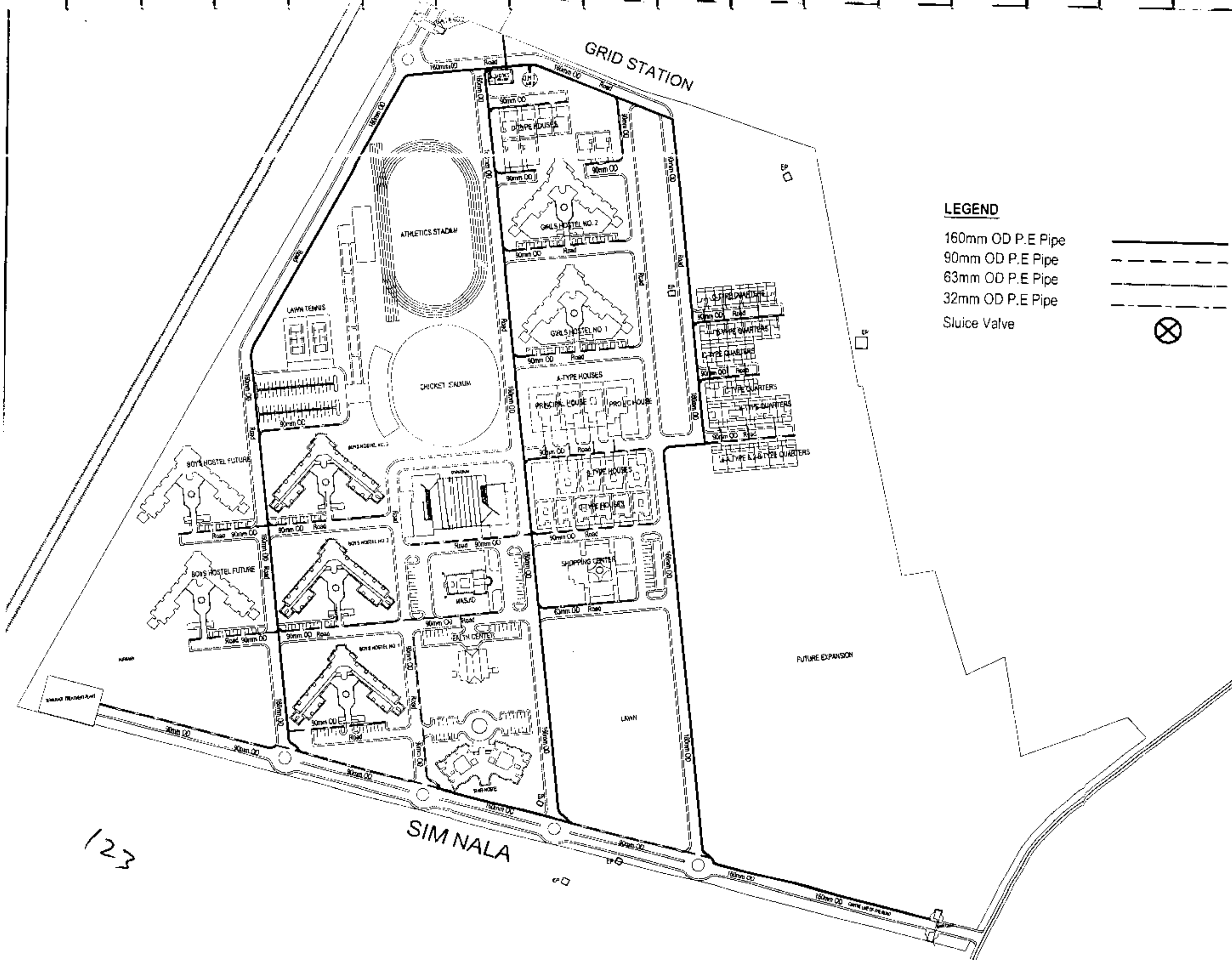
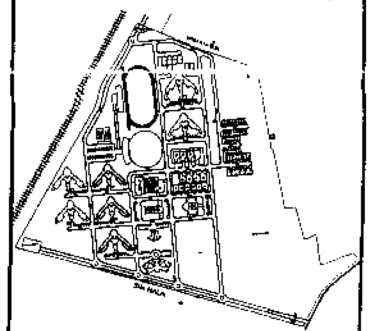
TENDER DRAWINGS
(NOT VALID FOR CONSTRUCTION)



123

MASTER PLAN OF UNIVERSITY



KEY PLAN

Note:-

Project:-

Z.A Bhutto Campus, Mehran University of Engineering and Technology Khairpur Mir's.

Client:-

Z.A BHUTTO CAMPUS, MEHRAN UNIVERSITY COLLEGE OF ENGINEERING AND TECHNOLOGY KHAIRPUR MIR'S

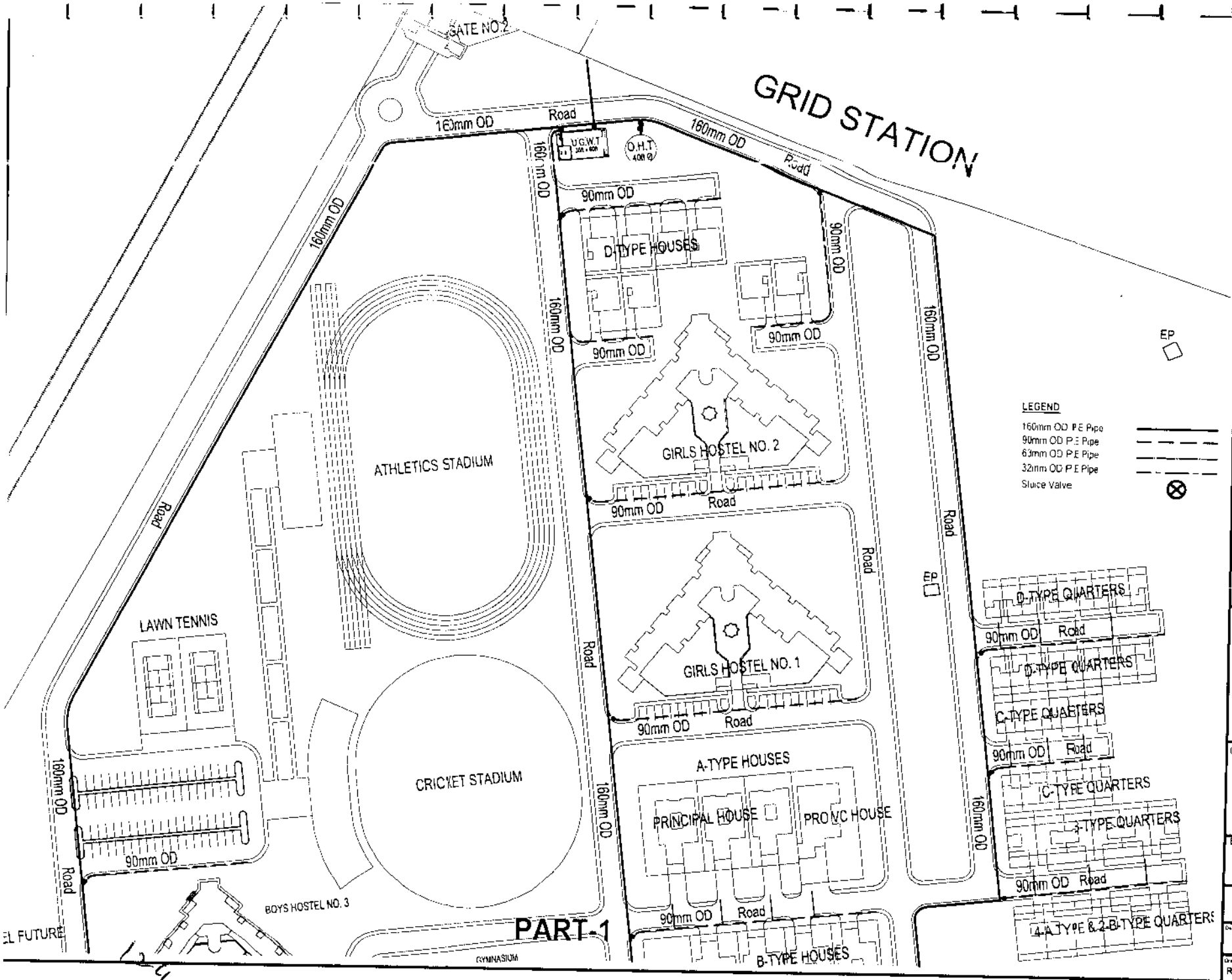
Consultants:-

RCC CONSULTANTS

Drawing Name:-

Plan Water Supply Distribution Network

Design By:	Check By:	Drawn by:
SML	NAVEED LAKHO	TANVEER
RCC/MUET/001	01 / 11 / 2014	00



PART-1

KEY PLAN

Note:-

Project:-

Z.A Bhutto Campus, Mehran University of Engineering and Technology Khairpur Mir's.

Client:-

Z.A BHUTTO CAMPUS, MEHRAN UNIVERSITY COLLEGE OF ENGINEERING AND TECHNOLOGY KHAIRPUR MIR'S

Consultants:-

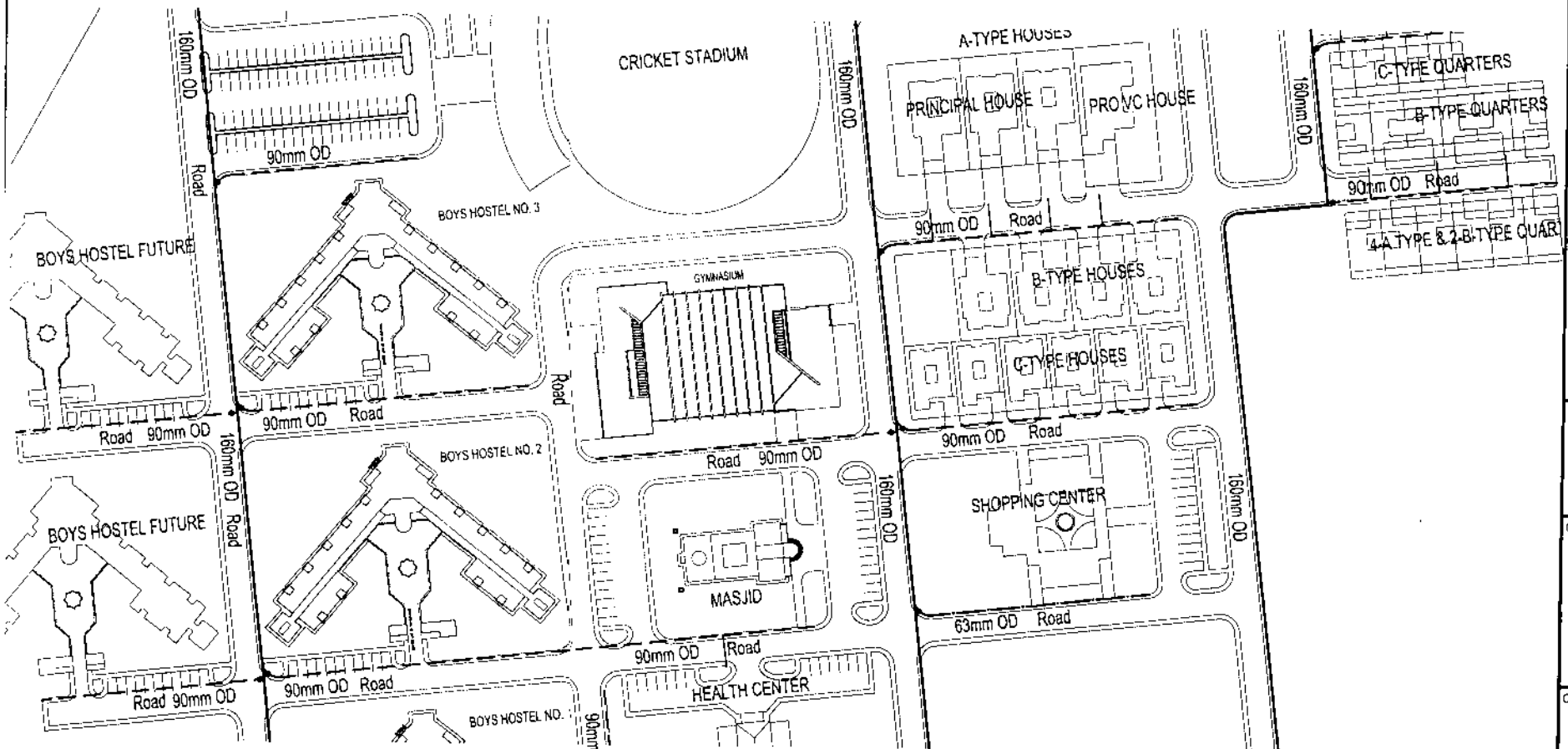
RCC CONSULTANTS

Drawing Name :-

Plan Water Supply Distribution Network (Part-1)

Design By	Check By	Drawn by
SML	NAVEED LAKHO	TANVEER

Drawing No.	Date	Revision No.
RCC/MUET/002	01 / 11 / 2014	00



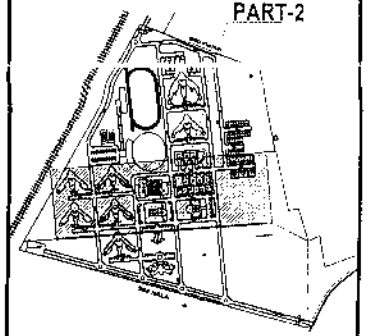
PART-2

12

LEGEND

- 160mm OD P.E Pipe
- 90mm OD P.E Pipe
- 63mm OD P.E Pipe
- 32mm OD P.E Pipe
- Sluice Valve

PART-2



KEY PLAN

Note:-

Project:-

Z.A Bhutto Campus, Mehran University of Engineering and Technology Khairpur Mir's.

Client:-

Z.A BHUTTO CAMPUS, MEHRAN UNIVERSITY COLLEGE OF ENGINEERING AND TECHNOLOGY KHAIRPUR MIR'S

Consultants:-

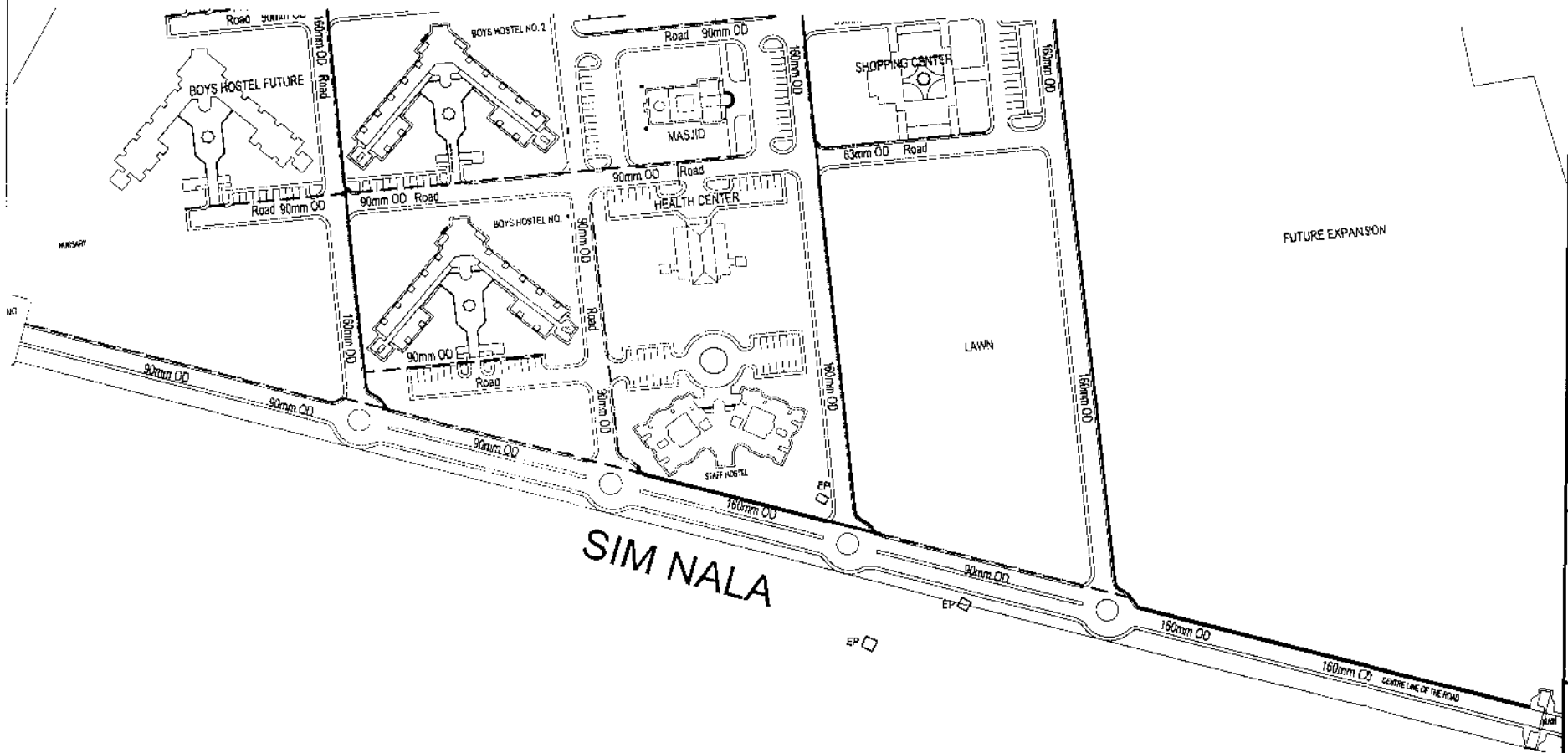
RCC CONSULTANTS

Drawing Name:-

Plan Water Supply Distribution Network (Part-2)

Design By:-	Check By:-	Drawn By:-
SML	NAVEED LAKHO	TANVEER

Drawing No:-	Date:-	Revision:-
RCC/MUET/003	01 / 11 / 2014	00



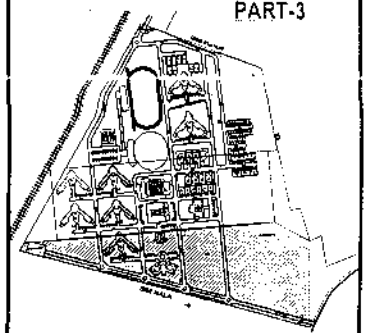
PART-3

126

LEGEND

160mm OD P.E Pipe
90mm OD P.E Pipe
63mm OD P.E Pipe
32mm OD P.E Pipe
Sluice Valve

PART-3



KEY PLAN

Note:-

Project:-
Z.A Bhutto Campus, Mehran University of Engineering and Technology Khairpur Mir's.

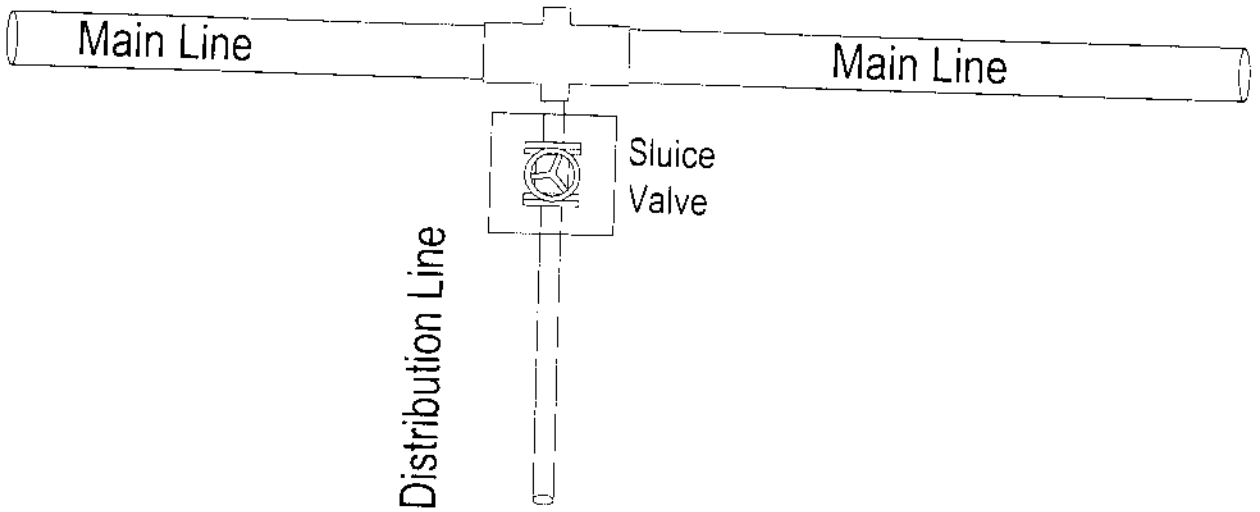
Client:-
Z.A BHUTTO CAMPUS, MEHRAN UNIVERSITY COLLEGE OF ENGINEERING AND TECHNOLOGY KHAIRPUR MIR'S

Consultants:-
RCC CONSULTANTS
GROUND FLOOR ALI COMPLEX MIR GHARIBSHAH ROAD HYDERABAD

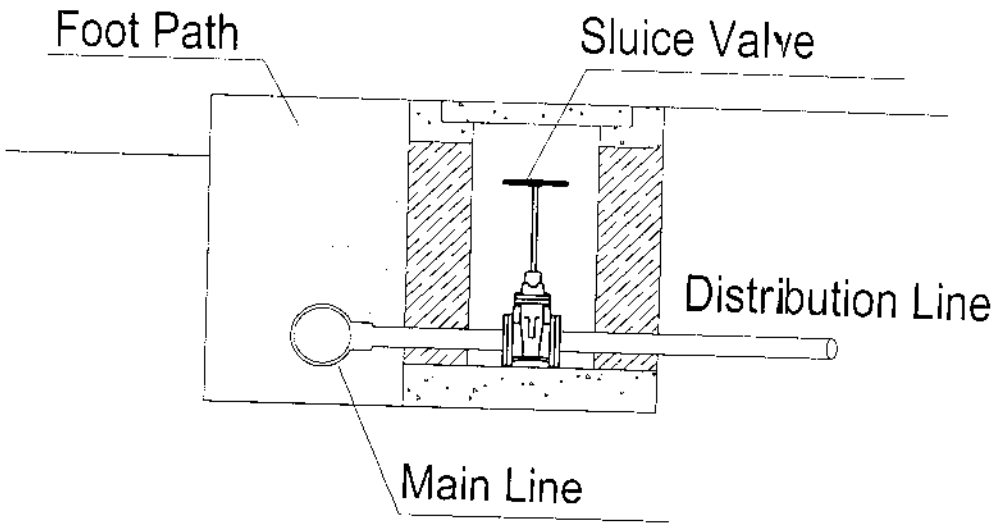
Drawing Name:-
Plan Water Supply Distribution Network (Part-3)

Design By:-	Check By:-	Drawn By:-
SML	NAVEED LAKHO	TANVEER

Drawing No:-	Dated:-	Revision No
RCC/MUET/004	01 / 11 / 2014	00

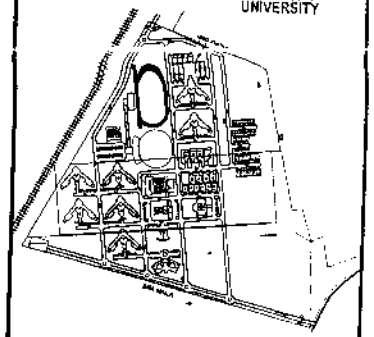


Plan of Sluice valve



Section of Sluice Valve

MASTER PLAN OF UNIVERSITY



KEY PLAN

Note:-

Project:-

Z.A Bhutto Campus, Mehran University of Engineering and Technology Khairpur Mir's.

Client:-

Z.A BHUTTO CAMPUS, MEHRAN UNIVERSITY COLLEGE OF ENGINEERING AND TECHNOLOGY KHAIRPUR MIR'S

Consultants:-

RCC CONSULTANTS

Drawing Name:-

Plan & Section of Sluice Valve

Design By:	Check By:	Drawn By:
SML	NAVEED LAKHO	TANVEER

Drawing No:	Dated:	Revision No:
RCC/MUET/005	01 / 11 / 2014	00

MEHRAN UNIVERSITY OF ENGINEERING & TECHNOOGY Z.A BHUTTO CAMPUS KHAIRPUR

TENDER DOCUMENTS

NAME OF WORK

CONSTRUCTION OF 1.0 LAC GALLON UNDER GROUND WATER TANK & PUMP ROOM INCLUDING PUMPING MACHINERY AT Z.A BHUTTO CAMPUS AT MUET KHAIRPUR

JUNE- 2015

Client:
MEHRAN UNIVERSITY OF ENGINEERING & TECHNOOGY Z.A BHUTTO CAMPUS KHAIRPUR

Consultants:

RCC Consultants
GROUD FLOOR RCC COMPLEX MAIN,
QASIMABAD HYDERABAD
TEL: 0-22-2652957 , 2650709
MOB-0323-2608043
RCC.CONSULTANTS@RCCGOC.COM
WWW.RCCGOC.COM

INSTRUCTIONS TO PROCURING AGENCIES

INSTRUCTIONS TO PROCURING AGENCIES
(Not to be included in Bidding Documents)

A. Basis of Documents

These Documents have been prepared as a global document intended to be used by different agencies/users according to their requirements. This document is envisaged for National Competitive Bidding (NCB), meant for use for Works costing not more than Rs. 25 Million. These documents may be tailored according to the scope of works as well as in case of contracts on International Competitive Bidding (ICB) basis, funded by international financial institutions/donors, with payments in foreign currencies. Procuring agencies are then to tailor the relevant clauses to suit their requirements including appropriate modifications in the relevant sections of the documents in the light of SPPRA Bidding Documents for Large Works.

The Procuring Agency is expected to manage the Contract itself. The role of Engineer may be added by the Procuring Agency, if the Procuring Agency wishes to engage a consultant. The role of the Engineer with specific delegated powers under various clauses of Instructions to Bidders such as clarifications of Bid Documents, Amendment of Bid Documents, evaluation of Bids etc. and to administer the Contract under various clauses of Conditions of Contract should have been specified. The Procuring Agency will be required to set out in the specifications and drawings the full scope of work including the extent of design to be done by the Contractor, if any.

B. Contents of Documents

As stated in Clause IB.4 of Instructions to Bidders, the complete Bidding Documents in addition to Invitation for Bids shall comprise items listed therein including any addendum to Bidding Documents issued in accordance with IB.6. The Standard Form of Bidding Documents (for Small Contracts) includes the following:

1. Instructions to Bidders & Bidding Data
2. Form of Bid & Schedules to Bid
3. Conditions of Contract & Contract Data
4. Standard Forms
5. Specifications
6. Drawings, if any

In addition, Instructions to procuring agencies are also provided at various locations of this document within parenthesis or as a Note(s). Procuring agencies are expected to edit or finalise this document accordingly, by filling in all the relevant blank spaces and forms as per the scope of the work, deleting all notes and instructions intended to help the bidders.

The procuring agency is required to prepare the following for completion of the Bidding Documents:

(i) Invitation for Bids

(ii) Bidding Data
(iii) Schedules to Bid (Samples)
(iv) Schedule of Prices (Format)
(v) Contract Data
(vi) Specifications
(vii) Drawings, if any

The Procuring agency's attention is drawn to the following while finalizing the Bidding Documents.

C. Notice Inviting Tender/ Invitation for Bids/ Request for Expression of Interest

The "Notice Inviting Tender" is meant for publication of tenders for calling bids in the newspapers and SPPRA Website.

The blank spaces wherever shown are required to be filled by the Procuring Agency before issuance of Bidding Documents.

The Procuring Agency may modify para 1 of Notice Inviting Tender as per its requirements. The notice should be published so as to give the interested bidders sufficient working period for preparation and submission of bids – not less than 15 days for National Competitive Bidding and 45 days for International Competitive Bidding (SPP Rule 18).

1. The eligible bidders are defined in IB.2; the text can be amended by the Procuring Agency as deemed appropriate.

2. The non-refundable fee for the sale of Bidding Documents should be nominal so as to cover printing/reproduction and mailing costs and to ensure that only bona-fide bidders shall apply (SPP Rule 20).

3. The amount of Bid Security should be a lump sum figure or a percentage, but not less than 1% and more than 5% of bid price and should be in accordance with IB.13.1 (SPP Rule 37).

4. If the venue of receipt of bids and the opening of bids is the same, the times for receipt and opening of bids are to be entered in last Para of the Notice Inviting Tender, otherwise indicate the name, address and exact location for the opening of bids. However the date for the receipt and the opening of bids shall be same (SPP Rule 41).

D. Instructions to Bidders

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

The Instructions to Bidders can be used as given. Procuring agency may have to make changes under Bidding Data.

The Procuring Agency's or Engineer's Representative, if any, shall exercise powers of the Engineer/Procuring Agency under and in connection with Clauses IB.5, IB.6, IB.16, etc. In

case an Engineer has been appointed by the Procuring Agency, the aforesaid clauses may be modified accordingly to specify the role of the Engineer by the Procuring Agency, otherwise the Engineer's reference wherever exist, except Sub-Clause 1.1.20 & Clause 15 of Conditions of Contract and Item 1.1.20 of Contract Data, shall be deleted.

E. Bidding Data

The blank spaces wherever shown in Bidding Data are required to be filled by the Engineer/Procuring Agency before issuance of Bidding Documents.

1. Contents of IB.10.3 may be retained or modified by the Procuring Agency.
2. Procuring Agency should insert required experience in IB.11.2.
3. Referring to IB.14.1, the period of bid validity may range from 30 to 90 days depending upon the size and nature of the works. Number of days shall be filled in as per Procuring Agency's requirements.
4. Contents of IB.16.3 to IB.16.8 may be retained or modified by the Procuring Agency in accordance with its requirements.

F. Schedules to Bid

Specimen of Schedules to Bid including format of Schedule of Prices are provided in this document. The Procuring Agency may add/delete/modify as per its requirement.

The blank spaces wherever shown are required to be filled by the Engineer/Procuring Agency before issuance of Bidding Documents except those required to be provided by the Contractor.

G. Conditions of Contract

The procuring agency while preparing Contract Data, shall ensure that no Clause of Conditions of Contract is deleted and that the changes included in Contract Data shall be such as not to change the spirit of the document. Any adjustment or change in clauses of Conditions of Contract to meet specific project features shall be made with care and incorporated in Contract Data.

H. Contract Data

The blank spaces wherever shown are required to be filled by the Engineer/Procuring Agency before issuance of Bidding Documents.

1. Referring to Sub-Clause 1.1.1 of Conditions of Contract, the Engineer/Procuring Agency may add, in order of priority, such other documents as to form part of the Contract, in Sub-Clause 1.3 of the Contract Data.

2. The Procuring Agency's Representative, if any, shall exercise powers of the Procuring Agency under and in connection with Sub-Clauses 1.3, 2.3, 4.2, 4.3, 5.1, 7.3, 8.2, 9.1, 9.2, 10.1, 10.2. 10.5, 11.1, 11.5, 12.1, 13.2 and 14.1 of the Conditions of Contract. In case an Engineer has been appointed by the Procuring Agency, the aforesaid clauses may be modified accordingly by the Procuring Agency.

3. The sum insured for different insurances including minimum amount of third party insurance should be assessed by the Engineer/Procuring Agency and entered in Contract Data. Such insurance cover shall be carried out with Insurance Company having at least AA rating from PACRA / JCR in the favour of the procuring agency.

4. The time for completion of the whole of the works should be assessed by the Engineer/Procuring Agency and entered in the Contract Data.

5. The Conditions of Contract contain no overall limit on the Contractor's liability. The amount of **liquidated damages** per day of delay shall be entered by the Engineer/Procuring Agency in Contract Data. Usually the liquidated damages are set between **0.05 percent and 0.10 percent per day and the maximum limit as 10 percent of contract price stated in the Letter of Acceptance.**

6. Any amendment and/or additions to the Conditions of the Contract that are specific to a given Bid/Contract should be included by the Procuring agency. This may include but not be limited to the provisions regarding the following:

   a) Terms of Payment should be prepared and incorporated in Contract Data by the Engineer/Procuring Agency.

   b) The Engineer/Procuring Agency to make sure that all taxes and duties are included by the Bidders/Contractors in their prices.

I. Specifications

To be prepared and incorporated by the Engineer/Procuring Agency

J. Drawings

To be prepared and incorporated by the Engineer/Procuring Agency, if required.

Summary of Contents

INVITATION FOR BIDS

INVITATION FOR BIDS

Bid Reference No.:PD/MUET/KHP/-145 Dated:05.06.2015

1. The Procuring Agency, **Mehran University of Engineering & Technology Khairpur Mirs** invites sealed Percentage/Item Rate Tenders from contractor/firm registered in Pakistan Engineering Council in category C-6 and above for the work, **Construction of 1.0 Lac Gallon Under Ground Water Tank & Pump Room including Pumping Machinery for Z.A Bhutto Campus at Mehran University of Engineering & Technology Khairpur Mirs,** which will be completed in (03) three months.

2. A complete set of Bidding Documents may be purchased by an interested eligible bidder on submission of a written application to the office given below and upon payment of a non-refundable fee of Rupees 3000/- Bidders may acquire the Bidding Documents from the Office of the Procuring Agency, at **Mehran University of Engineering & Technology Khairpur Mirs**

3. All bids must be accompanied by a Bid Security/Earnest Money in the amount of two percentage (2%) of bid price in the form of *pay order / demand draft* and must be delivered to office and in favor of **Mehran University of Engineering & Technology Khairpur Mirs** on or before 12:00 noon, on date 26.06.2015 Bids will be opened at 12:30 pm on the same day in the presence of bidder's representatives who choose to attend, at the same address. Any bid with conditional or un-accompanied of the earnest money will not be considered in the bidding process.

INSTRUCTIONS
TO BIDDERS
&
BIDDING DATA

Notes on the Instructions to Bidders

This section of the bidding documents should provide the information necessary for bidders to prepare responsive bids, in accordance with the requirements of the Procuring Agency. It should also give information on bid submission, opening and evaluation, and on the award of contract.

Matters governing the performance of the Contract or payments under the Contract, or matters affecting the risks, rights, and obligations of the parties under the Contract are not normally included in this Section, but rather in the appropriate sections of the *Conditions of Contract* and/or *Contract Data.*

TABLE OF CONTENTS

INSTRUCTIONS TO BIDDERS

INSTRUCTIONS TO BIDDERS

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

A. GENERAL

IB.1 Scope of Bid & Source of Funds

1.1 Scope of Bid

The Procuring Agency as defined in the Bidding Data (hereinafter called "the Procuring Agency") wishes to receive Bids for the Works summarized in the Bidding Data (hereinafter referred to as "the Works").

Bidders must quote for the complete scope of work. Any Bid covering partial scope of work will be rejected as non-responsive.

1.2 Source of Funds

The Procuring Agency has arranged funds from its own sources or *Federal/ Provincial /Donor agency or any other source,* which may be indicated accordingly in bidding data towards the cost of the project/scheme.

IB.2 Eligible Bidders

2.1 Bidding is open to all firms and persons meeting the following requirements:

a) duly licensed by the Pakistan Engineering Council (PEC) in the appropriate category for value of works.

Provided that the works costing Rs. 2.5 million or less shall not require any registration with PEC .

b) duly pre-qualified with the Procuring Agency. (*Where required*).

In the event that prequalification of potential bidders has been undertaken, only bids from prequalified bidders will be considered for award of Contract.

c) if prequalification has not undertaken , the procuring agency may ask information and documents not limited to following:-
   (i) company profile;
   (ii) works of similar nature and size for each performed in last *3/5* years;
   (iii) construction equipments;
   (iv) qualification and experience of technical personnel and key site management;

(v) financial statement of last 3 years;
(vi) information regarding litigations and abandoned works if any.

IB.3 Cost of Bidding

3.1 The bidder shall bear all costs associated with the preparation and submission of its bid and the Procuring Agency will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process (SPP Rules 24 & 25).

B. BIDDING DOCUMENTS

IB.4 Contents of Bidding Documents

4.1 In addition to Invitation for Bids, the Bidding Documents are those stated below, and should be read in conjunction with any Addendum issued in accordance with Sub-Clause IB.6.1.

1. Instructions to Bidders & Bidding Data
2. Form of Bid, Qualification Information & Schedules to Bid
   Schedules to Bid comprise the following:
   (i) Schedule A: Schedule of Prices/ Bill of Quantities (BoQ).
   (ii) Schedule B: Specific Works Data
   (iii) Schedule C: Works to be Performed by Subcontractors
   (iv) Schedule D: Proposed Programme of Works
   (v) Schedule E: Method of Performing Works
   (vi) Schedule F: Integrity Pact (works costing Rs 10 million and above)
3. Conditions of Contract & Contract Data
4. Standard Forms:
   (i) Form of Bid Security,
   (ii) Form of Performance Security;
   (iii)Form of Contract Agreement;
   (iv) Form of Bank Guarantee for Advance Payment.
5. Specifications
6. Drawings, if any

IB.5 Clarification of Bidding Documents

5.1 A prospective bidder requiring any clarification(s) in respect of the Bidding Documents may notify the Engineer/Procuring Agency at the Engineer's/ Procuring Agency's address indicated in the Bidding Data.

5.2 An interested bidder, who has obtained bidding documents, may request for clarification

of contents of bidding documents in writing and procuring agency shall respond to such quarries in writing within three calendar days, provided they are received at least five calendar days prior to the date of opening of bid (SPP Rule 23-1).

IB.6 Amendment of Bidding Documents (SPP Rules 22(2) & 22).

6.1 At any time prior to the deadline for submission of Bids, the Procuring Agency may, for any reason, whether at his own initiative or in response to a clarification requested by a interested bidder, modify the Bidding Documents by issuing addendum.

6.2 Any addendum thus issued shall be part of the Bidding Documents pursuant to Sub-Clause 6.1 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 Procuring Agency.

6.3 To afford interested bidders reasonable time in which to take an addendum into account in preparing their Bids, the Procuring Agency may at its discretion extend the deadline for submission of Bids.

C. PREPARATION OF BIDS

IB.7 Language of Bid

7.1 All documents relating to the Bid shall be in the language specified in the Contract Data.

IB.8 Documents Comprising the Bid

8.1 The Bid submitted by the bidder shall comprise the following:

(a) Offer /Covering Letter
(b) Form of Bid duly filled, signed and sealed, in accordance with IB.14.3.
(c) Schedules (A to F) to Bid duly filled and initialed, in accordance with the instructions contained therein & in accordance with IB.14.3.
(d) Bid Security furnished in accordance with IB.13.
(e) Power of Attorney in accordance with IB 14.5.
(f) Documentary evidence in accordance with IB.2(c) & IB.11
(g) Documentary evidence in accordance with IB.12.

IB.9 Sufficiency of Bid

9.1 Each bidder shall satisfy himself before Bidding as to the correctness and sufficiency of his Bid and of the premium on the rates of CSR / rates and prices quoted/entered in the Schedule of Prices, which rates and prices shall except in so far as it is otherwise expressly provided in the Contract, cover all his obligations under the Contract and all matters and things necessary for the proper completion of the works.

9.2 The bidder is advised to obtain for himself at his own cost and responsibility all information that may be necessary for preparing the bid and entering into a Contract for execution of the Works.

IB.10 Bid Prices, Currency of Bid and Payment

10.1 The bidder shall fill up the Schedule of Prices (Schedule A to Bid) indicating the percentage above or below the Composite Schedule of Rates/unit rates and prices of the Works to be performed under the Contract. Prices in the Schedule of Prices/Bill of Quantities shall be quoted entirely in Pak Rupees keeping in view the instructions contained in the Preamble to Schedule of Prices.

10.2 Unless otherwise stipulated in the Conditions of Contract, prices quoted by the bidder shall remain fixed during the bidder's performance of the Contract and not subject to variation on any account.

10.3 The unit rates and prices in the Schedule of Prices or percentage above or below on the composite schedule of rates shall be quoted by the bidder in the currency as stipulated in Bidding Data.

10.4 Items for which no rate or price is entered by the Bidder will not be paid for by the Procuring Agency when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities.

IB.11 Documents Establishing Bidder's Eligibility and Qualifications

11.1 Pursuant to Clause IB.8, the bidder shall furnish, as part of its bid, documents establishing the bidder's eligibility to bid and its qualifications to perform the Contract if its bid is accepted.

11.2 Bidder must possess and provide evidence of its capability and the experience as stipulated in Bidding Data and the Qualification Criteria mentioned in the Bidding Documents.

IB.12 Documents Establishing Works' Conformity to Bidding Documents

12.1 The documentary evidence of the Works' conformity to the Bidding Documents may be in the form of literature, drawings and data and the bidder shall furnish documentation as set out in Bidding Data.

12.2 The bidder shall note that standards for workmanship, material and equipment, and references to brand names or catalogue numbers, if any, designated by the Procuring Agency in the Technical Provisions are intended to be descriptive only and not restrictive.

IB.13 Bid Security

13.1 Each bidder shall furnish, as part of his bid, at the option of the bidder, a Bid Security as percentage of bid price/estimated cost or in the amount stipulated in Bidding Data in Pak. Rupees in the form of *Deposit at Call/ Payee's Order or a Bank Guarantee* issued by a Scheduled Bank in Pakistan in favour of the Procuring Agency valid for a period up to twenty eight (28) days beyond the bid validity date (*Bid security should not be below 1%.and not exceeding 5% of bid price/estimated cost SPP Rule 37*).

13.2 Any bid not accompanied by an acceptable Bid Security shall be rejected by the Procuring Agency as non-responsive.

13.3 The bid securities of unsuccessful bidders will be returned upon award of contract to the successful bidder or on the expiry of validity of Bid Security whichever is earlier.

13.4 The Bid Security of the successful bidder will be returned when the bidder has furnished the required Performance Security, and signed the Contract Agreement (SPP Rule 37).

13.5 The Bid Security may be forfeited:

(a) if a bidder withdraws his bid during the period of bid validity; or
(b) if a bidder does not accept the correction of his Bid Price, pursuant to Sub-Clause 16.4 (b) hereof; or
(c) in the case of a successful bidder, if he fails within the specified time limit to:

(i) furnish the required Performance Security or
(ii) sign the Contract Agreement.

IB.14 Validity of Bids, Format, Signing and Submission of Bid

14.1 Bids shall remain valid for the period stipulated in the Bidding Data after the date of bid opening.

14.2 In exceptional circumstances, Procuring Agency may request the bidders to extend the period of validity for a additional period but not exceeding 1/3 of the original period.The request and the bidders' responses shall be made in writing or by cable. A Bidder may refuse the request without forfeiting the Bid Security. A Bidder agreeing to the request will not be required or permitted to otherwise modify the Bid, but will be required to extend the validity of Bid Security for the period of the extension, and in compliance with IB.13 in all respects (SPP Rule 38).

14.3 All Schedules to Bid are to be properly completed and signed.

14.4 No alteration is to be made in the Form of Bid except in filling up the blanks as directed. If any alteration be made or if these instructions be not fully complied with, the bid may be rejected.

14.5 Each bidder shall prepare Original and number of copies specified in the Bidding Data of the documents comprising the bid as described in IB.8 and clearly mark them "ORIGINAL" and "COPY" as appropriate. In the event of discrepancy between them, the original shall prevail.

14.6 The original and all copies of the bid shall be typed or written in indelible ink and shall be signed by a person or persons duly authorized to sign (in the case of copies, Photostats are also acceptable). This shall be indicated by submitting a written Power of Attorney authorising the signatory of the bidder to act for and on behalf of the bidder. All pages of the bid shall be initialed and official seal be affixed by the person or persons signing the bid.

14.7 The Bid shall be delivered in person or sent by registered mail at the address to Procuring Agency as given in Bidding Data.

D. SUBMISSION OF BID

IB.15 Deadline for Submission, Modification & Withdrawal of Bids

15.1 Bids must be received by the Procuring Agency at the address/provided in Bidding Data not later than the time and date stipulated therein.

15.2 The inner and outer envelopes shall

(a) be addressed to the Procuring Agency at the address provided in the Bidding Data;
(b) bear the name and identification number of the Contract as defined in the Bidding and Contract Data; and
(c) provide a warning not to open before the specified time and date for Bid opening as defined in the Bidding Data.
(d) in addition to the identification required in 15.2, the inner envelopes shall indicate the name and address of the Bidder to enable the Bid to be returned unopened in case it is declared late.
(e) If the outer envelope is not sealed and marked as above, the Procuring Agency will assume no responsibility for the misplacement or premature opening of the Bid.

15.3 Bids submitted through telegraph, telex, fax or e-mail shall not be considered.

15.4 Any bid received by the Procuring Agency after the deadline for submission prescribed in Bidding Data will be returned unopened to such bidder.

15.5 Any bidder may modify or withdraw his bid after bid submission provided that the modification or written notice of withdrawal is received by the Procuring Agency prior to the deadline for submission of bids.

15.6 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 pursuant to IB.13.5 (a).

E. BID OPENING AND EVALUATION

IB.16 Bid Opening, Clarification and Evaluation (SPP Rules 41, 42 & 43)

16.1 The Procuring Agency will open the bids, in the presence of bidders' representatives who choose to attend, at the time, date and in the place specified in the Bidding Data.

16.2 The bidder's name, Bid Prices, any discount, the presence or absence of Bid Security, and such other details as the Procuring Agency at its discretion may consider appropriate, will be announced by the Procuring Agency at the bid opening. The Procuring Agency will record the minutes of the bid opening. Representatives of the bidders who choose to attend shall sign the attendance sheet.

Any Bid Price or discount which is not read out and recorded at bid opening will not be taken into account in the evaluation of bid.

16.3 To assist in the examination, evaluation and comparison of Bids the Engineer/Procuring Agency may, at its discretion, ask the bidder for a clarification of its Bid. The request for clarification and the response shall be in writing and no change in the price or substance of the Bid shall be sought, offered or permitted (SPP Rule 43).

16.4 (a) Prior to the detailed evaluation, pursuant to IB.16.7 to 16.9, the Engineer/Procuring Agency will determine the substantial responsiveness of each bid to the Bidding Documents. For purpose of these instructions, a substantially responsive bid is one which conforms to all the terms and conditions of the Bidding Documents without material deviations. It will include determining the requirements listed in Bidding Data.

(b) Arithmetical errors will be rectified on the following basis:

If there is a discrepancy between the unit price and total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected. If there is a discrepancy between the words and figures the amount in words shall prevail. If there is a discrepancy between the Total Bid price entered in Form of Bid and the total shown in Schedule of Prices-Summary, the amount stated in the Form of Bid will be corrected by the Procuring Agency in accordance with the Corrected Schedule of Prices.

If the bidder does not accept the corrected amount of Bid, his Bid will be rejected and his Bid Security forfeited.

16.5 A Bid determined as substantially non-responsive will be rejected and will not subsequently be made responsive by the bidder by correction of the non-conformity.

16.6 Any minor informality or non-conformity or irregularity in a Bid which does not constitute a material deviation **(major deviation)** may be waived by Procuring Agency,

provided such waiver does not prejudice or affect the relative ranking of any other bidders.

(A). Major (material) Deviations include:-

(i) has been not properly signed;
(ii) is not accompanied by the bid security of required amount and manner;
(iii) stipulating price adjustment when fixed price bids were called for;
(iv) failing to respond to specifications;
(v) failing to comply with Mile-stones/Critical dates provided in Bidding Documents;
(vi) sub-contracting contrary to the Conditions of Contract specified in Bidding Documents;
(vii) refusing to bear important responsibilities and liabilities allocated in the Bidding Documents, such as performance guarantees and insurance coverage;
(viii) taking exception to critical provisions such as applicable law, taxes and duties and dispute resolution procedures;
(ix) a material deviation or reservation is one :
  (a) which affect in any substantial way the scope, quality or performance of the works;
  (b) adoption/rectification whereof would affect unfairly the competitive position of other bidders presenting substantially responsive bids.

(B) Minor Deviations

Bids that offer deviations acceptable to the Procuring Agency and which can be assigned a monetary value may be considered substantially responsive at least as to the issue of fairness. This value would however be added as an adjustment for evaluation purposes only during the detailed evaluation process.

16.7 The Engineer/Procuring Agency will evaluate and compare only the bids previously determined to be substantially responsive pursuant to IB.16.4 to 16.6 as per requirements given hereunder. Bids will be evaluated for complete scope of works. The prices will be compared on the basis of the Evaluated Bid Price pursuant to IB.16.8 herein below.

Technical Evaluation: It will be examined in detail whether the works offered by the bidder complies with the Technical Provisions of the Bidding Documents. For this purpose, the bidder's data submitted with the bid in Schedule B to Bid will be compared with technical features/criteria of the works detailed in the Technical Provisions. Other technical information submitted with the bid regarding the Scope of Work will also be reviewed.

16.8 Evaluated Bid Price

In evaluating the bids, the Engineer/Procuring Agency will determine for each bid in addition to the Bid Price, the following factors (adjustments) in the manner and to the extent indicated below to determine the Evaluated Bid Price:

(i) making any correction for arithmetic errors pursuant to IB.16.4 hereof.

(ii) discount, if any, offered by the bidders as also read out and recorded at the time of bid opening.

(iii) excluding **provisional sums** and the provisions for **contingencies** in the Bill of Quantities **if any**, but including **Day work,** where priced competitively.

IB.17 Process to be Confidential

17.1 Subject to IB.16.3 heretofore, no bidder shall contact Engineer/Procuring Agency on any matter relating to its Bid from the time of the Bid opening to the time the bid evaluation result is announced by the Procuring Agency. The evaluation result shall be announced at least seven (07) days prior to award of Contract (SPP Rule 45). 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.

17.2 Any effort by a bidder to influence Engineer/Procuring Agency in the Bid evaluation, Bid comparison or Contract Award decisions may result in the rejection of his Bid. Whereas any bidder feeling aggrieved, may lodge a written complaint to Complaint Redressal Committee as per terms and conditions mentioned in SPP Rules 31 & 32. However, mere fact of lodging a complaint shall not warrant suspension of procurement process.

17.3 Bidders may be excluded if involved in **"Corrupt and Fraudulent Practices"** means either one or any combination of the practices given below SPP Rule2(q);

(i) "**Coercive Practice**" means any impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence the actions of a party to achieve a wrongful gain or to cause a wrongful loss to another party;

(ii) "**Collusive Practice**" means any arrangement between two or more parties to the procurement process or contract execution, designed to achieve with or without the knowledge of the procuring agency to establish prices at artificial, noncompetitive levels for any wrongful gain;

(iii) **"Corrupt Practice"** means the offering, giving, receiving or soliciting, directly or indirectly, of anything of value to influence the acts of another party for wrongful gain;

(iv) "**Fraudulent Practice"** means any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;

(v) **"Obstructive Practice"** means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in a procurement process, or affect the execution of a contract or deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements before investigators in order to materially impede an investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation, or acts intended to materially impede the exercise of inspection and audit rights provided for under the Rules

F. AWARD OF CONTRACT

IB.18. Post Qualification

18.1 The Procuring Agency, at any stage of the bid evaluation, having credible reasons for or *prima facie* evidence of any defect in contractor's capacities, may require the 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.

18.2 The determination will take into account the bidder's financial and technical capabilities. It will be based upon an examination of the documentary evidence of the bidders' qualifications submitted under B.11, as well as such other information required in the Bidding Documents.

IB.19 Award Criteria & Procuring Agency's Right

19.1 Subject to IB.19.2, the Procuring Agency 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 qualified to satisfactory perform the Contract in accordance with the provisions of the IB.18.

19.2 Not withstanding IB.19.1, the Procuring Agency 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 to inform the affected bidders of the grounds for the Procuring Agency's action except that the grounds for its rejection of all bids shall upon request be communicated, to any bidder who submitted a bid, without justification of the grounds. Notice of the rejection of all the bids shall be given promptly to all the bidders (SPP Rule 25).

IB.20 Notification of Award & Signing of Contract Agreement

20.1 Prior to expiration of the period of bid validity prescribed by the Procuring Agency, the Procuring Agency will notify the successful bidder in writing ("Letter of Acceptance") that his bid has been accepted (SPP Rule 49).

20.2 Within seven (07) days from the date of furnishing of acceptable Performance Security under the Conditions of Contract, the Procuring Agency will send the successful bidder the Form of Contract Agreement provided in the Bidding Documents, incorporating all agreements between the parties.

20.3 The formal Agreement between the Procuring Agency and the successful bidder duly stamped at rate of ----% of bid price(updated from time to time) stated in Letter of Acceptance shall be executed within seven (07) days of the receipt of Form of Contract Agreement by the successful bidder from the Procuring Agency.

IB.21 Performance Security

21.1 The successful bidder shall furnish to the Procuring Agency a Performance Security in the form and the amount stipulated in the Conditions of Contract within a period of fourteen (14) days after the receipt of Letter of Acceptance (SPP 39).

21.2 Failure of the successful bidder to comply with the requirements of Sub-Clauses IB.20.2 & 20.3 or 21.1 or Clause IB.22 shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Security.

21.3 Publication of Award of Contract: within seven days of the award of contract, the procuring shall publish on the website of the authority and on its own website, if such a website exists, the results of the bidding process, identifying the bid through procurement identifying Number if any and the following information:

(1) Evaluation Report;

(2) Form of Contract and letter of Award;

(3) Bill of Quantities or Schedule of Requirements. (SPP Rule 50)

IB.22 Integrity Pact The Bidder shall sign and stamp the Form of Integrity Pact provided at Schedule-F to Bid in the Bidding Document for all Sindh Government procurement contracts exceeding Rupees ten (10) million. Failure to provide such Integrity Pact shall make the bid non-responsive (SPP Rule 89).

BIDDING DATA

The following specific data for the works to be tendered 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 Procuring Agency: Mehran University of Engineering & Technology Khairpur Mirs**

Brief Description of Works: This work consists of **Construction of 1.0 Lac Gallon Under Ground Water Tank & Pump Room including Pumping Machinery for Z.A Bhutto Campus at Mehran University of Engineering & Technology Khairpur Mirs,**

5.1 (a) Procuring Agency's address: Mehran University of Engineering & Technology Khairpur Mirs,

(b) Engineer's address:

RCC Consultants
Ground Floor RCC Complex Main
Road, Qasimabad Hyderabad
Phones No 022-2652957,
Fax no 022-2655833
E-mail: rcc.consultants@rccgoc.com

10.3 Bid shall be quoted entirely in Pak. Rupees. The payment shall be made in Pak. Rupees.

11.2 The bidder has the financial, technical and constructional capability necessary to perform the Contract as follows:
i. Financial capacity: (must have annual average turnover of Rs 10 Million of last 05 years);
ii. Technical capacity: Category of registration with PEC C-6 or above

12.1 (a) A detailed description of the Works, essential technical and performance characteristics.

(b) Comp ete set of technical information, description data, literature and drawings as required i n accordance with BOQ, Specific Works Data. This will include but not be limited to a sufficient number of drawings, photographs, catalogues, illustrations and such othe· information as is necessary to illustrate clearly the significant characteristics such as general construction dimensions and other relevant information about the works to be performed.

13.1 Amount of Bid Security/Earnest Money: 2% of total bid amount

14.1 Period of Bid Validity: 90 days

14.4 Number of Copies of the Bid to be submitted: One original only.

14.6 (a) Procuring Agency's Address for the Purpose of Bid Submission:

Project Director Mehran University of Engineering & Technology Khairpur Mir's

15.1 Deadline for Submission of Bids: Time: 12:00 Noon

16.1 Venue, Time, and Date of Bid Opening

Venue: Project Director Mehran University of Engineering & Technology Khairpur Mir's

Time: 12:30 p.m

Date: 26.06.2015

16.4 Responsiveness of Bids

(i) Bid is valid till required period,

(ii) Bid prices are firm during currency of contract/Fixed Price Contract;
(iii) Completion period offered is within specified limits,
(iv) Bidder is eligible to Bid and possesses the requisite experience, capability and qualification.
(v) Bid does not deviate from basic technical requirements and
(vi) Bids are generally in order, etc.

(a) **Fixed Price contract**: In these contracts no escalation will be provided during currency of the contract.

(b) **Price adjustment contract**: In these contracts escalation will be paid only on those items and in the manner as notified by Finance Department, Government of Sindh, after bid opening during currency of the contract. **(NOT APPLICABLE)**

FORM OF BID AND SCHEDULES TO BID

FORM OF BID
(LETTER OF OFFER)

Bid Reference No. _____

_____

_____

(Name of Works)

To:

_____

_____

_____

Gentlemen,

1. Having examined the Bidding Documents including Instructions to Bidders, Bidding Data, Conditions of Contract, Contract Data, Specifications, Drawings, if any, Schedule of Prices and Addenda Nos. _____ for the execution of the above-named works, we, the undersigned, being a company doing business under the name of and address _____ _____ and being duly incorporated under the laws of Pakistan hereby offer to execute and complete such works and remedy any defects therein in conformity with the said Documents including Addenda thereto for the Total Bid Price of Rs_____(Rupees_____) or such other sum as may be ascertained in accordance with the said Documents.

2. We understand that all the Schedules 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 _____ _____ drawn in your favour or made payable to you and valid for a period of twenty eight (28) days beyond the period of validity of Bid.

4. We undertake, if our Bid is accepted, to commence the Works and to deliver and complete the Works comprised in the Contract within the time(s) stated in Contract Data.

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 undertake, if our Bid is accepted, to execute the Performance Security

referred to in Conditions of Contract for the due performance of the Contract.

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

9. We do hereby declare that the Bid is made without any collusion, comparison of figures or arrangement with any other person or persons making a bid for the Works.

Dated this _____day of _____, 20

Signature _____

in the capacity of _____duly authorized to sign bid for and on behalf of _____

(Name of Bidder in Block Capitals)

(Seal)

Address

_____

_____

_____

Witness:

(Signature)_____

Name:_____

Address: _____

_____

[SCHEDULES TO BID INCLUDE THE FOLLOWING:

- Schedule A to Bid: Schedule of Prices
- Schedule B to Bid: Specific Works Data
- Schedule C to Bid: Works to be Performed by Subcontractors
- Schedule D to Bid: Proposed Program of Works
- Schedule E to Bid: Method of Performing Works
- Schedule F to Bid: Integrity Pact]

SCHEDULE – A TO BID

SCHEDULE OF PRICES

* *[To be prepared by the Engineer/Procuring Agency]*

PREAMBLE TO SCHEDULE OF PRICES

1. General

1.1 The Schedule of Prices shall be read in conjunction with the Conditions of Contract, Contract Data together with the Specifications and Drawings, if any.

1.2 The Contract shall be for the whole of the works as described in these Bidding Documents. Bids must be for the complete scope of works.

2. Description

2.1 The general directions and descriptions of works and materials are not necessarily repeated nor summarized in the Schedule of Prices. References to the relevant sections of the Bidding Documents shall be made before entering prices against each item in the Schedule of Prices.

3. Units & Abbreviations

3.1 Units of measurement, symbols and abbreviations expressed in the Bidding Documents shall comply with the Systeme Internationale d' Unites (SI Units).

_____

_____

(Note: The abbreviations to be used in the Schedule of Prices to be defined by the Procuring Agency).

4. Rates and Prices

4.1 Except as otherwise expressly provided under the Conditions of Contract, the rates and amounts entered in the Schedule of Prices shall be the rates at which the Contractor shall be paid and shall be the full inclusive value of the works set forth or implied in the Contract; except for the amounts reimbursable, if any to the Contractor under the Contract.

4.2 Unless otherwise stipulated in the Contract Data, the premium, rates and prices entered by the bidder shall not be subject to adjustment during the performance of the Contract.

4.3 All duties, taxes and other levies payable by the Contractor shall be included in the rates and prices.

4.4 The whole cost of complying with the provisions of the Contract shall be included in the items provided in the Schedule of Prices, 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 and no separate payment will be made for those items.
The rates, prices and amounts shall be entered against each item in the Schedule of Prices. Any item against which no rate or price is entered by the bidder will not be paid for by the Procuring Agency when executed and shall be deemed covered by the rates and prices for other items in the Schedule of Prices.

4.5 (a) The bidder shall be deemed to have obtained all information as to and all requirements related thereto which may affect the bid price.
(b) The Contractor shall be responsible to make complete arrangements for the transportation of the plant to the site. Such cost shall be inbuilt in his quoted rates.

4.6 The Contractor shall provide for all parts of the Works to be completed in every respect. Notwithstanding that any details, accessories, etc. required for the complete installation and satisfactory operation of the Works, are not specifically mentioned in the Specifications, such details shall be considered as included in the Contract Price.

5. Bid Prices

5.1 Break-up of Bid Prices
The various elements of Bid Prices shall be quoted as detailed by the Procuring Agency in the format of Schedule of Prices. The bidder shall recognize such elements of the costs which he expects to incur the performance of the Works and shall include all such costs in the rates and amounts entered in the Schedule of Prices.

5.2 Tota Bid Price
The total of bid prices in the Schedule of Prices shall be entered in the Summary of Bid Prices.

6. Provisional Sums and Day work

6.1 Provisional Sums included and so designated in the Schedule of Prices if any, shall be expended in whole or in part at the direction and discretion of the Engineer/Procuring Agency. The Contractor will only receive payment in respect of Provisional Sums, if he has been instructed by the Engineer/Procuring Agency to utilize such sums.

6.2 Day work rates in the contractor's bid are to be used for small additional amounts of work and only when the Engineer have given written instructions in advance for additional work to be paid for in that way.

SCHEDULE OF PRICES – SUMMARY OF BID PRICES (Sample)

Bill No.	Description	Total Amount (Rs)
	(A) Building Work	
1.	Civil works	
2	Internal sanitary and water supply	
3	Electrification	
4	External Development works	
5	Miscellaneous Items	
	(B) Road Work.	
1.	Earthwork	
2.	Hard Crust and Surface Treatment	
3.	Culverts and Bridges	
4.	Miscellaneous Items	
	(C) Public Health Engineering Works.	
1.	Earthwork	
2.	Subsurface Drains	
3.	Pipe Laying and Man holes	
4.	Tube wells, Pump houses	
5.	Compound wall	
6.	Miscellaneous Items	
	Total Bid Price (The amount to be entered in Paragraph 1 of the Form of Bid) (In words).	

NOT APPLICABLE

SCHEDULE OF PRICES

Item No.	Description	Quantity	Unit Rate(Rs)	Total Amount (Rs)
	I. (Civil works)			
1.				
2.				
3.				
	II.Internal sanitary and water supply.			
1.				
2.				
3.				
	III. Electrification.			
1.				
2.				
3.				
	IV. External Development works.			
1.				
2.				
3.				
1.	**V. Miscellaneous Items**			
2.				
3.				
Total *(to be carried to Summary of Bid Price)*				
Add/ Deduct the percentage quoted above/below on the prices of items based on Composite Schedule of Rates.				

NOT APPLICABLE

*SPECIFIC WORKS DATA

(To be prepared and incorporated by the Procuring Agency)

Not applicable

NOT APPLICABLE

(Note: The Procuring Agency shall spell out the information & data required to be filled out by the bidder and to furnish complementary information).

SCHEDULE – C TO BID

WORKS TO BE PERFORMED BY SUBCONTRACTORS*

The bidder will do the work with his own forces except the work listed below which he intends to sub-contract.

Items of Works to be Sub-Contracted	Name and address of Sub-Contractors	Statement of similar works previously executed. *(attach evidence)*

Note:

* *The Procuring Agency should decide whether to allow subcontracting or not.*

In case Procuring Agency decides to allow subcontracting then following conditions shall be complied with:

1. No change of Sub-Contractors shall be made by the bidder without prior approval of the Procuring Agency.

2. The truthfulness and accuracy of the statement as to the experience of Sub-Contractors is guaranteed by the bidder. The Procuring Agency's judgment shall be final as to the evaluation of the experience of Sub-Contractors submitted by the bidder.

3. Statement of similar works shall include description, location & value of works, year completed and name & address of the clients.

SCHEDULE – D TO BID

PROPOSED PROGRAMME OF WORKS

Bidder shall provide a programme in a bar-chart or Program Evaluation and Review Technique (PERT) or Critical Path Method (CPM) showing the sequence of work items by which he proposes to complete the works of the entire Contract. The programme should indicate the sequence of work items and the period of time during which he proposes to complete the works including the activities like designing, schedule of submittal of drawings, ordering and procurement of materials, manufacturing, delivering, construction of civil works, erection, testing and commissioning of works to be supplied under the Contract.

SCHEDULE – E TO BID

METHOD OF PERFORMING WORKS

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

- The sequence and methods in which he proposes to carry out the Works, including the number of shifts per day and hours per shift, he expects to work.
- A list of all major items of construction and plant erection, tools and vehicles proposed to be used in delivering/carrying out the works at site.
- The procedure for installation of equipment and transportation of equipment and materials to the site.
- Organisation chart indicating head office & field office personnel involved in management, supervision and engineering of the Works to be done under the Contract.

SCHEDULE – F TO BID

(INTEGRITY PACT)

DECLARATION OF FEES, COMMISSION AND BROKERAGE ETC PAYABLE BY CONTRACTORS
(FOR CONTRACTS WORTH RS. 10.00 MILLION OR MORE)

Contract No._____ Dated _____
Contract Value: _____
Contract Title: _____

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

Without limiting the generality of the foregoing, [name of Contractor] represents and warrants that it has fully declared the brokerage, commission, 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, from Procuring Agency (PA) except that which has been expressly declared pursuant hereto.

[name of Contractor] accepts full responsibility and strict liability 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 PA and has not taken any action or will not take any action to circumvent the above declaration, representation or warranty.

[name of Contractor] 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 PA under any law, contract or other instrument, be voidable at the option of PA.

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

.....
[Procuring Agency]

[Contractor]

CONDITIONS OF CONTRACT

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CONDITIONS OF CONTRACT

CONDITIONS OF CONTRACT

1. GENERAL PROVISIONS

1.1 Definitions

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

The Contract

1.1.1 "Contract" means the Contract Agreement and the other documents listed in the Contract Data.

1.1.2 "Specifications" means the document as listed in the Contract Data, including Procuring Agency's requirements in respect of design to be carried out by the Contractor (if any), and any Variation to such document.

1.1.3 "Drawings" means the Procuring Agency's drawings of the Works as listed in the Contract Data, and any Variation to such drawings.

Persons

1.1.4 "Procuring Agency" means the person named in the Contract Data and the legal successors in title to this person, but not (except with the consent of the Contractor) any assignee.

1.1.5 "Contractor" means the person named in the Contract Data and the legal successors in title to this person, but not (except with the consent of the Procuring Agency) any assignee.

1.1.6 "Party" means either the Procuring Agency or the Contractor.

Dates, Times and Periods

1.1.7 "Commencement Date" means the date fourteen (14) days after the date the Contract comes into effect or any other date named in the Contract Data.

1.1.8 "Day" means a calendar day

1.1.9 "Time for Completion" means the time for completing the Works as stated in the Contract Data (or as extended under Sub-Clause 7.3), calculated from the Commencement Date.

Money and Payments

1.1.10 "Cost" means all expenditure properly incurred (or to be incurred) by the Contractor, whether on or off the Site, including overheads and similar charges but

does not include any allowance for profit.

Other Definitions

1.1.11 "Contractor's Equipment" means all machinery, apparatus and other things required for the execution of the Works but does not include Materials or Plant intended to form part of the Works.

1.1.12 "Country" means the Islamic Republic of Pakistan.

1.1.13 "Procuring Agency's Risks" means those matters listed in Sub-Clause 6.1.

1.1.14 "Force Majeure" means an event or circumstance which makes performance of a Party's obligations illegal or impracticable and which is beyond that Party's reasonable control.

1.1.15 'Materials" means things of all kinds (other than Plant) to be supplied and incorporated in the Works by the Contractor.

1.1.16 "Plant" means the machinery and apparatus intended to form or forming part of the Works.

1.1.17 "Site" means the places provided by the Procuring Agency where the Works are to be executed, and any other places specified in the Contract as forming part of the Site.

1.1.18 "Variation" means a change which is instructed by the Engineer/Procuring Agency under Sub-Clause 10.1.

1.1.19 'Works" means any or all the works whether Supply, Installation, Construction etc. and design (if any) to be performed by the Contractor including temporary works and any variation thereof.

1.1.20 "Engineer" means the person notified by the Procuring Agency to act as Engineer for the purpose of the Contract and named as such in Contract Data.

1.2 **Interpretation**

Words importing persons or parties shall include firms and organisations. Words importing singular or one gender shall include plural or the other gender where the context requires.

1.3 **Priority of Documents**

The documents forming the Contract are to be taken as mutually explanatory of one another. If an ambiguity or discrepancy is found in the documents, the priority of the documents shall be in accordance with the order as listed in the Contract Data.

1.4 **Law**

The law of the Contract is the relevant Law of Islamic Republic of Pakistan.

1.5 **Communications**

All Communications related to the Contract shall be in English language.

1.6 **Statutory Obligations**

The Contractor shall comply with the Laws of Islamic Republic of Pakistan and shall give all notices and pay all fees and other charges in respect of the Works.

2. THE PROCURING AGENCY

2.1 **Provision of Site**

The Procuring Agency shall provide the Site and right of access thereto at the times stated in the Contract Data.
Site Investigation Reports are those that were included in the bidding documents and are factual and interpretative reports about the surface and subsurface conditions at the Site.

2.2 **Permits etc.**

The Procuring Agency shall, if requested by the Contractor, assist him in applying for permits, licences or approvals which are required for the Works.

2.3 **Engineer's/Procuring Agency's Instructions**

The Contractor shall comply with all instructions given by the Procuring Agency or the Engineer, if notified by the Procuring Agency, in respect of the Works including the suspension of all or part of the works.

2.4 **Approvals**

No approval or consent or absence of comment by the Engineer/Procuring Agency shall affect the Contractor's obligations.

3. ENGINEER'S/PROCURING AGENCY'S REPRESENTATIVES

3.1 **Authorised Person**

The Procuring Agency shall appoint a duly authorized person to act for him and on his behalf for the purposes of this Contract. Such authorized person shall be duly identified in the Contract Data or otherwise notified in writing to the Contractor as soon as he is so appointed. In either case the Procuring Agency shall notify the Contractor, in writing, the precise scope of the authority of such authorized person at the time of his appointment.

3.2 **Engineer's/Procuring Agency's Representative**

The name and address of Engineer's/Procuring Agency's Representative is given in Contract Data. However the Contractor shall be notified by the Engineer/Procuring Agency, the delegated duties and authority before the Commencement of works.

4. THE CONTRACTOR

4.1 **General Obligations**

The Contractor shall carry out the works properly and in accordance with the Contract. The Contractor shall provide all supervision, labour, Materials, Plant and Contractor's Equipment which may be required

4.2 **Contractor's Representative**

The Contractor shall appoint a representative at site on full time basis to supervise the execution of work and to receive instructions on behalf of the Contractor but only after obtaining the consent of the Procuring Agency for such appointment which consent shall not be withheld without plausible reason(s) by the Procuring Agency. Such authorized representative may be substituted/ replaced by the Contractor at any time during the Contract Period but only after obtaining the consent of the Procuring Agency as aforesaid.

4.3 **Subcontracting**

The Contractor shall not subcontract the whole of the works. The Contractor shall not subcontract any part of the works without the consent of the Procuring Agency.

4.4 **Performance Security**

The Contractor shall furnish to the Procuring Agency within fourteen (14) days after receipt of Letter of Acceptance a Performance Security at the option of the bidder, in the form of Payee's order /Bank Draft or Bank Guarantee from scheduled bank for the amount and validity specified in Contract Data.

5. DESIGN BY CONTRACTOR

5.1 **Contractor's Design**

The Contractor shall carry out design to the extent specified, as referred to in the Contract Data. The Contractor shall promptly submit to the Engineer/Procuring Agency all designs prepared by him, within fourteen (14) days of receipt the Engineer/Procuring Agency shall notify any comments or, if the design submitted is not in accordance with the Contract, shall reject it stating the reasons. The

Contractor shall not construct any element of the works designed by him within fourteen (14) days after the design has been submitted to the Engineer/Procuring Agency or which has been rejected. Design that has been rejected shall be promptly amended and resubmitted. The Contractor shall resubmit all designs commented on taking these comments into account as necessary.

5.2 **Responsibility for Design**

The Contractor shall remain responsible for his bided design and the design under this Clause, both of which shall be fit for the intended purposes defined in the Contract and he shall also remain responsible for any infringement of any patent or copyright in respect of the same. The Engineer/Procuring Agency shall be responsible for the Specifications and Drawings.

6. PROCURING AGENCY'S RISKS

6.1 The Procuring Agency's Risks

The Procuring Agency's Risks are:-

a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies, within the Country;

b) rebellion, terrorism, revolution, insurrection, military or usurped power, or civil war, within the Country;

c) riot, commotion or disorder by persons other than the Contractor's personnel and other employees including the personnel and employees of Sub-Contractors, affecting the Site and/or the Works;

d) 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 of such an assembly, except to the extent to which the Contractor/Sub-Contractors may be responsible for the use of any radio-active material;

e) Pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds;

f) use or occupation by the Procuring Agency of any part of the Works, except as may be specified in the Contract;

g) late handing over of sites, anomalies in drawings, late delivery of designs and drawings of any part of the Works by the Procuring Agency's personnel or by others for whom the Procuring Agency is responsible;

h) a suspension under Sub-Clause 2.3 unless it is attributable to the Contractor's failure; and

i) physical obstructions or physical conditions other than climatic conditions, encountered on the Site during the performance of the Works, for which the Contractor immediately notified to the Procuring Agency and accepted by the Procuring Agency.

7. TIME FOR COMPLETION

7.1 Execution of the Works

The Contractor shall commence the Works on the Commencement Date and shall proceed expeditiously and without delay and shall complete the Works, subject to Sub-Clause 7.3 below, within the Time for Completion.

7.2 Programme

Within the time stated in the Contract Data, the Contractor shall submit to the Engineer/Procuring Agency a programme for the Works in the form stated in the Contract Data.

7.3 Extension of Time

The Contractor shall, within such time as may be reasonable under the circumstances, notify the Procuring Agency/Engineer of any event(s) falling within the scope of Sub-Clause 6.1 or 10.3 of these Conditions of Contract and request the Procuring Agency/Engineer for a reasonable extension in the time for the completion of works. Subject to the aforesaid, the Procuring Agency/Engineer shall determine such reasonable extension in the time for the completion of works as may be justified in the light of the details/particulars supplied by the Contractor in connection with the such determination by the Procuring Agency/Engineer within such period as may be prescribed by the Procuring Agency/Engineer for the same; and the Procuring Agency may extend the time for completion as determined.

7.4 Late Completion

If the Contractor fails to complete the Works within the Time for Completion, the Contractor's only liability to the Procuring Agency for such failure shall be to pay the amount as **liquidity damages** stated in the Contract Data for each day for which he fails to complete the Works.

8. TAKING-OVER

8.1 Completion

The Contractor may notify the Engineer/Procuring Agency when he considers that the Works are complete.

8.2 **Taking-Over Notice**

Within fourteen (14) days of the receipt of the said notice of completion from the Contractor the Procuring Agency/Engineer shall either takeover the completed works and issue a Certificate of Completion to that effect or shall notify the Contractor his reasons for not taking-over the works. While issuing the Certificate of Completion as aforesaid, the Procuring Agency/Engineer may identify any outstanding items of work which the Contractor shall undertake during the Maintenances Period.

9. REMEDYING DEFECTS

9.1 **Remedying Defects**

The Contractor shall for a period stated in the Contract Data from the date of issue of the Certificate of Completion carry out, at no cost to the Procuring Agency, repair and rectification work which is necessitated by the earlier execution of poor quality of work or use of below specifications material in the execution of Works and which is so identified by the Procuring Agency/Engineer in writing within the said period. Upon expiry of the said period, and subject to the Contractor's faithfully performing his aforesaid obligations, the Procuring Agency/Engineer shall issue a Maintenance Certificate whereupon all obligations of the Contractor under this Contract shall come to an end.

Failure to remedy any such defects or complete outstanding work within a reasonable time shall entitle the Procuring Agency to carry out all necessary works at the Contractor's cost. However, the cost of remedying defects not attributable to the Contractor shall be valued as a Variation.

9.2 **Uncovering and Testing**

The Engineer/Procuring Agency may give instruction as to the uncovering and/or testing of any work. Unless as a result of an uncovering and/or testing it is established that the Contractor's design, materials, plant or workmanship are not in accordance with the Contract, the Contractor shall be paid for such uncovering and/or testing as a Variation in accordance with Sub-Clause 10.2.

10. VARIATIONS AND CLAIMS

10.1 **Right to Vary**

The Procuring Agency/Engineer may issue Variation Order(s) in writing. Where for any reason it has not been possible for the Procuring Agency/Engineer to issue such Variations Order(s), the Contractor may confirm any verbal orders given by the Procuring Agency/Engineer in writing and if the same are not refuted/denied by the Procuring Agency/Engineer within ten (10) days of the receipt of such confirmation the same shall be deemed to be a Variation Orders for the purposes of this Sub-Clause.

10.2 **Valuation of Variations**

Variations shall be valued as follows:

a) at a lump sum price agreed between the Parties, or

b) where appropriate, at rates in the Contract, or

c) in the absence of appropriate rates, the rates in the Contract shall be used as the basis for valuation, or failing which

d) at appropriate new rates, as may be agreed or which the Engineer/Procuring Agency considers appropriate, or

e) if the Engineer/Procuring Agency so instructs, at day work rates set out in the Contract Data for which the Contractor shall keep records of hours of labour and Contractor's Equipment, and of Materials, used.

10.3 **Changes in the Quantities.**

a) If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25 percent, provided the change exceeds 1 percent of the Initial Contract Price, the Procuring Agency/Engineer shall adjust the rate to allow for the change and will be valued as per sub clause 10.2.

b) The Engineer shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 15 percent, except with the prior approval of the Procuring Agency.

c) If requested by the Engineer, the contractor shall provide the Engineer with a detailed cost breakdown of any rate in the Bill of Quantities.

10.4 **Early Warning**

The Contractor shall notify the Engineer/Procuring Agency in writing as soon as he is aware of any circumstance which may delay or disrupt the Works, or which may give rise to a claim for additional payment.

To the extent of the Contractor's failure to notify, which results to the Engineer/Procuring Agency being unable to keep all relevant records or not taking steps to minimise any delay, disruption, or Cost, or the value of any Variation, the Contractor's entitlement to extension of the Time for Completion or additional payment shall be reduced/rejected.

10.5 **Valuation of Claims**

If the Contractor incurs Cost as a result of any of the Procuring Agency's Risks, the Contractor shall be entitled to the amount of such Cost. If as a result of any

Procuring Agency's Risk, it is necessary to change the Works, this shall be dealt with as a Variation subject to Contractor's notification for intention of claim to the Engineer/Procuring Agency within fourteen (14) days of the occurrence of cause.

10.6 **Variation and Claim Procedure**

The Contractor shall submit to the Engineer/Procuring Agency an itemised detailed breakdown of the value of variations and claims within twenty eight (28) days of the instruction or of the event giving rise to the claim. The Engineer/Procuring Agency shall check and if possible agree the value. In the absence of agreement, the Procuring Agency shall determine the value.

11. CONTRACT PRICE AND PAYMENT

11.1 (a) **Terms of Payments**

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 11.3, be paid by the Procuring Agency to the Contractor within 30 days after such Interim Payment Certificate has been jointly verified by Procuring Agency and Contractor, or, in the case of the Final Certificate referred to in Sub Clause 11.5, within 60days after such Final Payment Certificate has been jointly verified by Procuring Agency and Contractor;

Provided that the Interim Payment shall be caused in thirty (30) days and Final Payment in 60 days in case of foreign funded project. In the event of the failure of the Procuring Agency to make payment within 90 days then Procuring Agency shall pay to the Contractor compensation at the 28 days rate of KIBOR+2% per annum in local currency and LIBOR+1% for foreign currency, upon all sums unpaid from the date by which the same should have been paid.

(b) **Valuation of the Works**

The Works shall be valued as provided for in the Contract Data, subject to Clause 10.

11.2 **Monthly Statements**

The Contractor shall be entitled to be paid at monthly intervals:

a) the value of the Works executed less to the cumulative amount paid previously; and
b) value of secured advance on the materials and valuation of variations (if any).

The Contractor shall submit each month to the Engineer/Procuring Agency a statement showing the amounts to which he considers himself entitled.

11.3 **Interim Payments**

Within a period not exceeding seven (07) days from the date of submission of a statement for interim payment by the Contractor, the Engineer shall verify the same and within a period not exceeding thirty (30/60) days from the said date of submission by the Contractor, the Procuring Agency shall pay to the Contractor the sum subject to adjustment for deduction of the advance payments and retention money.

11.4 **Retention**

Retention money shall be paid by the Procuring Agency to the Contractor within fourteen (14) days after either the expiry of the period stated in the Contract Data, or the remedying of notified defects, or the completion of outstanding work, all as referred to in Sub-Clause 9.1, whichever is the later.

11.5 **Final Payment**

Within twenty one (21) days from the date of issuance of the Maintenance Certificate the Contractor shall submit a final account to the Engineer to verify and the Engineer shall verify the same within fourteen (14) days from the date of submission and forward the same to the Procuring Agency together with any documentation reasonably required to enable the Procuring Agency to ascertain the final contract value.

Within sixty (60) days from the date of receipt of the verified final account from the Engineer, the Procuring Agency shall pay to the Contractor any amount due to the Contractor. While making such payment the Procuring Agency may, for reasons to be given to the Contractor in writing, withhold any part or parts of the verified amount.

11.6 **Currency**

Payment shall be in the currency stated in the Contract Data.

12. DEFAULT

12.1 **Defaults by Contractor**

If the Contractor abandons the Works, refuses or fails to comply with a valid instruction of the Engineer/Procuring Agency or fails to proceed expeditiously and without delay, or is, despite a written complaint, in breach of the Contract, the Procuring Agency may give notice referring to this Sub-Clause and stating the default.

If the Contractor has not taken all practicable steps to remedy the default within fourteen (14) days after receipt of the Procuring Agency's notice, the Procuring Agency may by a second notice given within a further twenty one (21) days, terminate the Contract. The Contractor shall then demobilize from the Site leaving behind any Contractor's Equipment which the Procuring Agency instructs, in the second notice, to be used for the completion of the Works at the risk and cost of the Contractor.

12.2 **Defaults by Procuring Agency**

If the Procuring Agency fails to pay in accordance with the Contract, or is, despite a written complaint, in breach of the Contract, the Contractor may give notice referring to this Sub-Clause and stating the default. If the default is not remedied within fourteen (14) days after the Procuring Agency's receipt of this notice, the Contractor may suspend the execution of all or parts of the Works.

If the default is not remedied within twenty eight (28) days after the Procuring Agency's receipt of the Contractor's notice, the Contractor may by a second notice given within a further twenty one (21) days, terminate the Contract. The Contractor shall then demobilise from the Site.

12.3 **Insolvency**

If a Party is declared insolvent under any applicable law, the other Party may by notice terminate the Contract immediately. The Contractor shall then demobilise from the site leaving behind, in the case of the Contractor's insolvency, any Contractor's Equipment which the Procuring Agency instructs in the notice is to be used for the completion of the Works.

12.4 **Payment upon Termination**

After termination, the Contractor shall be entitled to payment of the unpaid balance of the value of the works executed and of the Materials and Plant reasonably delivered to the site, adjusted by the following:

a) any sums to which the Contractor is entitled under Sub-Clause 10.4,

b) any sums to which the Procuring Agency is entitled,

c) if the Procuring Agency has terminated under Sub-Clause 12.1 or 12.3, the Procuring Agency shall be entitled to a sum equivalent to twenty percent (20%) of the value of parts of the Works not executed at the date of the termination, and

d) if the Contractor has terminated under Sub-Clause 12.2 or 12.3, the Contractor shall be entitled to the cost of his demobilisation together with a sum equivalent to ten percent (10%) of the value of parts of the works not executed at the date of termination.

The net balance due shall be paid or repaid within twenty eight (28) days of the notice of termination.

13. RISKS AND RESPONSIBILITIES

13.1 **Contractor's Care of the Works**

Subject to Sub-Clause 9.1, the Contractor shall take full responsibility for the care

of the Works from the Commencement Date until the date of the Procuring Agency's/Engineer's issuance of Certificate of Completion under Sub-Clause 8.2. Responsibility shall then pass to the Procuring Agency. If any loss or damage happens to the Works during the above period, the Contractor shall rectify such loss or damage so that the Works conform with the Contract.

Unless the loss or damage happens as a result of any of the Procuring Agency's Risks, the Contractor shall indemnify the Procuring Agency, or his agents against all claims loss, damage and expense arising out of the Works.

13.2 **Force Majeure**

If Force Majeure occurs, the Contractor shall notify the Engineer/Procuring Agency immediately. If necessary, the Contractor may suspend the execution of the Works and, to the extent agreed with the Procuring Agency demobilize the Contractor's Equipment.

If the event continues for a period of eighty four (84) days, either Party may then give notice of termination which shall take effect twenty eight (28) days after the giving of the notice.

After termination, the Contractor shall be entitled to payment of the unpaid balance of the value of the Works executed and of the Materials and Plant reasonably delivered to the Site, adjusted by the following:

a) any sums to which the Contractor is entitled under Sub-Clause 10.4,

b) the cost of his demobilization, and

c) less any sums to which the Procuring Agency is entitled.

The net balance due shall be paid or repaid within thirty five (35) days of the notice of termination.

14. INSURANCE

14.1 **Arrangements**

The Contractor shall, prior to commencing the Works, effect insurances of the types, in the amounts and naming as insured the persons stipulated in the Contract Data except for items (a) to (e) and (i) of the Procuring Agency's Risks under Sub-Clause 6.1. The policies shall be issued by insurers and in terms approved by the Procuring Agency. The Contractor shall provide the Engineer/Procuring Agency with evidence that any required policy is in force and that the premiums have been paid.

14.2 **Default**

If the Contractor fails to effect or keep in force any of the insurances referred to in the previous Sub-Clause, or fails to provide satisfactory evidence, policies or receipts, the Procuring Agency may, without prejudice to any other right or

remedy, effect insurance for the cover relevant to such as a default and pay the premiums due and recover the same plus a sum in percentage given in Contractor Data from any other amounts due to the Contractor.

15. RESOLUTION OF DISPUTES

15.1 Engineer's Decision

If a dispute of any kind whatsoever arises between the Procuring Agency and the Contractor in connection with the works, 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 twenty eight (28) days after the day on which he received such reference, the Engineer shall give notice of his decision to the Procuring Agency (Superintending Engineer) and the Contractor.

Unless the Contract has already been repudiated or terminated, the Contractor shall, in every case, continue to proceed with the work with all due diligence, and the Contractor and the Procuring Agency (Superintending Engineer)shall give effect forthwith to every such decision of the Engineer unless and until the same shall be revised, as hereinafter provided in an arbitral award.

15.2 Notice of Dissatisfaction

If a Party is dissatisfied with the decision of the Engineer of consultant or if no decision is given within the time set out in Sub-Clause 15.1 here above, the Party may give notice of dissatisfaction referring to this Sub-Clause within fourteen (14) days of receipt of the decision or the expiry of the time for the decision. If no notice of dissatisfaction is given within the specified time, the decision shall be final and binding on the Parties. If notice of dissatisfaction is given within the specified time, the decision shall be binding on the Parties who shall give effect to it without delay unless and until the decision of the Engineer is revised by an arbitrator.

If a contractor is dissatisfied with the decision of the Engineer of the department or decision is not given in time then he can approach Superintending Engineer within 14 days, in case of dissatisfaction with decision of Superintending Engineer or not decided within 28 days, then arbitration process would be adopted as per clause 15.3.

15.3 Arbitration

A dispute which has been the subject of a notice of dissatisfaction shall be finally settled as per provisions of Arbitration Act 1940 (Act No. X of 1940) and Rules made there under and any statutory modifications thereto. Any hearing shall be held at the place specified in the Contract Data and in the language referred to in Sub-Clause 1.5.

16 INTEGRITY PACT

16.1 If the Contractor or any of his Sub-Contractors, agents or servants is found to have violated or involved in violation of the Integrity Pact signed by the Contractor as Schedule-F to his Bid, then the Procuring Agency 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 Sub-Contractors, agents or servants;
(b) terminate the Contract; and
(c) recover from the Contractor any loss or damage to the Procuring Agency as a result of such termination or of any other corrupt business practices of the Contractor or any of his Sub-Contractors, agents or servants.

On termination of the Contract under Sub-Para (b) of this Sub-Clause, the Contractor shall demobilize from the site leaving behind Contractor's Equipment which the Procuring Agency instructs, in the termination notice, to be used for the completion of the works at the risk and cost of the Contractor. Payment upon such termination shall be made under Sub-Clause 12.4, in accordance with Sub-Para (c) thereof, after having deducted the amounts due to the Procuring Agency under Sub-Para (a) and (c) of this Sub-Clause.

CONTRACT DATA

Sub-Clauses of
Conditions of Contract

1.1.3 Procuring Agency's Drawings: Attached Separately at page no. ____

1.1.4 **The Procuring Agency** means — the person or entity named in the Contract Data and the legal successors in title to this person, but not (except with the consent of the Contractor) any assignee. Here P/A is **Mehran University of Engineering & Technology Khairpur Mir's**

1.1.5 **The Contractor** means a firm which is employed by the P/A. The contractor is responsible for providing all of the material, labor, equipment and services necessary for the construction of the project.

1.1.7 Commencement Date means the date of issue of Engineer's Notice/Work Order to Commence which shall be issued within fourteen (07) days of the signing of the Contract Agreement.

1.1.9 Time of Completion:- 03 Month

1.1.20 Consultants

RCC Consultants
Ground Floor RCC Complex Main Road, Qasimabad Hyderabad
Phones No 022-2652957, Fax no 022-2655833
E-mail: rcc.consultants@rccgoc.com

1.3 Documents forming the Contract listed in the order of priority:
(a) The Contract Agreement
(b) Letter of Acceptance
(c) The completed Form of Bid
(d) Contract Data
(e) Conditions of Contract
(f) Bill of Quantities (BOQ)
(g) The Drawings
(h) The Specifications
(i) Special Conditions of Contract

2.1 Provision of Site: On the Commencement Date

3.1 Authorized person: Project Director Mehran University of Engineering & Technology Khairpur Mirs

3.2 Name and address of Engineer's/Procuring Agency's representative:

Project Director Mehran University of Engineering & Technology Khairpur Mirs

4.4 **Performance Security: (Not Applicable)**

5.1 **Requirements for Contractor's design (if any):** Contractor to confirm design of any components if necessary.

7.2 **Programme:**

Time for submission: Within fourteen (07) days of the Commencement Date.

Form of programme: *Bar Chart / CPM/PERT*

7.4 Amount payable due to failure to complete shall be 0.05% per day up to a maximum of (10%) of sum stated in the Letter of Acceptance **(Not Applicable)**

7.5 Early Completion (Not Applicable)
In case of earlier completion of the Work, the Contractor is entitled to be paid bonus Up-to limit and at a rate equivalent to 50% of the relevant limit and rate of liquidated damages stated in the contract data.

9.1 Period for remedying defects (Defects Liability Period): (06) **six months**

10.2 (e) **Variation procedures: (Not Applicable)**
Day work rates_____
_____(details)

11.1 Terms of Payments

a) Mobilization Advance

(1) Procuring Agency will decide.

(i) on submission by the Contractor of a Mobilization Advance Guarantee for the full amount of the Advance in the specified form from a Scheduled Bank in Pakistan to the Procuring Agency;

(ii) Contractor will pay interest on the mobilization advance at the rate of 10% per annum on the advance; and

(iii) This Advance including the interest shall be recovered in 5 equal installments from the five (05) R.A bills and in case the number of bills is less than five (05) then 1/5th of the advance **inclusive of the interest** thereon shall be recovered from each bill and the balance together with interest be recovered from the final bill. It may be insured that there is sufficient amount in the final bill to enable recovery of the Mobilization Advance.

2) **Secured Advance on Materials**

(a) The Contractor shall be entitled to receive from the Procuring Agency Secured Advance against an INDENTURE BOND in P W Account Form No. 31(Fin.R. Form No. 2 acceptable to the Procuring Agency of such sum as the Engineer may consider proper in respect of non-perishable materials brought at the Site but not yet incorporated in the Permanent Works provided that:

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

(ii) Such materials have been delivered to the Site and are properly stored and protected against loss or damage or deterioration to the satisfaction and verification of the Engineer but at the risk and cost of the Contractor;

(iii) The Contractor's records of the requirements, orders, receipts and use of materials are kept in a form approved by the Engineer, and such records shall be available for inspection by the Engineer;

(iv) The Contractor shall submit with his monthly statement the estimated value of the materials on Site together with such documents as may be required by the Engineer for the purpose of valuation of materials and providing evidence of ownership and payment therefore;

(v) Ownership of such materials shall be deemed to vest in the Procuring Agency and these materials shall not be removed from the Site or otherwise disposed of without written permission of the Procuring Agency;

(vi) The sum payable for such materials on Site shall not exceed 75 % of the (i) landed cost of imported materials, or (ii) ex-factory / ex-warehouse price of locally manufactured or produced materials, or (iii) market price of stands other materials.

(vii) Secured Advance should not be allowed unless &until the previous advance, if an, fully recovered;

(viii) Detailed account of advances must be kept in part II of running account bill; and

(ix) Secured Advance may be permitted only against materials/quantities anticipated to be consumed / utilized on the work within a period of 3 months from the date of issue of secured advance and definitely not for full quantities of materials for the entire work/contract

(b) Recovery of Secured Advance:

(i) Secured Advance paid to the Contractor under the above provisions shall be effected from the monthly payments on actual consumption basis, but not later than period specified in the rules not more than three months (even if unutilized); other conditions.

(ii) As recoveries are made the outstanding accounts of the items concerned in Part II should be reduced b making deduction entries in the column; —deduct quantity utilized in work measured since previous bill,ll equivalent to the quantities of materials used by the contractor on items of work shown as executed in part I of the bill.

(c) Interim payments: The Contractor shall submit to the Engineer monthly statements of the estimated value of the work completed less the cumulative amount certified previously.

(i) The value of work completed comprises the value of the quantities of the items in the Bill of Quantities completed.

(ii) Value of secured advance on the materials and valuation of variations (if any).

(iii) Engineer may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

(v) Retention money and other advances are to be recovered from the bill submitted by contractor.

11.2 *(a) **Valuation of the Works:**

Measurement of executed quantities at quoted rates.

11.3 Percentage of retention: Eight percent (8%) (Bid Security)

11.6 Currency of payment: Pak Rupees

14.1 Insurances: (Not Applicable)

Type of cover

The works

Amount of cover

The sum stated in the letter of acceptance plus fifteen percent

Type of cover
Contractor's equipment

Amount of cover
Full rep acement cost

Type of cover
Third party injury to persons and damage t property

Workers:

Other cover:

14.2 Amount to be recovered (not applicable)

Premium plus_____ percent (%)

15.3 Arbitration

Place of Office of the **Project Director Mehran University of Engineering & Technology Khairpur Mirs.**

STANDARD FORMS

(Note: Standard Forms provided in this document for securities are to be issued by a bank. In case the bidder chooses to issue a bond for accompanying his bid or performance of contract or receipt of advance, the relevant format shall be tailored accordingly without changing the spirit of the Forms of securities).

FORM OF BID SECURITY
(Bank Guarantee)

Guarantee No._____
Executed on _____

(Letter by the Guarantor to the Procuring Agency)

Name of Guarantor (Scheduled Bank in Pakistan) with address:_____
Name of Principal (Bidder) with address:_____
_____
Sum of Security (express in words and figures):_____
_____
Bid Reference No._____ Date of Bid _____

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

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted the accompanying Bid numbered and dated as above for _____ (Particulars of Bid) to the said Procuring Agency; and

WHEREAS, the Procuring Agency has required as a condition for considering the said Bid that the Principal furnishes a Bid Security in the above said sum to the Procuring Agency, conditioned as under:

(1) that the Bid Security shall remain valid for a period of twenty eight (28) days beyond the period of validity of the bid;
(2) that in the event of;

(a) the Principal withdraws his Bid during the period of validity of Bid, or

(b) the Principal does not accept the correction of his Bid Price, pursuant to Sub-Clause 16.4 (b) of Instructions to Bidders, or

(c) failure of the successful bidder to

(i) furnish the required Performance Security, in accordance with Sub-Clause IB-21.1 of Instructions to Bidders, or

(ii) sign the proposed Contract Agreement, in accordance with Sub-Clauses IB-20.2 & 20.3 of Instructions to Bidders,

the entire sum be paid immediately to the said Procuring Agency for delayed completion and not as penalty for the successful bidder's failure to perform.

NOW THEREFORE, if the successful bidder shall, within the period specified therefore, on the prescribed form presented to him for signature enter into a formal Contract Agreement with the said Procuring Agency in accordance with his Bid as accepted and furnish within fourteen (14) days of receipt of Letter of Acceptance, a Performance Security with good and sufficient surety , as may be required, upon the form prescribed by the said Procuring Agency for the faithful performance and proper fulfilment of the said Contract or in the event of non-withdrawal of the said Bid within the time specified then this obligation shall be void and of no effect, but otherwise to remain in full force and effect.

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

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

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

_____
Guarantor (Bank)

Witness:

1. _____

_____
Corporate Secretary (Seal)

2. _____

_____
(Name, Title & Address)

1. Signature _____

2. Name _____

3. Title _____

Corporate Guarantor (Seal)

FORM OF PERFORMANCE SECURITY
(Bank Guarantee)

Guarantee No._____
Executed on _____
Expiry Date

(Letter by the Guarantor to the Procuring Agency)

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

Name of Principal (Contractor) with address:_____

_____

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

_____

Letter of Acceptance No._____ Dated _____

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

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has accepted the Procuring Agency's above said Letter of Acceptance for _____ _____ (Name of Contract) for the _____

_____ (Name of Project).

NOW THEREFORE, if the Principal (Contractor) shall well and truly perform and fulfill all the undertakings, covenants, terms and conditions of the said Documents during the original terms of the said Documents and any extensions thereof that may be granted by the Procuring Agency, with or without notice to the Guarantor, which notice is, hereby, waived and shall also well and truly perform and fulfill all the undertakings, covenants terms and conditions of the Contract and of any and all modifications of the said Documents that may hereafter be made, notice of which modifications to the Guarantor being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue till all requirements of Clause 9, Remedying Defects, of Conditions of Contract are fulfilled.

Our total liability under this Guarantee is limited to the sum stated above and it is a condition of any liability attaching to us under this Guarantee that the claim for payment in writing shall

be received by us within the validity period of this Guarantee, failing which we shall be discharged of our liability, if any, under this Guarantee.

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

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

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

_____
Guarantor (Bank)

Witness:

1. _____

_____
Corporate Secretary (Seal)

2. _____

_____
(Name, Title & Address)

1. Signature _____

2. Name _____

3. Title _____

_____
Corporate Guarantor (Seal)

FORM OF CONTRACT AGREEMENT

THIS CONTRACT AGREEMENT (hereinafter called the "Agreement") made on the _____ day of _____ 200 _____ between _____(hereinafter called the "Procuring Agency") of the one part and _____ (hereinafter called the "Contractor") of the other part.

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

NOW this Agreement witnesseth as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.

2. The following documents after incorporating addenda, if any except those parts relating to Instructions to Bidders, shall be deemed to form and be read and construed as part of this Agreement, viz:

   (a) The Letter of Acceptance;
   (b) The completed Form of Bid along with Schedules to Bid;
   (c) Conditions of Contract & Contract Data;
   (d) The priced Schedule of Prices/Bill of quantities (BoQ);
   (e) The Specifications; and
   (f) The Drawings

3. In consideration of the payments to be made by the Procuring Agency to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Procuring Agency to execute and complete the Works and remedy defects therein in conformity and in all respects within the provisions of the Contract.

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

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

Signature of the Contactor	Signature of the Procuring Agency
(Seal)	(Seal)
Signed, Sealed and Delivered in the presence of:	
Witness:	Witness:
(Name, Title and Address)	(Name, Title and Address)

MOBILIZATION ADVANCE GUARANTEE

Guarantee No._____

Executed on_____

(Letter by the Guarantor to the Procuring Agency)

WHEREAS the _____ (hereinafter called the Procuring Agency) has entered into a Contract for _____ _____ _____ _____ (Particulars of Contract), with _____ _____ (hereinafter called the Contractor).

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

AND WHEREAS the Procuring Agency has asked the Contractor to furnish Guarantee to secure the advance payment for the performance of his obligations under the said Contract.

AND WHEREAS _____ (Scheduled Bank) (hereinafter called the Guarantor) at the request of the Contractor and in consideration of the Procuring Agency agreeing to make the above advance to the Contractor, has agreed to furnish the said Guarantee.

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

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

This Guarantee shall come into force as soon as the advance payment has been credited to the account of the Contractor.

This Guarantee shall expire not later than _____

by which date we must have received any claims by registered letter, telegram, telex or telefax.

It is understood that you will return this Guarantee to us on expiry or after settlement of the total amount to be claimed hereunder.

_____
Guarantor (Scheduled Bank)

Witness:

1. _____

_____
Corporate Secretary (Seal)

2. _____

_____
(Name, Title & Address)

1. Signature _____
2. Name _____
3. Title _____

_____
Corporate Guarantor (Seal)

INDENTURE FOR SECURED ADVANCES.

(For use in cases in which is contract is for finished work and the contractor has entered into an agreement for the execution of a certain specified quantity of work in a given time).

This INDENTURE made the .... day of ..... ----- ..... ----------.....-197--"- BETWEEN (hereinafter called "the Contractor" which expression shall where the context so admits or implied be deemed to include his heirs, executors, administrators and assigns) of the one part and THE GOVERNOR OF SINDH (hereinafter called "the Government" of the other part).

WHEREAS by an agreement, dated (hereinafter called the said agreement, the contractor has agreed to perform the under-mentioned works (hereinafter referred to as the said work):-

(Here enter (the description of the works).[1]

AND WHEREAS the contractor has applied to the .... —..... ----- for an advance to him of Rupees ----------. (Rs. .....) on the security of materials absolutely belonging to him and brought by him to the site of the said works the subject of the said agreement for use in the construction of such of the said works as he has undertaken to execute at rates fixed for the finished work (inclusive of the cost of materials and labour and other charge) AND WHEREAS the Government has agreed to advance to the Contractor the sum of Rupees, (Rs. .....) on the security of materials the quantities and other particulars of which are detailed in Part II of Running Account Bill (E). the said works signed by the contractor

Fin R.Form.17.A

on---------- .....— and on such covenants and conditions as are hereinafter contained and the Government has reserved to itself the option of marking any further advance or advances on the security of other materials brought by the Contractor to the site of the said works.

NOW THIS INDENTURE WTTNESSETH that in pursuance of the said agreement and in consideration of the sum of Rupees.....---------- .....-.....— ..... (Rs. ------ ..... -----) on or before the execution of these presents paid to the Contractor by the Government (the receipt whereof the Contractor doth hereby acknowledge) and of such further advances (if any) as may be made to him as aforesaid (all of which advances are hereinafter collectively referred to as the said amount) the Contractor doth hereby assign unto the Government the said materials by way of security for the said amount

And doth hereby covenant and agree with the Government and declare ay follow :-

(1) That the said sum of Rupees .....-..... ----------..... ---------- (RF. ----------) so advanced by the Government to the Contractor as aforesaid and all or any further sum or sums which may be advanced aforesaid shall be employed by the contractor in or towards expending the execution of the said works and for no other purpose whatsoever.

(2) That the materials detailed in the said Running Account Bill (B) which have been
Fin R Form No. 17-A
Offered to and accepted by (he Government as security for the said amount are absolutely by the Contractors own property free from encumbrances of any kind and the Contractor will not make any application for or receive a further advance on the security of materials which are not absolutely his own property and free from encumbrances of any kind and the contractor hereby agrees, at all times, to indemnify and save harmless the Government against all claims whatsoever to any materials in respect of which an advance has been made to him as aforesaid.

(3) That the said materials detailed in the said Running Account Bill (B) and all other
Fin. R. Form No. 17-A
Materials on the security of which any further advance or advances may hereafter be made as aforesaid (hereinafter called the said materials) shall be used by the Contractor solely in *the* execution of the said works in accordance with the directions of the Divisional Officer----------(hereinafter called the Divisional Officer) and in the terms of the said agreement.

(4) That the Contractor shall make at his own cost all necessary and adequate arrangement for the proper watch, safe custody and protection against all risks of the said material and that until used in construction as aforesaid the said materials shall remain at the site of the said works in the Contractor's custody and at his own risk and on his own responsibility and shall at all times be open to inspection by (he Divisional Officer or any officer authorized by him. In the event of the said materials of any part (hereof being stolen, destroyed or damaged or becoming deteriorated in a grater degree than is due to reasonable use and wear thereof Contractor will forthwith replace the same with other materials of like qualify or repair and make good the same as required by the Divisional Officer and the materials so brought to replace the said materials so repaired and made good shall also be considered as security for the said amount.

(5) 'Hurt the said materials shall not on any account be removed from the site of the said works except with the written permission of the Divisional Officer or an officer authorized by him in that behalf

(6) That the said amount shall be payable in full when or before the Contractor receives payment, from the Government of the price payable to him for the said works under the terms and provisions of the said agreement PROVIDED THAT if any intermediate payments are made to the contractor on account of work done then on the occasion of each such payment the Government will be at liberty to make a recovery from the Contractors Bill for such payment by deducting there from in the value of the said materials (hen actually used in the construction and in respect of which recovery has not been made previously the value for this purpose being determined in respect of each description of material at (he rates at which the amount of the advances made under these presents were calculated.

(7) That if the Contractor shall at any time make any default in the performance or observation in any respect of any of the terms and provisions of the said agreement or of these presents the total amount of the advance or advances that may still be owing to the Government shall immediately on the happening of such default be repayable by the Contractor to the Government together with interest thereon at twelve

percent per annum from the date or respective dates of such advance or advances to the date or repayment and with all costs, charges, damages and expenses incurred by the Government in or for the recovery thereof or the enforcement of this security or otherwise by reason of (he default of the Contractor and any moneys so becoming due and payable shall constitute a debt due from the Contractor to the Government and the Contractor hereby covenants and agrees with the Government to repay and the same respectively to it accordingly.

(8) That the Contractor hereby charges all the said materials with the repayment to the Government of the said sum of Rupees ..... - ..... (Rs.....) and any further sum or sums which may be advanced as aforesaid and all costs charges damages and expenses payable under these present PROVIDED ALWAYS and it is hereby agreed and declared that not withstanding anything in the said agreement and without prejudice to the powers contained therein if and whether the covenant for payment and repayment hereinbefore contained shall become enforceable and the money owing shall not be paid to accordingly.

Once therewith the Government may at any time thereafter adopt all or any of following courses as it may deem best ;-

(a) Seize and utilize the said materials or any part thereof in the completion of the said works on behalf of the Contractor in accordance with the provisions in that behalf contained in the said agreement debiting the Contractor with the actual cost of effecting such completion the amount due in respect of advances under these presents and crediting the Contractor with the value of work done as he had carried it out in accordance with the said agreement and at the rates thereby provided. If the balance is against the Contractor he is to pay the same to the Government on demand.

(b) Remove and sell by public auction the seized materials or any part thereof and out of the moneys arising from the sale retain all the sums aforesaid repayable to the Government under these presents and pay over the surplus (if any) to the Contractor.

(c) Deduct all or any part of the moneys owing out of the security deposit or any sum due to the Contractor under the said agreement.

(9) That except as is expressly provided by the presents interest on the aid advance shall not be payable.

(10) That in the event of any conflict between the provisions of these presents and the said agreement the provisions of these presents shall prevail and in the event of any dispute or difference arising over the construction or effect of these presents the settlement of which has not been hereinbefore expressly provided for the same shall be referred to the Superintending Engineer..... Circle whose..... decision shall be final and the provisions of the Indian Arbitration Act for the time being in force so far as they are applicable shall apply to any such reference.

In witnesses whereof the* ----- -—__..... on behalf of the Govern or of Sindh and the said..... —..... - .....--have hereunto set their respective hands and seals the day and first above written.

Signed, sealed and delivered by* In the presence of

Seal

1st witness 2nd witness

Signed, sealed and delivered by* In the presence of

Seal

1st Witness 2nd witness

SPECIFICATIONS

[Note for Preparing the Specifications]

A set of precise and clear specifications is a prerequisite for bidders to respond realistically and competitively to the requirements of the user without qualifying their Bids. The specifications must be drafted to permit the widest possible competition and, at the same time, present a clear statement of the required standards of workmanship, materials, performance of the works. Only if this is done objectives of economy, efficiency, and fairness in procurement will be realized and responsiveness of Bids can be ensured, and the subsequent task of bid evaluation can be facilitated. The specifications should require that materials to be incorporated in the works be new, unused, and of the most recent or current models, and incorporated all recent improvements in design and materials unless provided for otherwise in the contract.

Samples of specifications from similar to previous procurements are useful in this respect. The use of metric units is encouraged. Depending on the complexity of the works and the repetitiveness of the type of procurement, it may be advantageous to standardize the Technical Specifications that should cover all classes of workmanship, materials and equipment although not necessarily to be used in a particular procurement.

Care must be taken in drafting specifications to ensure that they are not restrictive. In the specification of standards for equipment, materials, and workmanship, recognized international standards should be used as much as possible. The specifications shall consider all conditions but not limited to seismic conditions, weather conditions and environmental impact. The specifications should state that equipment, materials, and workmanship that meet other authoritative standards, and which ensure at least a substantially equal quality than the standards mentioned, will also be acceptable. The following clause may be inserted in the Specifications.

Sample Clause: Equivalency of Standards and Codes

Wherever reference is made in the Specifications to specific standards and codes to be met by Works to be furnished and tested, the provisions of the latest current edition or revision of the relevant shall apply, unless otherwise expressly stated in the Contract. Other authoritative standards that ensure equivalence to the standards and codes specified will be acceptable.]

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SECTION-1

GENERAL

The Contractor is responsible for the proper execution of all works under this contract. The construction site shall be provided sufficiently at all times with adequate staff/personnel and equipment.

The Contractor shall at his own expense provide on the sites at his own expense water, electricity, communication facilities and all other services required to execute the works. When main supplies are not available on site, he shall provide a generator with suitable capacity, and tank of suitable sizes for diesel, potable water, gas etc. as required.

The Contractor shall drain flood water and excess water or storm water by pumping to prevent damage on the site and to prevent any damage to a third party.

The Contractor shall keep a special record (daily diary), registering the construction activities and works carried out, number of personnel and plant on site, problems encountered, climatic conditions, incl. maximum/minimum temperatures, humidity, the daily rainfall in millimetres and the number of hours of rainfall, for each day. The format of the daily diary has to be approved by the Engineer.

The Contractor shall give due attention to the following matters:

General Obligations

The Contractor shall preserve trees, planted fields and fences in a suitable manner, and shall replant those that were damaged or removed, and re-erect fences to their original condition, in accordance to the Employer's Representative's instructions.

In case of repair works, the Contractor shall tabulate the requirements and methodology thereof, and ask the Employer's Representative for approval before starting any repair. After completion or repaired work, such work shall be re-inspected by the Engineer.

In case of a need to erect scaffolding on any private property the Contractor shall contact the owner of the property and arrange for the proper execution, and for the removal of the scaffolding. He shall carry out all repairs and re-instatement prior to the contractual completion date.

Before starting any construction activity in public or private roads, the Contractor has to submit a method statement presenting the intended signposting, signalling, erection of barriers or guard rails, diversion of traffic, protection measures for the public, railings around construction pits etc. He has to obtain approval from the local authorities and the police before starting any construction work.

Contractor's Supervision

In case of joint-ventures and sub-contracting, the lead contractor has the full responsibility of the performance and execution of all works. The Lead Contractor's Representatives and his staff shall, in compliance with his quality management system, supervise, check and control permanently the staff of the joint-venture partner(s) and / or subcontractors during their part of

the construction and shall take full responsibility for their performance and execution of the works.

The Contractor's Representative shall supervise all design and construction works from the commencement of the works until completion and commissioning. All documents during the completion of all works issued by the Contractor shall be only in force and accepted by the Employer and the Employer's Representative, if these documents are issued by the Contractor's Representative in accordance with the requirements of the Contract.

With the commencement of the Works, the Contractor shall hand over a list of all names, titles, addresses and telephone/fax/mobile phone/e-mail of his managerial and supervising staff on site indicating those responsible who may be reached outside of normal working hours in emergency cases.

First Aid Outfits

The Contractor shall, at his own cost, provide and maintain for the duration of the Contract adequate first aid outfits at all construction sites.

Cleanliness on Site

The Contractor shall make every effort to keep the site tidy and in orderly manner and to take at any time every possible precaution against the contamination of subsoil and groundwater. The Contractor shall be responsible for making all arrangements for the disposal of solid and liquid wastes from the site at his own expenses. Furthermore, he shall give strict instructions to all persons employed by him to use the sanitary accommodation provided at site. If the Contractor fails to keep the site clean, the Engineer will instruct a third party to carry out the work at the cost of the Contractor.

Site guard

The Contractor shall provide sufficient number of watchmen for guarding the site and the works, day and night. Each Contractor has to safe his stocks at the site.

Protection of water quality

The Contractor shall make every effort to not contaminate the drinking water in the area surrounding the site. The Contractor has to keep in mind that drinking water is an essential food for human beings which requires careful hygienic handling. Whenever the risk of contamination may arise the Contractor shall interrupt the supply (with the consent of the Employer) and shall then disinfect the works in contact with drinking water.

Protection of environment

The Contractor shall make every effort to not contaminate the environment within or adjacent to the WWTP area , especially the beaches and concerned Black Sea section. The Contractor has to keep in mind that during summer month the nearby beaches will be frequented by visitors and the impact on the near shore sea and beaches shall be kept at a minimum. Works leading to notable turbidity in the Black Sea shall be undertaken when currents condition are such that beaches used for recreation are not affected or even better in low season (autumn – spring).

Whenever the risk of contamination may arise the Contractor shall immediately stop the works and inform the Engineer to jointly decide on the next steps and who to mitigate the danger.

SECTION-2

SITE CLEARANCE

All trees shrubs, vegetation, rubbish etc., within the limits of the Site and elsewhere as directed by the Engineer shall be cleared down to ground level and removed from the Site. The trees and shrubs etc., which have to be removed shall either be cut or burnt down to ground level, and where directed grubbed up by the roots and removed from the Site. All trees shall remain the property of the Employer, and the Contractor shall collect these trees and store them until required by the Employer. All trees near to and about the Works, except such as are to be removec, shall be carefully protected from damage by the Contractor during the construction of the Works and during the period of maintenance and no trees shall be removed without the prior consent of the Engineer.

2.1 Clearing

Clearing shall consist of cutting, or trimming of trees, if any, and the satisfactory disposal of tree and other vegetation designated for removal, together with the timber snags, bushes, and rubbish occurring within the area. Trees, other vegetation stumps, roots, and bushes in area to be cleared shall be cut off flush with or below the original ground surface except such individual trees, group of trees and vegetation as may be indicated on the drawing or designated by Consultant's Representative to be left standing. Individual trees and other vegetation, to be left standing shall be thoroughly protected from damage during construction operation, by erection of barriers or by such other means as the circumstances require and as approved by the Consultant's Representative. Clearing operation shall be conducted in a manner that existing structures, and installations under construction, employees and others remain safe.

2.2 Grubbing

Grubbing shall consist of the removal and disposal of the stumps, roots larger that 25 mm, 12.7 mm in and matted roots in the designated grubbing areas. Stumps, roots, logs and timbre and other debris, shall be excavated and removed to a depth not less than 0.6 m below any sub-grade level. In areas where the cut is over 1 m grubbing shall not be necessary.

2.3 Disposal Of Debris

Timber and other refuse to be disposed off by burning shall be burned at location, approved by the Consultant's representative, in manner that will avoid all hazard such as damage to existing structures, construction in progress, trees and vegetation. The contractor shall be responsible for compliance with all pertinent laws and regulations pertaining to the burin of fire. Disposal by burning shall be kept under constant attendance, and residual, until materials will not be permitted to be pushed or placed on the adjacent areas without written approval of the owner/owners. The stones and concrete shall be broken and removed from the site for receiving the structure/flooring where required. No separate payment will be made for the work covered in this section of the specification and all costs of site clearing and setting out shall be concerned in the unit rates of the Contractor for items

2.4 Setting out of Works

The contractor shall set out the works and shall be responsible for true and perfect setting out of the same and for correctness of the direction, levels, dimension and alignment of all parts thereof. He shall give 24 hours notice to the Engineer of his request for the setting out to be checked and shall provide all instruments, tapes, etc. and assistance to the Engineer in the

checking thereof. If at any time any error in this respect shall appear during the progress of the works, the Contractor shall, at his own expense, rectify the error to the satisfaction the Consulting Representative. The Contractor shall construct accurate bench marks so that the lines and levels can easily be checked by the Consulting Representative.

SECTION-3

EXCAVATION, FILLING, BACK-FILING AND DISPOSAL

3.1 Scope of Work

The work covered by this section of the specifications consists of furnishing all Plant, Labour Equipment Appliances and materials and in performing all operations in connection with excavating, filling, backfilling and disposal for building construction, and other foundations complete in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and conditions of the Contract.

a) Classification:- Excavation shall include the removal of all materials of every category and nature. If rock is encountered it shall be removed carefully and without excessive noise and vibration. Blasting shall not be resorted to without specific permission in writing from the Consultants.

b) The excavation shall conform to the dimensions and elevation as indicated on the Drawings. Foundations on made up ground shall be taken down to natural bottom soil as per direction and approval of the Consultants. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms installation of services and for inspection but the same shall not be paid.

c) In the event of any excavations being carried out wider or deeper than authorized. The same shall be filled in by the Contractor at his own cost the required levels with lean concrete if below footing or with properly compacted local river sand if beneath slabs or as directed by the Engineer.

d) Shoring and Breaching: - The Contractor shall provide at his own cost where required all shoring walls, supports etc., to the sides of the excavation to prevent sliding or any movement. Where necessary, excavated sides shall be sloped as directed by the Engineer.

e) De-watering and Drainage: - The Contractor shall control the grading in the vicinity of site of work in order to prevent any water from running into the excavated areas. He shall at his own cost keep dry all pits and trenches during construction and all de-watering and pumping out whether due to ground water seepage or otherwise, shall be included in the rates as quoted by the Contractor. The method employed in all cases shall be approved and agreed by the Consultants or his Representative.

f) Protection of utility lines: - When any existing utility lines whether to be retained or be removed are enchanted within the area of operations the Contractor shall notify the Consultants and his Representative, and shall not protection or removal of the lines and instructions are obtained from the Consultants.

g) Excess and undesirable material form excavation not required for fill or backfill of the building site, shall be disposed off, removed and/or deposited as for filling and leveled anywhere on the work site as 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.

3.2 Excavation

Everything contained in this clause with regard to the execution of excavations, disposal of excavated material etc. shall apply to all material, unless otherwise stated.

All excavations shall be carried out to the lines and limits shown on the excavation plan and other drawings, or defined in the Specification. Said lines and limits may be amended by the Engineer to suit soil and other conditions encountered during actual excavation and field inspection. When excavating in any material other than rock for formation levels under any structure, the last 15cm of excavation shall be taken out not more than 24 hours before placing of foundations or fill. The bottoms of excavations shall be levelled and trimmed to full width to required lines and levels and where under foundations shall be well watered and rammed before placing of concrete.

The Contractor shall well and effectively hold up the sides and ends of all trenches and excavations wherever necessary with strong, close timbering, and shall prevent any fall or run of earth or sand from any portion of the ground outside of the trench or excavation. If, despite such precautions, or by reason of their neglect, any portions of the bottoms sides or ends of any trenches or excavations shall give way or be excavated without instructions from the Engineer, the Contractor shall at his own expense excavate and remove all the ground thereby disturbed both within and without the limits of the trench or excavation. Should the Contractor exceed in depth or extend the excavation of the formations or be ordered to take out extra excavation for the reasons given above, no payment will be made for such extra excavation, and he shall, if ordered by the Engineer, make it good with well rammed fill or in such class of concrete as may be ordered by the Engineer and at the Contractor's expense. Should any existing subsoil or field drains be uncovered during any excavation, the Contractor shall carefully replace them when backfilling or, if this is impossible, he shall divert them to new drains or ditches, otherwise relay them as the Engineer may direct. Payment for this work shall be by Daywork and will be met from the Contingencies

Before commencing any pipelaying, building or earth-filling work, all shattered and loose material must be removed by hand, the excavation being performed in such a manner as the Engineer shall direct so as to ensure that the work sits on an absolutely solid and clean foundation or abuts tightly against solid ground In no case must pipes, concrete or earthfill be placed in an excavation until the surface onto which such pipes, concrete and earthfill are to be placed has been approved by the Engineer.

3.3 Preparation of Foundation

The Contractor shall prepare the areas of excavations against which concrete is to be placed or on which pipes are to be laid, in a manner suitable for forming a foundation. Foundations in earth upon which concrete is to be placed shall be finished accurately to the dimensions shown on the Drawings or prescribed by the Engineer, brought to proper moisture content by sprinkling as required, and thoroughly compacted with suitable tools. No boulders shall be left projecting within the minimum excavation lines shown on the Drawing.

Foundations for concrete on bedrock shall be trimmed to the prescribed lines, thoroughly cleaned of mud and debris, and moistened in advance of placing concrete. All foundation surfaces shall be free from pools of water at the time of placing concrete. Wherever any excavation in earth has been made below grade without the Engineer's instructions, it shall be refilled as specified in Clause 1.4 hereof at the Contractor's expense.

3.4 Back-filing

All excavations shall be backfilled to the level of the original ground surfaces, unless otherwise shown on the Drawings or ordered by the Engineer, and in accordance with the requirements of the Specification. The material used for backfill, the amount thereof, and the manner of depositing and compacting shall be subject to the approval of the Engineer, but the Contractor will be held responsible for any displacement of pipe or other structures, any damage to their surfaces, or any instability of pipes and structures caused by the improper depositing of backfill materials.

Pipe surround and structures of concrete shall be backfilled as soon as the concrete has attained sufficient strength, as determined by the Engineer, to sustain the load imposed.

Where concrete slabs are to be placed on the ground, any loam, organic and other unsuitable material shall be removed. Fill where required to raise the sub-grade for concrete slabs shall be clean, undulated local river sand or gravel and shall be free from wood, stones and others debris. Excavated material shall only be used for fill if approved by the Consultants in writing. All the Backfill behind the sub-grade walls shall be done with clean local river sand or approved excavated soil. Fill shall be compacted up to 95% modified AASHTO Density by a Power vibratory roller, mechanical hammer, or other approved equipment, in layers not more than 150mm thick. Each layer shall be uniformly spread, watered to the extent of optimum moisture requirement for the required degree of compaction and then compacted. Contractor shall arrange at his own cost the testing of the filling where required by the Consultants or his Representative, after completion of foundation footings, walls, slabs and other construction below the elevation of the final grades and prior to backfilling. Backfill shall be placed in horizontal layers not more than 150mm thick and shall have a proper moisture content for the required degree of compaction of 95% . Each layer shall be compacted by mechanical tampers or by other suitable equipment suitable elevation above grade to provide for anticipated settlement and shrinkage thereof checked.

Backfill shall not be placed against foundation walls etc., prior to the damp proofing treatment as specified elsewhere in these specifications and approval by the Consultants or his Representative. Backfill shall be brought up evenly on each side 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 footing. Fill and/or backfill within the building or structures and for a distance of 6 ft. outside structures shall be compacted to a density of not less than 95% maximum density at optimum moisture content

3.5 Measurement & Payment

All excavation shall be measured net and perpendicular and no allowance shall be made for any increase in bulk of the excavate material after excavation or for sloping side or widened trenches to accommodate.

Excavation, filling and Disposal shall include all leads and lifts as specified elsewhere in these specifications. Payment for all items under this section shall be made at the rate entered in BOQ appended to the contract and in accordance with the applicable conditions of the contract.

SECTION-4

CONCRETE

4.1 GENERAL

Concrete shall be composed of Portland cement, fine aggregate, coarse aggregate, water and admixtures as specified, all well mixed and brought to the proper consistency. All concrete and its constituent materials and all methods and procedures shall conform to applicable standards of the British Standards Institution otherwise specified. The costs of all tests of concrete and/or its components shall be deemed to be included in the dispatching to the Project.

4.2 CEMENT

Unless otherwise specified the cement used in the Works shall be sulphate resisting Portland Cement (SRPC) complying with BS 402. Where specified or ordered by the Engineer, Ordinary Portland Cement (OPC) complying with BS 12 7 standard current at the time shall be used.

The cement to be used in the works shall be obtained from an approved manufacturer. For each delivery of Cement the Contractor shall furnish, free of cost, test certificates as directed by the Engineer, relating to the cement to be used on the work. Analyses of the cement shall be shown. The Contractor shall maintain a record available for inspection by the Engineer of the locations of cement from each consignment. The Contractor shall supply samples of cement, when requested by the Engineer from any store on Site and the place of manufacture.

4.3 AGGREGATE

Aggregate for concrete shall comply with BS 882 current edition.

Fine aggregate shall consist of natural sand and shall comply with requirements of Table 4 of BS 882. The Engineer will permit the addition of suitable crushed rock fine aggregate, as necessary, to the sand where in his opinion it is impracticable to obtain the specified grading of the combined aggregate otherwise than by such addition. The maximum quantities of particles smaller than 75mm shall, in any event, not exceed 3% by weight when the sample is tested to BS 812; Section 103.1. Coarse aggregate shall comply with the requirements in Table 3 of BS 882 for single sized aggregate to the nominal maximum size specified for the appropriate class of concrete and shall be made up of the following grading:-

a) 40mm single sized
b) 20mm single sized
c) 10mm single sized

The shape of the aggregate shall be rounded, or irregular as defined in BS 812; Part 1. The flakiness index, as determined in accordance BS 812; Section 105.1, shall not exceed 3% when measured in accordance with BS 812; Part 2. The soundness of the aggregate, as determined in accordance with ASTM C 88-83 using magnesium sulphate with 5 cycles, shall not show a loss of greater than 15% for find aggregate and 18% for coarse aggregate.

Immediately after commencement of the Works, the Contractor shall supply samples of proposed aggregates for preliminary tests of compliance with Specification to the satisfaction of the Engineer before the Engineer will give approval to the source aggregate proposed by Contractor. Alternatively and subject to the approval of the circumstances by the Engineer, the

Contractor may submit a Certificate from an independent laboratory. Where 40mm nominal maximum size coarse aggregate is specified it shall consist of a mix of 40mm single sized aggregate, 20mm single sized aggregated and 10mm single sized aggregate.

During the performance of the Contract, the Contractor shall supply samples of aggregates when required by the Engineer for testing (the samples shall be taken in accordance with BS 812). Testing of all specified requirements will be performed by the Contractor at intervals as directed by the Engineer for each source at each grading approved by the Engineer, unless otherwise instructed by the Engineer. Any rejected aggregate shall be promptly removed from Site. The Contractor shall demonstrate that no part of the aggregates contain any mineral known to have a potential to cause alkali silica, alkali silicate, alkali carbonate or any other damaging chemical reaction between alkalis and aggregates. Testing of aggregates shall be accordance with ASTM C 1260-94 and ASTM C586 as appropriate.

Should the results of the test prove unsatisfactory the Contractor shall make provision for the employment of a low alkali content cement to the approval of the Engineer.

4.4 WATER

The water used for making and curing concrete, grout and mortar shall be from a source approved by the Engineer and at the time of use shall be free from polluting matter in any quantity which:-

a) Affects the initial setting time of the cement by more than 30 minutes or reduces the compressive strength of test cylinders by more than 20% when tested in accordance with BS 3148.

b) Prevents the achievement of the specified test cylinder strengths at 28 days for the appropriate class of concrete.

c) Produce discoloration or efflorescence on the surface of the hardened concrete.

The water shall be free from hydrocarbons and from suspended organic matter. Inorganic matter in solution shall not exceed 500mg/1 by weight and in suspension shall not exceed 50mg/1 by weight.

No salty water shall be used.

The water which the Contractor proposes shall be tested by the Contractor to the approval of the Engineer before use in the Permanent Works. Regular tests of the water shall be made by the Contractor during construction of the Works. The water shall be sampled at the point of discharge into the mix and the frequency of sampling shall be as approved by the Engineer. The Contractor shall supply two copies of each test result to the Engineer.

4.5 ADMIXTURES

Admixtures in general shall comply with BS 1014, BS 3892 or BS 5075 as appropriate. Concrete shall be made from cement, aggregates and water as specified. No other ingredient shall be mixed with the concrete or mortar without the Engineer's approval.

If the Contractor proposes to use retarding or workability agents then the manufacturer's literature must be supplied giving typical dosage, effects of incorrect dosage, the amount of air

entertainment associated with its use, and the chloride ion content by weight of the admixture. The Engineer's approval to the use of admixtures shall be subject to the following conditions.

a) No reduction of target mean strength compared with additive-free concrete of the same class.
b) No change in specified cement content or effective water cement ratio.
c) No corrosive effect on reinforcement steel.
d) Dosage and admixture must be strictly in accordance with the manufacturer's instructions in respect of the specific conditions pertaining. Dosage to be by an approved dispenser, to within 5% of the required amount.

If air entertainment is approved the air content shall be 4% for concrete with a maximum aggregate size of 20mm, with an allowable tolerance of 1.5%.
The method of determining the air content shall be in accordance with BS 1881: Part 106 and the Contractor shall supply the necessary apparatus so that the Engineer may check the air content. If the average air content is greater or less than that specified or the range is greater than 2%, before any further concrete is used in the Works the Contractor shall take such steps as may be agreed with the Engineer to adjust the air content of the concrete or improve its uniformity. Any rejected air entertained concrete must be removed.

4.6 CHEMICAL CONCRETE MATERIALS

The total sulphate content, whether as gypsum or more soluble salts, of concrete ingredients when measured as sulphur trioxide shall together not exceed 4.-0% of the weight of cement in the concrete. The chloride content of concrete ingredients when measures as Cl shall together not exceed 0.3% of the weight of cement in concrete using SRPC.

The sulphate and chloride contents shall be established using the following tests:-

	Sulphate	**Chloride**
Aggregate	BS 1377: Part 3	BS 812: Part 117
Cement	BS 4550: Part 1 Clause 12	BS 4550: Part 2 Clause 17
Water	BS 1377: Part 3	BS 812: Part 117

The contribution of any admixture must also be included. Testing will be weekly, or as directed by the Engineer. When the acid soluble alkali content of the cement is greater than 0.6% (calculated as Na2 0+0.658K20) the Contractor must demonstrate that adverse alkali-silica reaction is likely. This may done by determining the alkali content of the cement, in accordance with BS 4450; Part 2 and establishing the alkali content of the concrete. Any concrete containing less than 3.0 Kg/m³ may be considered not at risk. In the event of higher alkali contents a sample of aggregate from each source must be tested in accordance with ASTM C 227-87. Any aggregate source showing an expansion greater than 0.05% at 3 months shall not be approved.

4.7 WATER STOPS

The Contractor shall supply and fix water stops in all contraction and expansion joints in members which are to be liquid retaining and where shown on the Drawings. They shall be obtained from manufacturers approved by the Engineer and shall be stored and fixed in accordance with the manufactures instructions. PVC water stops shall comply with information and Guidance Note 4-31-02 of the UK Water Research Centre. The number of joints made on Site shall be kept to minimum. Any jointing of PVC water stops on Site shall be by the process of head fusion using an appropriate jig and heating blade all in accordance with the

manufactures instructions. PVC water stops shall comply with information and Guidance Note 4-31-02 of the UK Water Research Centre. The number of joints made on Site shall be kept to a minimum. Any jointing of PVC water stops on Site shall be by the process of head fusion using an appropriate jig and heating blade all in accordance with the manufacturer's recommendations. The minimum dimensions of water-stops shall be as tabulated below (all dimensions in mm):

Width	Web Thickness	Edge Bulb* diameter	Centre Bulb* Int. diameter	Edge Bulb* height
140	4.5	12.5	8	-
190	4.5	12.5	8	-
240	4.5	19.0	10	22

Notes: * Internal water stops only

** External water stops only

Unless otherwise shown on the Drawings, the width of the water stops shall be at least equal to the thickness of the concrete member in which it is embedded, up to a maximum width of 250 mm. The edge bulb section of internal water stops shall be circular or semicircular. The centre bulb should be hollow. The water stops shall be carefully maintained in the position shown on the Drawings and properly protected from damage and the harmful effects of light and heat during all stages of construction. The stop-boards on each side of the water stops. The concrete shall be carefully compacted under and around the water stops so as to leave no cavities.

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

The Contractor shall supply the manufacturer's test certificates for each consignment of water stops delivered to Site and shall if requested to supply to the Engineer sufficient samples of each type and consignments for conformity tests to be carried out in accordance with the appropriate standard test procedure. The PVC for PVC water stops shall be high grade virgin polyvinyl chloride containing no filter, reclaimed or scrap material. It shall comply with the requirements of BS 2571 for type A3 of Class 1 but shall have improved tensile qualities. The minimum tensile strength shall be 12.5 N/mm² and the minimum elongation at break shall be 28.5%.

4.8 JOINT FILLER

The Contractor shall supply and fix pre-moulded joint filler in all expansion joints and where shown on the Drawings. Unless otherwise specified the joint filler shall be of resin or bitumen bonded cork or impregnated fibreboard. Impregnated fibreboard shall not be used in water retaining structures. Materials shall be obtained form manufacturers approved by the Engineer and shall be stored and fixed in accordance with the manufacturer's instructions. The joint filler of the material and thickness specified shall be cut to shape and fixed to fill the whole space

between the concrete faces to the joint not otherwise filled by water stop and joint sealer. Abutting places shall be placed in close contract and the joints covered on each side to prevent the passage of cement grout.

The Contractor shall supply the manufacturer's test certificate for each supply to the Engineer sufficient samples of each type and consignment for confirmatory tests to be carried out in accordance with the appropriate standard test procedure.

The filler shall comply with the following American Society for Testing and Materials Specifications.

a)	Resin Bonded Cork	ASTM D 1752-84 Type II
b)	Bitumen Bonded Cork and Impregnated Fiberboard.	ASTM D 1751-83

4.9 JOINT SEALERS

All joints of concrete member shall be sealed with mastic as specified and/or as directed by the Engineer.

The Contractor shall select permanent elastic, synthetic mastic sealing compound, which has a high degree of extensibility, optimum elastic force and good adhesion to concrete. Products consisting of one or two components, one the basis of poly sulphide liquid polymer, silicone rubber and polyurethane of others may be used; however, only proprietary materials (made by fully recognised manufacturers), which are resistant to aging, oxygen, irradiation with ultra-violet light, water, oil, grease, chemicals and biodegradation and which have been approved by the Engineer may be used. Areas not exposed to the eye may be filled with dark coloured mastic.

The mastic shall be stored in sealed containers in a dry and cool place prior to use, strictly in accordance with manufacturer's instructions.

Mastic sealing compound used for expansion joints in water tanks shall be:

- Physiologically absolutely safe, i.e it shall not contain any substances which may be considered a substrate for water bacteria;
- Resistant to any detergents used in water tanks;
- Complying with the health requirements for potable water.

The Contractor shall construct recesses at all joints and on both faces of accurately formed to the lines and dimensions shown on the Drawings or as agreed with the Engineer. The Contractor shall prepare the surfaces of the recess and shall supply a joint sealer and fill or caulk the recess completely with it. Joint sealing shall not be commenced without the approval of the Engineer. In reservoir joints the sealer shall be poured after the construction of the reservoir roof.

All joint sealers shall be from an approved manufacturer. The Contractor shall supply the manufacturer's test certificates for each consignment of each type of joint sealant delivered to the Site and shall if requested to supply to the Engineer sufficient samples of each type and consignment for conformity tests to be carried out in accordance with the appropriate test procedure.

Sealants shall be installed in strict accordance with the manufacturer's instructions. Debonding strip shall be used in conjunction with the sealers as indicated on the Drawings. The debonding strip shall be compatible with the joint sealer and shall be resistant to attack from the primer used to bond the sealer to the concrete.

Polysulphide and polyurethane sealers shall not abut bituminous sealers. Surfaces to receive polysulhpide and polyurethane sealers shall be kept free from bituminous paints.

All sealers shall be appropriate for the prevailing climatic conditions.

Bituminous sealers shall comply with BS 2499 for Type Al.

Polysulphide Sealers shall comply with BS 4254

4.10 BOND BREAKING COMPOUND

Bond breaking compound shall consist of 66% of 200 pen bitumen blended hot with 14% light creosote oil and when cold brought to the consistency of paid by the addition of 20% solvent naphtha or other approved compound meeting the following requirement.

a) It shall not retard or in any other way affect the settling of concrete.

b) The average bond stress on bars coated with the compound with half their length cast into concrete specimens and subjected to pull out tests at 7 days shall not exceed 0.13 N/mm² and the total movement of the dowel bar relative to the concrete specimens shall be not less than 0.15mm at the stress. The concrete specimens shall be 150mmx150mm in section and 450mm long and made with the same mix proportions as used in the works.

4.11 CLASSES OF CONCRETE – GENERAL

The class of concrete is defined by the characteristic cylinder crushing strength and the nominal maximum aggregate size, with additional suffix defining any additional requirements. The requirements for each class of concrete are give in Table 14.1 below.

The specified slump values are a guide only and may be varied subject to the approval of the Engineer.

The Concrete grads is defined as the 28 day cylinder crushing strength (MPa) below which no more than 5% of results are expected to fail.

TABEL: 14. 1

Concrete Classes

Concrete Class	Grade (MPa)	Maximum Aggregate Size (mm)	Cement * Type	Workability**
35/20S	35	20	SRPC	High
28/40	28	40	OPC	Medium
28/20	28	20	OPC	High
28/10	28	10	OPC	High
24/40S	28	40	SRPC	Medium

28/20S	28	20	SRPC	High
21/20	21	20	OPC	-
21/20S	21	20	SRPC	-
C15/40	15	40	OPC	-

Notes: * SRPC shall be used where specified in Clauses 2.19 and 2.21

** High workability; slump 65 to 135 mm

Medium workability: slump 50 to 100mm

4.12 CLASSES OF CONCRETE – PARTICULAR

The classes of concrete to be used are as noted on the Drawings. In addition, the following shall apply unless specified otherwise:

35/20 S	-	Reinforced Concrete in Piles
28/20 S	-	Reinforced concrete in foundation and plinth, reservoirs and chambers (if required).
28/20	-	Reinforced concrete in foundation and plinth, reservoirs and chambers.
21/20	-	Reinforced concrete in super structure above plinth.
	-	Precast concrete.
21/20	-	Benching to manholes and chambers.
	-	Carriageways and footpaths.
21/20S	-	Pipe bedding and pipe anchor
	-	Support blocks & filling with mass concrete.
15/20	-	Binding/Lean Concrete
	-	Non-structural concrete around manholes & chambers.
	-	Haunching to kerbs.

All concrete or mortar used in sewerage manholes, chambers or tanks shall be made with SRPC.

4.13 WATER-RETAINING CONCRETE

Where water proof concrete is required, the Contractor shall take full responsibility for ensuring that such construction is completely water proof (crack-free). Any leaks appearing during the construction and maintenance period of the Contract shall be completely repaired by the Contractor at his own expense. The method proposed by the Contractor for dealing with shrinkage cracks, leaks, or other defective work shall have no adverse effect on the finished structure. Treatments of internal and external concrete surfaces of water retaining structures, etc. (coating or toppings) provided in the Bill of Quantities, does not relieve the Contractor of this obligations under the Contract. These treatments shall be considered as an additional step for waterproofing and / or resistance to chemical attack.

4.14 CONCRETE MIX DESIGN

The Contractor shall determine to the approval of the Engineer the actual proportions of ingredients for each class of concrete to be used in the permanent works.

The concrete shall meet the requirements given in Table below.

Before commencing any concerning on the Site the Contractor shall conduct tests to the satisfaction of the Engineer to determine the concentration of sulphate in the soil and the ground water in order to determine the concrete exposure class as detailed in Table 4.14. The Contractor shall ensure that all concrete susceptible to sulphate attack from the soil and ground water shall be designed to satisfy the additional requirements given in Table 4.13 for the particular Site exposure class.

TABLE 4.13

Requirements of Classes of Concrete

Class	Cement Content kg/m³		Maximum W/C ratio
	Minimum	Maximum	
35/20S	295	550	0.65
28/40	245	550	0.65
28/20	275	550	0.65
28/10	315	550	0.65
28/40S	250	550	0.65
28/20S	285	550	0.65
21/20	270	550	0.65
21/20S	280	550	0.65
15/20	220	550	0.60

Notes: 1 Water cement ration is the ratio of free water to cement in the mix based on aggregates being in a saturated surface dry condition.

2 Characteristic compressive strength compliance requirements shall be to BS 5328 Clause 3.16.2 and Table 1.

TABLE: 4.14

Requirement of Classes of Concrete

Exposed to Sulphate Attack

Class	Concentration of Sulphate expressed as SO		Type of Cement	Dense fully compacted concrete made with 20 nominal size aggregate complying with BS 882 or BS 1047
	In Soil	In Groundwater (g/litre)		

	Total SO3	SO3 2:1 Water soil Extract (g/litre)			Cement* Content not less than	Free water Cement* ratio not More than
1	Less than 0.2	Less than 1.0	Less than 0.3	All cement listed in Clause 6.1, 2.1** BS 12 cements combined with pfa* BS 12 cements Combined with ggbfs+	No additional requirements	
2	0.2 to 0.4	1.0 to 1.5	0.3 to 0.7	All cements listed in Clause 6.1, 2.1** BS 12 cements combined with pfa* Bs 12 cements Combined with ggbfs+	330	0.50
				BS 12 cements Combined with min 25% or max 40% pfa++ BS 12 cements Combined with min 70% or max 90% ggbfs	310	0.55
				BS 4027 cements (SRPC) BS 4248 cements (SSC)	280	0.55
3.	0.4 to 0.7	1.5 to 2.1	0.7 to 1.4	BS 12 cements Combined with min 25% or max 40% pfa+, BS 12 cements Combined with min 70% or max 90% ggbfs	3850	0.45
				BS 4027 cements (SRPC) BS 4248 cements (SSC)	330	0.50
4	0.7 to 1.0	2.1 to 3.1	1.4 to 2.5	BS 4027 cements (SRPC) BS 4248 cements (SSC)	370	0.45
5	Over 1	Over 3.1	Over 2.5	BS 4027 cements (SRPC) and BS 4248 cements (SSC) with adequate Protective coating. Refer Clause 6.2.3.3**		

Notes: * Inclusive of pfa and ggbfs content.

** All clause numbers refer to BS 8110.

+ Refer to BS 8110, Clause 3.3.5

++ Values expressed as percentages by mass of total contents of cement, Pfs and.

1. Mix proportions shall be adjusted in accordance with BS 8110, Clause 6.2.4.3.
2. Reference should be made to the notes give with Table 6.1 in BS 8110 retaining to use of sulphate-resisting Portland Cement (SRPC) and the method analysis of soil water extracts.
3. SSC – Super sulphated Cement.

Unless otherwise specified or agreed by the Engineer for concrete Grade 30 and above the proportions of coarse and the aggregates shall be selected to achieve one of the grading curves defined in Table 4.15, within an allowable tolerance of generally 5%. A change from a maximum positive tolerance to a maximum negative tolerance in consecutive sieve sizes should be avoided. Classes 20/40P and 20/40SP shall have a find aggregate content of 15% of the coarse aggregates.

TABLE 4.15 Combined Aggregate Gradings

40mm maximum aggregate size grading curves

Sieve size (mm)	1	2	3	4
50	100	100	100	100

37.5	95	97	99	100
20	50	59	67	75
10	36	44	52	60
5	24	32	40	47
2.36	18	25	31	38
1.18	12	18	24	30
0.60	7	12	17	15
0.30	3	7	11	15
0.15	0	0	2	5

20mm maximum aggregate size grading curves

Sieve size (mm)	1	2	3	4
37.5	100	100	100	100
20	95	97	99	100
10	45	55	65	75
5	30	35	42	48
2.36	23	28	35	42
1.18	16	21	28	34
0.60	9	14	21	27
0.30	2	3	5	12
0.15	0	0	0	1.5

10mm maximum aggregate size grading curves

Sieve size (mm)	1	2	3	4
10	95	97	99	100
5	30	45	60	75
2.36	20	33	46	60
1.18	16	26	37	46
0.60	12	19	28	34
0.30	4	8	14	20
0.15	0	1	3	6

The Contractor shall submit details of the source of all material and the proposed quantities of each ingredient per cubic meter of fully compacted concrete. The Contractor shall then make trial mixes for each class of concrete using the same type of Constructional Plant and the same materials as are proposed for the Permanent Works. The Contractor shall give 24 hours notice of such trials to enable the Engineer to attend. For each trial mix, three separate batches of concrete shall be made by the Contractor and will be tested at 28 days all in accordance with BS 1881: Part 116. Such trial mixes shall not be the first batch through the plant in any one sequence of concrete production.

The Contractor shall not commence concerning in the Permanent Works until details of trial mixes and test results for each class of concrete have been submitted to, and approved by, the Engineer.

A trial mix design will be approved by the Engineer with respect to strength if the average compressive strength of the nine cylinders so tested is more than the target mean strength.

The Contractor shall not alter the approved mix proportions nor the approved source of supply of any of the ingrecients without having previously obtained the approval of the Engineer

During the production the Engineer may require trial mixes to be made before a substantial change is made in the materials or in the proportions of the materials to be used.

4.15 DELIVERY AND STORAGE OF MATERIALS

All materials for concrete delivered shall be approved and contain following identification marks both in English and Urdu and Stacked as per instruction of the Engineer.

- Type of cement/steel
- Number and date of standard conforming to
- Net weight of cement contained in bags
- Name, trade name of manufacturer
- Country of origin
- Date of manufacturer

4.16 CONTROL AND MIXING OF INGREDIENTS

The Contractor shall measure the moisture content in the aggregates and so determine the amount of water to be added to each batch of fresh concrete. Such determinations shall be to the approval of the Engineer and the results and calculations shall be available for inspection by him. The frequency of such determinations shall be as directed by the Engineer and shall depend on the quality of control of storage and handling, weather conditions and variability of aggregated supplied.

The Contractor shall proportion the ingredients of each batch of concrete by weight. The measuring equipment should give an accuracy of $\pm$ 3% for each ingredient. The water shall be added to the aggregates and cement in a mechanical batch mixer; it shall not exceed the maximum ratio with regards to cement give in Table 14.2 (A0 hereof, and shall otherwise be the minimum amount necessary consistent with complete compaction. The device for measuring the water shall show accurately the weight required with given moisture content of the aggregate and shall be so designed that the water supply will be automatically stopped when the correct quantity has been discharged into the mix. The concrete ingredient shall then be thoroughly mixed.

The minimum mixing time shall be:

1) For mixes of 1.5m³ capacity or less 1-1/2 minutes.

2) For mixes of larger capacity that 1.5m³ the time shall be increased by 15 seconds for each additional 0.75m³ capacity. For intermediate sizes the time shall be assessed by proportion.

3) IN special circumstances, and at the sole discretion of the Engineer, the proportioning of materials by volume may be approved. In such circumstances the cement content of the concrete shall be increased by 10% over the amount in the approved mix. The boxes used for proportioning shall be deep and narrow to the approval of the Engineer, and shall be separately constructed for each class of concrete to be proportioned by volume.

4.17 CONCRETE SAMPLING AND TESTING

The temperature of concrete, concrete constituents, reinforcement form work and the atmosphere shall be monitored continuously for every concrete pour. All sampling and testing of fresh and of hardened concrete shall be carried out in accordance with the provision of BS 1881 unless such provision is at variance with the Specification.

Table 14.5 gives the program for sampling and testing of concrete for each class of concrete from each batching centre in each active day.

TABLE 14.5

Program for Works Sampling and Testing

Grade	30 & above	Less than 30
Workability (slump test)	1	0
Workability (compacting factory test)	2	0
Compressive Strength	3	0

Where: *0- No testing required.*

1- Every batch at point of deposit

2- One sample from every 10 batches, one sample per 20m³ of concrete or one sample from each day's concrete, whichever involves the greatest number of samples.

3- One sample from every 50 batches, one sample per 50m³ of concrete or one sample from every three days concrete, whichever involves the greatest number of sample.

The Contractor shall establish a plan for sampling and testing to the approval of the Engineer. Samples shall be taken at the place of deposition from each class of concrete at random. The frequency of sampling shall in general be in accordance with Table 14.5 but the actual rate of sampling may vary with the approval of the Engineer and shall be increased when ordered by the Engineer in appropriate circumstances, From each such sample six 150mm concrete cylinders shall be prepared, each cylinder shall be marked indelibly for identification when it is in the mould. After retention at the site for 24 hours the cylinders shall be delivered to the testing laboratory for curing and testing.

4.18 COMPLIANCE WITH SPECIFIED CONCRETE REQUIREMENTS

Of the six cylinders made from each sample of fresh concrete in accordance with the Specifications, three will be crushed at 7 days and the other three at 28 days. The average of the three 28 days strengths will be taken as the test result. Compliance with the specified strength requirements shall always be judged on the 28 days test results.

Concrete shall be considered to have failed to comply with the Specification.

(a) If a test result is less than the minimum specified in BS 5328 for that class of concrete, in which case the concrete which it represents shall be broken out and disposed of away from the site by the Contractor unless at his sole discretion the Engineer approves

(b) If the average of four consecutive test results for that class of concrete shall have failed to exceed the minimum mean of 4 as specified in BS 5328 in which case no further concrete of that class shall be placed in the Permanent Works until the Contractor shall have discovered the cause of such failure and rectified it to the satisfaction of the Engineer.

If a mix fails to achieve the requirements for fresh concrete the batch shall be rejected and no further concrete of that class shall be placed in the Permanent Works until the cause of failure has been rectified.

If test results for strength of concrete of any class are consistently and significantly in excess of the target strength the Engineer may on the application of the Contractor agree to a reduction in the cement content in the mix for that class, provided the cement content is not lowered below the minimum specified for that class, nor the maximum water/cement ratio exceeded.

4.19 FURTHER TESTING

When the Engineer agrees to or requires testing of the hardened concrete in a structure of pre cast element all such testing shall be carried out in accordance with BS 1881 or BS 8110. The

results of such tests shall be interpreted in accordance with BS 6089. Any test on hardened concrete required by the Engineer shall be completed within 28 days of the Engineer's order for the test.

In assessing the results of compressive tests on cores the concrete represented by the core shall be deemed not to comply with the Specification if the strength of the core when adjusted for length; diameter ratio and converted to estimated cylinder strength in accordance with BS 1881 is less than 85% of the specified characteristics strength. Cores shall not be tested for strength at ages less than 28 days and no adjustment shall be made to the measured strength in respect of the age of the core when tested.

4.20 TRANSPORTING, PLACING AND COMPACTING CONCRETE

The concrete shall be handled so that at the point of deposition it is of the specified quality and approved consistency, nothing having been added to it or lost from it since leaving the mixer. Any free water shall have been removed from the section to be concreted before concrete is deposited.

The Contractor shall obtain the approval of the Engineer to the arrangements he proposes to use for concreting before commencing concrete work.

The Contractor shall regard the compaction of the concrete as work of fundamental importance and shall produce a watertight concrete of maximum density compatible with the approved mix. Compaction shall be assisted by the use of mechanical vibrators of the immersion type, but shall not involve the vibration of reinforcement or shutters except that vibration of shutters may be allowed in precast concrete, with the approval of the Engineer. Vibrators shall be inserted at least to the full depth of the newly deposited concrete, kept in position for about a quarter of a minute and then slowly withdrawn to prevent the formation of voids. The procedure shall be continuous with points of insertion 150 to 225 mm apart. The number and type of vibrators available for use during each period of concerting shall be to the approval of the Engineer, which will not be given if sufficient stand by vibrators in good working order are not readily available. If concerting is in the dark, ample lighting shall be provided at the mixing stations and at every place where concrete is being deposited.

Lean concrete for binding course may be compacted by tamping.

Concrete without a retarded which is not deposited in the work within 30 minutes after the start of mixing shall not be used unless the Engineer approves otherwise.

Concrete may be pumped provided the mix design and the nature of pumping comply with the recommendations give in the Guide to Concrete Pumping as published by the Building Research Establishment (UK) and are not in conflict with any specified requirements. The first batch of concrete to be made every time work is commenced shall contain 10% more cement than the normal amount.

Concrete shall be placed continuously up to positions of joints prepared prior to commencement of concreting. No concrete shall be dropped or chuted into the shuttering in such a manner as to cause segregation of the ingredients. The deposited layers of concrete shall not exceed 600 mm in thickness. Shallow beams may be concreted to full height in one operation as directed by the Engineer. Care shall be taken to ensure that reinforcement projecting from concrete recently placed is not shaken or disturbed.

Where steps, splays and kickers occur these shall be cast in one with the slab and additional case shall be taken in the vibration and finishing techniques and procedures to ensure that thorough compaction is achieved and the unset concrete is not subjected to tension and no cracks are formed. The techniques and procedures to be adopted shall be discussed with the Engineer and his approval received before any such concreting is commenced.

4.21 TRUCK MIXED CONCRETE

Truck mixers can be used if authorized by the Engineer. They shall be of the revolving type, watertight and so constructed that the concrete can be mixed to ensure a uniform distribution. When truck mixers are approved to supply concrete to a distant location, the Contractor shall ensure that the following information is supplied on an approved delivery from:

- Type of concrete and ingredients used;
- Water/cement ratio;
- Type and quantity of approved additives to the concrete mix;
- Time of departure from batching plant;
- Slump;
- Signature of Plant manager

Water shall be added to the mix either at site or at the batching plant. In no circumstances shall water be added in transit.

No concrete shall remain in a revolving truck mixer more than 1 ½ hours.

4.22 CONCRETING IN UNFAVOURABLE CONDITIONS

The Contractor shall not place concrete in the Permanent Works:-

a) During heavy rains or dust storms.

b) When the air temperature is more than 40°C.

c) When the air temperature is les than 2°C.

d) If the temperature of the concrete on discharge from the mixer is less than 4°C or more that 32°C.

e) When the air temperature exceeds 25°C without taking precautions and demonstrating to the approval of the Engineer that the maximum internal temperature of the concrete within 24 hours after casting in place is unlikely to be more than 30°C in excess of the ambient temperature or more than 60°C.

f) Without the approval of the Engineer if the temperature of the shutters or reinforcement exceeds 30°C.

To keep within these limits the Contractor may, among other means, spray aggregates with water, and use chilled mixing water, or add ice direct to the mixer provided that no ice is present in the mix when discharged form the mixer. When concreting in hot weather all material used shall be kept in the shade. Water tanks, mixers and chutes should be shaded, but where this is not possible they shall be painted white and kept white.

4.23 CONCRETING RECORDS

A written record of the concrete works shall be made each day by the Contractor and kept available for inspection by the Engineer. The diary shall contain notes and records of;

a) The names of the Contractor's engineers who are responsible for the different phases of the concrete work, and also the names of their assistants.

b) The temperatures of air, water, cement, aggregates and concrete, together with the air humidity and type of weather.

c) Deliveries to the site of concrete materials (quantity, brand of cement, etc).

d) Inspections carried out, tests performed, etc and their results.

f) Quantity of cement, fine and coarse aggregate and admixture used for each section of work, and the number and kind of test samples taken on these ingredients and water.

4.24 SHUTTERING

The terms shuttering and form work shall be interpreted as meaning one hand the same thing, namely temporary works set up to obtain the required profiles and surface textures of the concrete. Shuttering shall be such that it remains rigid during the placing and setting of the concrete and prevents the loss of any concrete ingredients.

The shuttering shall be fixed in correct alignment and to the true shape and dimensions of the Permanent Works and shall be designed so that it can easily be removed for curing of concrete to commence as soon as practicable. Where necessary, shuttering should be so arranged that the soffit form, properly supported on props only, can be retained in position for such periods as may be required to allow the concrete to mature as specified in Clause 2.44. A method of support which would involve holes or tie wires extending the whole width from face of work to be concreted will not be permitted, unless authorised by the Engineer in writing. No plugs, bolts, wire ties, holdfasts or any other appliance whatsoever for the purpose of supporting the shuttering or reinforcement shall be fixed permanently into the structure so that they have less cover than that specified for the reinforcement or in any way impair the strength or appearance of the work, nor shall they be placed in such a manner that damage to the work would result in the removal of the same at the time of striking the shuttering.

Before the concrete is placed the retaining surfaces shall be cleaned of sawdust and shavings, dir, other debris and standing water.

The inside of shuttering shall be coated with a release agent of non-staining mineral oil, mould cream emulsion or with other approved material. Adjacent concrete or reinforcement shall not be contaminated. The release agent must be compatible with any applied finish.

Temporary openings for cleaning and inspection before concreting shall be provided at the base of column and wall shuttering and where necessary. Shuttering for walls or other thin sections may have openings where approved by the Engineer for the placing and compacting of the concrete. No concreting shall be started before the shuttering has been inspected by the Engineer. Unless otherwise approved, top shuttering shall be provided to concrete faces where the slope exceeds one vertical to three horizontal. Exposed arises shall be formed with a chamber measuring 20mmx20mm.

The rates for concreting shall include shuttering and for all types of cutting and waste, forming chambers or as otherwise indicated on the Drawings.

4.25 SURFACE FINISHES

The faces of all concrete shall be left sound, solid, free from voids and to the class of finish specified.

No treatment to the finished concrete other than that specified in the class of finish shall be carried out unless approval to do so has been given by the Engineer.

Bolt bobbin holes shall be filled with cement and suitable fine aggregate mortar to match the colour of the concrete. The mortar shall be well worked in and thoroughly cured.

Classes for formed surfaces.

Class F-1: This finish requires no special treatment and is for surfaces which will remain hidden in the Permanent Works.

Class F 2S: This finish is for all exposed surfaces that shall not be rendered.

The finish shall be obtained from forms designed to produce a hard smooth surface with true, clean arises. Only very minor surface blemishes shall be permitted and these shall be no staining or discoloration. The formwork shall be faced with plywood or equivalent material in large sheets rigidly supported so as to prevent distortion under load. The sheets shall be arranged to coincide with architectural features, or changes in direction of the surface. All joints between panel shall be straight and either vertical or horizontal unless otherwise directed and the joints between panels to slab soffits shall be parallel to the supports. Suitable joints shall be provided between sheets to minimize joint marks and to maintain accurate alignment in the plane of the sheets.

Class F2R: This finish is for all exposed surfaces that are to be rendered or plastered. The formwork shall be face with plywood or equivalent material in large sheets rigidly supported to as to prevent distortion under load. All joints between panels shall be straightened either vertical or horizontal unless otherwise directed. Suitable joints shall be provided between sheets to minimise joint marks and to maintain accurate alignment in the plane of the sheets. The surface of the formwork shall be unplanned so as to produce a rough concrete finish to provide a good key for the render or plaster.

Class F3: This finish identical to Class F2 finish except that the permitted deviations for irregularities are more stringent as given in Table 14.6.

Profited Surface Finish – This finish is used where indicated on the Drawings. The quality of the surface finish and the permitted deviations shall be as for a Class F2S finish.

Where a surface is partly below sand partly above the final ground level the finish for exposed surfaces shall extend for 500mm below the final ground level.

Classes for unformed surfaces:

Type U1: This finish is for surfaces where a superior finish is not required. It is also the first stage for finishes U2 and U3. The finishing operations shall consist of grading, tamping and screeding the concrete to produce a uniform, plain or ridged surface.

Type U2: This is a smooth matt finish such as may be achieved by a wood trowel, as required, inter alia, to receive mastic pavings, block of tile pavings bedded in mastic or screeds. Smoothing shall be done only after the concrete has hardened sufficiently, and may be hand produce a uniform surface free from marks.

Type U3: This a smooth steel-trowelled finish for surfaces of concrete pavings, tops of walls, coping's and other members exposed to weathering or water, surfaces to receive thin flexible sheet, tile pavings bedded in adhesive, and seatings for bearing plates and the like where the metal is in direct contact with the concrete. Trowelling shall not commence until the moisture firm has disappeared and the concrete hardened sufficiently to prevent excess laitance from being worked to the surface. The surfaces shall be trowelled by hand or machine under firm pressure and left free trowel marks.

Type U4: This is power trowelled finish for surfaces to receive epoxy resin floor finish. Trowelling shall not commence until the moisture film has disappeared and the concrete hardened sufficiently to take the weight of the machine and operator.

4.26 FINISHES FOR FORMED SURFACES – PARTICULAR

Class F1 is for surfaces which will remain hidden in the Permanent Works.

Unless otherwise stated on the Drawings all exposed surfaces shall be Class F2R, subject to the following exceptions:-

The internal faces of all liquid retaining structures shall be Class F2S.

The exposed faces of all concrete walls shall be Class F2S.

4.27 PERMITTED DEVIATIONS IN FINISHED WORK

The irregularities in formed and unformed surfaces for the various classes of finish shall be within the target limits shown in Table 14.6. If irregularities exceed the target the Contractor shall take the necessary steps to bring subsequent work within the target. If, however, the irregularities exceed the maximum allowable shown in the table it shall be sufficient cause for the structure, member or section of a member of the structure to be removed and properly reconstructed.

In Table 14.6 the type of irregularity is defined as follows:-

i) Departure from alignment and grad and dimension shown on the Drawings.

ii) The cross sectional dimensions of structural members less than 600 mm, such as walls, columns, beams etc where for structural reasons, it is desirable to keep the tolerances within closer limits than those for alignment and grade.

iii) Gradual irregularities measured from a 3m long template placed against the concrete.

iv) Abrupt irregularities such as those resulting from defective or displaced facing or movement of supports.

TABLE 14.6

Permitted Deviations for Irregularities of Concrete Surfaces

Tolerances in mm Formed finish

Type Irregularity	Target			Maximum allowed		
	F1	F2	F3	F1	F2	F3
1	± 20	± 5	± 1	± 40	± 10	± 2
2	± 07	± 5	± 1	± 15	± 10	± 2
3	7	5	± 1	15	10	± 2
4	7	3	± 1	10	5	± 2

Tolerances in mm Unformed finish

Type Irregularity	Target			Maximum allowed		
	U1	U2	U3	U1	U2	U3
1	± 20	±10	± 3	± 35	± 20	± 6
2	± 07	± 5	± 3	± 15	± 10	± 6
3	10	5	3	20	10	6

4.28 REMEDIAL WORK

A concrete surface with in the opinion of the Engineer fails to achieve the required standard shall render that section of concrete, the member of which it is a part, or in extreme cases the whole structure, liable to be rejected by the Engineer.

No remedial work shall be started before the defective section has been inspected by the Engineer. IF the Engineer permits remedial work as an alternative to reconstruction, the Contractor shall submit his proposals in respect of the repair to the Engineer for his approval.

Bolt bobbin holes shall be filled with cement and suitable fine aggregate mortar to match the colour of the concrete. The mortar shall be well worked in and thoroughly cured.

4.29 FIXING REINFORCEMENT

Steel reinforcement shall be cut from straight bars free from kinks and bends or other damages, and cold bent by experience competent workmen. Bars shall be bent in a bending machine approved by the Engineer. Cutting, bending and marking shall be to the tolerances and format give in BS 4466 unless otherwise specified or ordered by the Engineer.

The Contractor shall place and fix steel reinforcement accurately in the positions shown on the Drawings and shall ensure that it remains rigidly in that position during the placing of concrete. Tack welding shall not normally be permitted, however in particular cases it may be allowed with the prior approval of the Engineer. Supports, spacers, including PVC spacers, and tie shall be subject to the approval of the Engineer. Concrete spacers shall be made of the same quality concrete as that for the work in which they will be embedded with any tying wires galvanized and located to give a minimum cover of at least half that specified for the reinforcement. Metallic spacers, fixing clips and tying wire shall be computable with the material of the reinforcement and the specified cover shall be maintained.

Spacers should be of such materials and designs as will be durable, not lead to corrosion of the reinforcement and not cause spelling of the concrete.

Reinforcement projecting form previously cast concrete shall not be bent so as to require rebending without the prior approval of the Engineer.

The main wires of adjacent sheets of steel fabric reinforcement shall be lapped at least 300 mm and the transverse wires at least 150mm.

The Contractor shall not place concrete around reinforcement until the reinforcement has been inspected by the Engineer.

4.30 COVER TO REINFORCEMENT

Except where otherwise shown on the Drawings the nominal concrete cover the nearest reinforcement (exclusive of concrete blinding and rendering) shall be 40mm.

4.31 CONSTRUCTION JOINTS

Where construction joints are shown on the Drawings the Contractor will not be permitted to after these joints or their positions or to increase their number without the prior approval of the Engineer.

Where not shown on the Drawings, the details and position of construction joints shall be submitted to the Engineer for approval before any concerting takes place. They shall be located so that, when considered with sequence of concreting, the effects of shrinkage and temperature are minimized.

Construction Joints shall be formed in straight lines with rigid shuttering perpendicular to the principal line of stress and as far practicable at points of least shear. They shall be the plain type unless otherwise specified or approved.

As soon as the exposed concrete has sufficiently hardened surface of the joint shall be brushed with a stiff brush to expose the larger aggregate without it being disturbed. Roughening of the surface by chipping or hacking will not generally be approved. Before Placing fresh concrete against a construction joint all loose material shall be removed and the surface sluiced with water until it is perfectly clean, thereafter all ponded water should be removed.

A period of at least 3 days and not more than 14 days, except under special circumstances and with the approval of the Engineer, shall elapse between the casting of successive lifts of concrete.

In the case of water retaining structures no more than 7 days will be permitted to elapse between casting of the base or footing to a wall panel and the casting of the stem of the wall on the base or footing.

The cost of construction joints shall be deemed to be included in the rates for concrete.

4.32 MOVEMENT JOINTS

Movement joints (Expansion & Partial Contraction Joint) shall be constructed in the positions as shown on the Drawings or as directed or approved by the Engineer.

Movement joints are measured separately and items are included in the Bill of Quantities for the various joints in each of the structures.

Where indicated on the Drawings, dowel bars shall be positioned across the joint. They shall be placed with the midpoint of the longitudinal axes intersecting the plane of joint at right angles, half the length of the bars being suitably coated to prevent bonding. Fitted over the coated length shall be pipe sleeve, closed and packed with compressible filler for a depth of 25mm at the end of the bar remote from the joint.

Where shown on the Drawings or as directed by the Engineer, joints shall be sealed on one of both faces as required. On the face or faces requiring, a groove of the shape and dimensions shown in the standard joint details shall be formed. Not earlier than fourteen days after the placing of the concrete, or when otherwise directed by the Engineer, the groove shall compound to the underside of the chamfers. The sealer shall be prepared and applied strictly in accordance with the manufacturer's instructions.

The joints shall be made by forming the concrete on one side of the joint and allowing it to set before concrete is placed on the other side of the joint. The surface of the concrete first placed at contraction joints shall be coated with band breaking compound before the concrete on the other side of the joint is placed.

4.33 PROTECTION AND CURING OF CONCRETE

The Contractor shall take measures to the approval of the Engineer for the protection of concrete from the harmful effects of wind, sun, high and low temperatures, rapid temperature changes, premature loading, deflection impact and aggressive ground water. Such measure shall continue from the time that the concrete is placed for a minimum of 14 days.

All exposed concrete surfaces shall be kept moist, for not less that 14 days after casting by methods to be approved by the Engineer in writing before use.

Concrete surfaces shall be protected and cured in the following manner.

a) The concrete shall be kept moist for a continuous period of at lease 14 days after placing by covering it with moist sane, wet sacks, canvass, fibre mats or other satisfactory material capable of retaining the moisture, or by providing a sprinkler system.

b) Utilizing of an approved non-bituminous pigmented liquid curing compound of an adequate type. The compound shall be applied strictly in accordance with the recommendations of the manufacturer. This compound shall not be applied on concrete surfaces of movement or construction joints.

4.34 REMOVAL OF SHUTTERING

Shuttering shall be removed in accordance with Table 14.7. In certain circumstances reductions may be made to these times in accordance with the principles of BS 8110: Part 1: Clause 6.9.3 with prior written approval of the Engineer. Unless the soffit shuttering to beams and slabs has been designed so that it can be struck without disturbing the props, it shall be retained in position for the minimum period given in Table 14.7 for the retention of the props. Great care shall be exercised during the removal to avoid shocks to ore reversal stress in and the concrete.

TABLE 14.7

Minimum Period before Striking Formwork

Temperature of Concrete Type of formwork	16°C	7°C
Vertical formwork of columns Wall and Large beams	18 hours	24 hours
Soffit formwork to slabs (props left under)	4 days	7 days
Props to slabs	11 days	14 days
Soffit formwork to beams (props left under)	8 days	14 days
Props to beams	15 days	21 days

Notwithstanding the foregoing the Contractor shall be held responsible for any damage arising from removal f formwork before the structure is capable of carrying its own weight and any incidental loading.

4.35 CEMENT MORTAR

Mortar shall comply with BS 5628.

Sand sha l be to BS 1200, Table 1, for general purpose mortars. Cement shall be as specified in Clause 2.2

Plasticizers shall comply with BS 4887 and be used only as recommended by the manufacturer.

The dry ingredients of cement mortar shall be thoroughly mixed with just sufficient water to make to workable to the correct degree. With the approval of the Engineer anon-shrink admixture may be used subject to the provisions of Clause 2.6.

Cement mortar which has begun to set shall not be used or reworked for use in the works.

Mortar shall be mixed in batcher mixer of a type approved by the Engineer or mixed by hand as instructed by the Engineer.

The proportions of mortar shall be:

a) **Type M1.**
Mortar for block work and building in ancillary components such as sills, copings, lintels.
Cement: Sand

The proportion of sand may be increased to give a maximum cement; sand ration of 1:5 provided that the workability of the mortar is maintained by the addition of an approved Plasticizer.

b) **Type M2**

Mortar for:-

- Bedding steel flooring system support angles;
- Packing cavities between pipe work or embedded plant and the surface of structural concrete or block work;
- Packing under horizontal surfaces such as stanchions and machine base plates;
- Grouting of steel channels or support frames for switch board and electrical equipment.

Cement: Sand 1:1

Levelling of the equipment before mortar packing, and checking of alignment before and after the grouting will be carried out by others.

Immediately before mortar packing, the space between the concrete and base plate shall be cleaned and thoroughly wetted. Al excess water shall then be blown away by means of a compressed air jet.

4.36 CEMENT GROUT

Cement ground shall be mixed in the relevant proportions indicated in the following table using the minimum quantity of water to ensure the necessary fluidity and to render it capable of penetrating the work.

Class	Nominate mix by mass	
	Cement	**Sand**
G1	**1**	-

The Contractor shall carry out the following grouting work as and when instructed by the Engineer, using the specified grout type:

i. filling of pockets containing holding-down bolt anchorages or rag bolts: G1

ii. Grouting of bolt tubes: G1.

Levelling of the equipment before grouting, and checking of arrangement before and after the grouting will be carried out by others. Grout shall be mixed in batcher mixer of a type approved by the Engineer or mixed by hand as instructed by the Engineer.

Immediately before grouting, the grout pockets shall be cleaned and thoroughly wetted. All excess water shall then be blown away by means of a compressed air jet.

The grout shall be transported from the mixer to the placing point quickly and in such a way that the materials do not segregate. Grout shall be placed within 30 minutes of being mixed. Grout shall be worked into position with roads or other suitable instruments until the whole of the space is completely filled with the ground. Mechanical vibrators shall not be used. The main grouting and the grouting of bolt sleeves and pockets should normally be carried out at the same time. If separate operations are advisable bolt sleeves and pockets shall be grouted up to approximately 50mm below the level of the concrete foundation before the main grouting.

4.37 PRECAST CONCRETE

Unless otherwise specified or described all precast concrete work shall be Class 28/20. Moulds for precast units shall be so constructed as to provide a Class F3 finish to the units unless otherwise specified.

Each mould for concrete work which is specified or approved by the Engineer to be precast shall have a different embossed or recessed identification mark in a position to the approval of the Engineer. Each precast unit shall be indelibly marked with the date of casting and after the mould is removed shall not be disturbed for 28 days.

Each precast unit shall, where required be provided with lifting eyes and holes located to avoid excess stress during handling to the satisfaction of the Engineer. Units requiring removal at a later date for inspection/maintenance shall be provided with permanent lifting points where indicated on the Drawings. These shall be proprietary fixings allowing easy removal of the units and shall have suitable protection against corrosion. They shall not protrude above the finished surface of the concrete. Temporary lifting point shall be removed or covered up and any holes or recesses shall be filled after installation of the precast units. Precast units must be of a sufficient age and handled with sufficient cast to avoid permanent damage. The Contractor shall take steps to ensure the even seating of all pre-cast members on their bearings to the satisfaction of the Engineer.

4.38 FILTER UNDERDRAINS

Filter under drains will be dual parallel under drain filters for drinking water applications. The low profile blocks design will have a method of gripping the grout, which helps to alleviate the buoyancy inherent in plastic under drain installation with wide, low-profile design requiring that fewer blocks be installed to cover a filter floor.

The blocks are formed covering the floor of the gravity filters, supporting the filter media. Air is distributed evenly across the entire filter bottom area to scour the media and to provide an air lift which, with the water, removes the released solids from the filter. This dual backwash action provides intense washing energy throughout the filter. The TETRA (or similar) blocks can be cut in half lengthwise to avoid filling the remaining space with grout that will not accommodate a full width block

4.39 MEASUREMENT AND PAYMENT

4.39.1 Measurement

Measurement, for payment, of concrete required to be placed directly upon or against surfaces of excavation will be made to the lines for which payment for excavation is made. Measurement, for payment, of all other concrete will be neat lines of the structures an shown on the Drawings unless otherwise prescribed in this Specification.

In measuring concrete for payment, deductions will be made for the volume of all ducts, embedded pipes, surface conduits and drains, recesses for rails and gate guides in firs stage concrete, embedded metalwork and other blockouts having a cross-sectional area larger than 0.10m² as measured at right angles to their longitudinal axis. Deductions will also be made for all openings, recesses and blockouts with cross-sectional area less than 0.10m² but which have an individual volume larger than 0.5 m³.

Measurement, for payment, for concrete required for treatment of defects outside the excavation pay lines other than in excavation for underground works will be made for the actual volume of concrete directed to be placed in these locations. Measurement, for payment, of backfill/dental concrete will be made of the actual volume of concrete placed as directed by the Engineer. Measurement of precast concrete shall be made as per dimension shown on drawings.

4.39.2 Payment

Payment for concrete in the various parts of the Works will be made at the applicable rates per cubic meter tendered in the priced Bill of Quantities. These rates shall be include the cost of all labour, constructional plant, formwork and materials including cement required in the construction, except that payment for providing and placing or installing reinforcing bars. Payment will not be made for concrete required to be places outside specified or approved excavation pay lines due to over-breakage, excess excavation or wasted concrete, or for any other reason. Direct payment will not be made for cement used in concrete, mortar, shotcrete, dry-pack or grout for filling the cavities. The cost of producing or providing aggregates required under this Specification shall be included in the rate tendered in the priced Bill of Quantities for the various grades of concrete construction in which the aggregate is used. The Contractor will not be entitled to any additional payment for materials wasted from deposits, including crusher fines, excess material of any of the sizes into which the aggregates are required to be separated by the Contractor and material which have been discarded by reason of being above the maximum sizes specified for use.

The cost of contraction joints shall be included in the rate tendered in the priced Bill of Quantities for the concrete in which the joints are required. The cost of expansion joints shall be included in the rate tendered in the priced Bill of Quantities for the concrete in which the joints are required. The cost of all labour and materials for forms and for any necessary treatment or coating of forms shall be included in the rate tendered in the priced Bill of Quantities for concrete for which the forms are used. All materials, labour and construction plant required for the repair of concrete shall be provided at the expenses of the Contractor.

No payment will be made for the backfill/dental concrete to fill the over excavation due to negligence and fault of Contractor

The cost of placing concrete in blockouts, and dry pack and grout under base plates of equipment and machinery supplied and installed by the Contractor shall be deemed to be included in the rates tendered in the priced Bill of Quantities for items of work for which the concrete and grout is required. No separate payment will be made for injection of cement grout or epoxy grout for filling the gap or cavity within hardened concrete.

4.39.3 Unit of Measure

Unit of Measure: CUBIC FEET

SECTION-5

REINFORCEMENT STEEL

5.1 SCOPE OF WORK

The work covered by the section of the specification consists of furnishing all materials, tools, labours and in performing all operations in connection with providing, straightening cutting, bending, binding, fixing, including binding wire, chairs, pains, spacer block complete in strict accordance with this section of the Specifications, the applicable drawings, approved bar bending schedule, and the terms and conditions of the contract.

5.2 MATERIALS

A. Reinforcing steel to be new billet stock of mild steel (plain bar), hard grade (deformed bar) and Ribbed Tor steel as specified on the drawings and shall conform to British Standard Specifications or equivalent ASTM or Pakistan Standard.

B. The contractor shall purchase the steel from ay reputable source of steel manufacturing company/factory. The contractor shall furnish to consultants manufacturer's mills certificate to guarantee that steel meets the standard, specifications requirement and medium certified yield stresses as follows;

1) Mild Steel Plain Bars conforming BSS 15 or BSS 4449 or PS-231-1962

a.	Tensile Strength	438 to 517 N/sq.mm (28 to 33 tons/sq.in)
b.	Yield Strength	250 N/sq.mm (16 tons/sq.in)
c.	Elongation	16% to 26% (avg. 20%)

2) Hard grade deformed bars conforming to ASTM, A-15-85 T. or PS-605-1962 Tensile Strength-560 N/sq.mm (35.7 tons/sq.in)

a.	Yield Strength	350 N/sq.mm
b.	Elongation	Max. 7%

3) Ribbed Tor Steel conforming to BS 4461

a.	Tensile Strength	490 N/sq.mm
b.	Yield Strength	420 N/sq.mm
c.	Elongation	14.5%

C. All steel to be true to the Standard Specifications with regard to bend-ability specially the hard grade deformed bars under 19mm dia shall be capable of being bent cold through 90° round a bar of four times its own diameter without fractures or injury of any kind. In case of deformed bars over 19mm dia and under 28mm dia round a bar of 6 times its own diameter.

D. 20 gauge galvanized wire shall be used for binding the steel reinforcement.

5.3 TESTING

Samples shall be tested for above specification in an approved laboratory when required by the Consultants of his representative and all costs of such tests shall be borne by the contractor.

5.4 STORAGE

Reinforcing bars shall be stored on platforms above surface of ground and be free from scales, oil, structural defects prior to placement in works. Rusted or dirty steel bars not to be used in the works unless brushed and cleaned by proper steel wire rushes and after being approved for use by the Consultants.

5.5 CUTTING AND PLACING OF REINFORCEMENT

All reinforcement steel shall be cut and bent cold in strict accordance with bar bending schedule approved and drawings supplied by the consultants. The contractor shall prepare bar bending schedule form approved structural working drawings and instructions to be provided to him by the consultants. The bending schedules shall be drawn on approved forms and submitted to the consultants or his representative for checking and approval, the steel reinforcement shall be cut and bent to sizes as per drawings and approved bending schedules. In case any bar(s), cut, bent or even fixed in position are found incorrect in dimensions size or shape according to the requirements of the drawings and instructions of the consultants, the contractor shall replace such steel bars cut bent or fixed in position by correct sized bars at his own cost and no extra payment shall be made to the contractor on such account. These systems of holding bars in place shall ensure that all steel in top section will support weight of workmen without displacement or distortion. Suitable spacers chairs as approved by the consultants representative shall be used for supporting and spacing purposed bars. In case any bar(s) are bent or displaced they shall be straightened or the limit if a days pour shall be in place and firmly tied with 20 gauge G.T Wire, bars with kinks or bends not shown on drawings shall not be used.

Where indicated in the drawings, mesh shall be of the sizes as shown on drawings and conform to British Standard BS 785. Mesh reinforcement when used in slabs shall be supported at proper elevations by standard accessories. In slabs on ground, precuts concrete blocks may be substituted for chairs.

All reinforcement shall be secured in place by use of metal or concrete supports, spacers, or ties, as approved by the consultants. Such supports shall be of sufficient strength to maintain the reinforcement in place throughout the concreting operation. The supports shall be used in such a manner that they will discoloration or deterioration of the concrete. Concrete supports shall be manufactured of the same concrete mix as used in the structure to be concreted.

All reinforcing steel fixed in position shall be inspected by the consultants' representative and no concrete shall be poured until steel placement has been approved by the consultants' representative ad no concrete shall be poured until steel placement has been approved by the consultants representative. For inspection purposes the contract shall give to the consultants' representative reasonable notice before the scheduled pouring time.

5.6 LAPS AND SPLICES

Except otherwise shown on the drawings or specified herein, all splices, lengths of laps, splice location placement and embedment of reinforcement shall conform to the applicable requirements of ACI 318-77, Building Code Requirements for Reinforced Concrete. All splices

and locations of laps in reinforcement shall be as shown in drawings or directed by the consultants. Lapped ends of bars may be placed in contact and securely wired or may be separated sufficiently to permit the embedment of the entire surface of each bars by butt-welding or by approved mechanical methods such as the Cadweld splice or the other type splice using positive connectors shall be adopted where indicated or directed by the consultants. But welding of the reinforcing bars, where indicated or directed shall conform to the requirement of American Welding Society's Recommended practice for welding reinforcing steel, metal inserts and connections, D. 12.1 Concrete shall be protected from heat during welding operations.

5.7 MEASUREMENT AND PAYMENT

The quantity to be paid for shall be the calculated in theoretical number of metric ton or reinforcement steel bars or mesh as determined from the approved bar bending diagrams and incorporated in the concrete and accepted, except when reinforcement is paid for under other items.

a. The weight of plain or deformed bars will be computed from the theoretical weight of plain round bars of the same nominal size as shown in the following tabulation;

Size (mm)	Weight per unit length (kg/m)
10	0.561
13	0.996
16	1.556
19	2.24
22	3.049
25	3.982
29	5.071
32	6.418
36	7.924
40	9.619
43	11.41
57	20.284

b. Clips, ties, separators and other material used for positioning and fastening the reinforcement in place, and structural steel shall not be included in the weight calculated for payment under this item. If bars are substituted upon consultant's request and as a result more steel is used than specified only the amount specified shall be included.

c. When laps are made for splices, other than those shown on the drawings or required by the Engineer and for the convenience of the contractor, the extra steel shall not be measured nor paid for.

d. When continuous bars are shown on the drawings, without the splices being shown the necessary steel in the splices will be paid for on the basis of individual bars not being shorter than 40 ft.

The accepted quantity measured as provided above shall be paid for at the contract unit price for items listed in the bill of quantities which price and payment shall be full compensation for furnishing materials, labour, equipment and incidentals necessary to complete the item.

SECTION-6

DEMOLITION AND DISMANTLING WORKS

6.1 SCOPE

The work covered by this Section of the Specifications consists of furnishing all plant, labour, equipment, appliances and performing all operations in connection with demolition and removal of existing, brick masonry work and concrete structures including disposal of demolished material to designated places. Demolition work shall be done in accordance with these specifications and as directed by the Engineer.

6.2 Demolition Procedures

The Engineer will define the limits where demolition is to be done and shall approve the procedures/methods of demolition to be adopted by the contractor.

Demolition shall be performed in an orderly manner and the Contractor shall take all necessary precautions and expedients to prevent damages to the adjunct structures, installed equipment/machinery, pipes, conduits etc. Any damage caused to the structures and installations due to negligence of the Contractor during demolition operations shall be repaired/replaced by the Contractor at his cost and to the satisfaction of the Engineer.

6.3 DEMOLITION OF MASONRY WORKS AND CONCRETE WORKS

The Contractor shall demolish, masonry and concrete works to the line and depth as shown on the drawing or as directed by the Engineer. Explosives shall not be used to remove the plain and reinforced cement concrete or any other material whatsoever. Mechanically operated brakers, concrete saws, chipping hammers or other approved methods shall be employed for cutting. Care shall be taken that existing services, structures are not damaged. It shall be the responsibility of the contractor to replace at his cost any services, structures damaged by the contractor due to his negligence during cutting operations or thereafter until the whole of cut parts/arrears are restored to original condition to the satisfaction of the Engineer.

6.4 DISPOSAL

All debris materials resulting from demolition work shall be disposed off to places designated by the Engineer with in free haulage limit of 10 km from the place of work and in the manner of disposition required and directed by the Engineer. All useable materials resulting from demolition and removal shall remain the property of the Employer.

SECTION-7

PLASTERING

7.1 GENERAL REQUIREMENTS

a) Contractor shall examine all other sections of the specifications for requirements with affect work of this section whether or not such work is specifically mentioned in this section.

b) Contractor shall coordinate work with that of all other trades affecting, or affected by work of this section especially all embedded items in walls.

7.2 SCOPE

a) The scope of work consists of the installation of all materials to be furnished under this section and without limiting the generality thereof, includes all equipments, labour and services required for all latching and cement plastering, including all items incidental thereto as specified herein and as shown on the Drawings.

b) Includes as part of the work herein, the installation of scratch coat plaster base and cement mortar setting bed for ceramic tile at walls.

c) See drawings and schedules for location and details.

7.3 SAMPLES

Contractor shall submit samples as requested by the consultant of all material specified herein and before ordering material, obtain approval from the consultant.

7.4 PLASTERING MATERIALS

a) Materials shall be approved by the consultant.

b) Portland cement shall conform to British Standard specifications as specified for Plain & Reinforced concrete Work.

c) Sand shall conform to British Standard Specifications except that the gradation shall meet further requirements for cement plaster work as directed by the consultant.

d) Water shall be clean, fresh and suitable for domestic consumption.

7.5 WORKMANSHIP

a) All work shall be done in the best possible manner by skilled workmen of the plastering trade, contractor will be responsible for results of the highest quality. Unsound and unsightly work shall be removed and replaced by work satisfactory to the consultant at no additional cost.

b) All finished surfaces shall be even and properly trawled. Finished surfaces shall be even in colour, free from stains, marks or defects. Finished surfaces shall be straight-edged and plumb or level in every direction, angles shall be straight, true and perfect.

c) Test and examine all work related to the work under this section. Work shall be plumb and straight, special care being taken at intersections.

d) All work shall be prepaid drying. Exterior openings shall be kept properly adjusted to regulate the drying and curing of cement plaster.

7.6 PLASTER SAMPLE PANELS

A plaster sample application shall be made in finished area for consultant approval of the finished appearance, which shall be uniform in finish, free of swirls or float marks. Un-approved plaster sample shall be removed and additional plaster applications made, until approval is obtained. Samples for ach different types of plaster shall be made for consultant's approval. No plastering work shall be done without the approval of plaster samples.

7.7 CEMENT PLASTER APPLICATION

Inserts And Embedded Items.

Plastering shall not commence until all metal lath, electric conduits, drainage and sanitary pipes, inlets to tanks, brackets, clamps, doors and window frames and all sorts of inserts are fixed in position. It shall be the responsibility of the contractor to make sure that all such work is carried out by other contractors before starting of plaster work. Chiseling and repairing of cement plaster shall not be permitted without the approval of the Engineer. Before commencing plaster work contractor shall check with the specialist and other service contractors to ensure that all embedded and other items are in place.

Preparation of Masonry Surface to be Plastered.

All masonry surfaces to be plastered shall be cleaned to remove all matter which will otherwise adversely affect the adhesion of plaster to the surface concerned. All the adhesion of plaster to the surface concerned. All masonry joints and concrete surfaces shall be properly roughened before plaster work is commenced. The surface thus prepared shall be treated uniformly with cement and sand slurry. The slurry to be used shall be one part cement to one part sieved sand by volume with water added with a stiff brush on surface which shall be applied with a stiff brush on surface which shall be well wetted before the application of the slurry.

7.8 METAL LATH OVER RCC - MASONRY JOINT.

Expanded metal strips of 152 mm width shall be installed over all joints of masonry and RCC members. It shall be heavy duty expanded metal with6 mm to 19 mm approx. openings and shall be firmly fixed to both RCC and masonry @ 228 mm spacing of both sides before start of plastering work.

Preparation of Cement Mortar for Plaster

a) The mortar shall be mixed form ordinary Portland cement mixed with clean sieved sand in the volumetric ratio of one part cement to four parts of sand (1:4) or as specified. The m xtures shall be turned over and over till the ingredients are thoroughly mixed.

b) Only limited water shall be added for proper workability and such quantity of the mortar shall be prepared that will be consumed in thirty minutes after preparation. Preparation of mortar in bulk quantity for use during the entire day or for any other time more than that stipulated above is expressly prohibited.

7.9 APPLICATION OF PLASTER.

The minimum thickness of plaster shall be 12.7 mm. If the plaster is to be more than 16 mm thick it shall be done in two layers. The surface of first layer shall be made rough after the initial set. The second layer shall be applied after a period of three (3) days of application of the first layer. The plaster shall not have wavy surfaces and shall be perfectly in line level and Plumb. The edges and corners shall represent straight lines. The plaster shall be kept wet continuously for at least 10 (ten) days. Plaster shall be carried in jambs, junctions, corners, edges, round surfaces. The plaster work is to cover all conduits, pipes etc. fixed in the walls and ceiling. Before start of plastering, 152 mm wide continuous strip of heavy duty panded metal lath (4.25 kg. per sq.m) shall be nailed to all joints of RCC and brick to prevent plaster cracks at such joints. No extra payment shall be made for thicker plaster due to defective masonry.

7.9.1 Patching

Plaster containing cracks, blisters, pits, discoloration or any defects shall not be acceptable. Any such plaster or loose plaster shall be removed and replaced with plaster in conformity with these specifications and as additionally directed by the consultants. Contractor shall remove completely and provide plaster in lieu of all defective work in patches as directed, at no additional expense to the employer.

7.9.2 Drips and Grooves

The contractor shall make drips for rainwater protection and grooves as per details shown on drawings.

7.9.3 Alignment and Smoothness

All cement plaster shall be uniformly true in line level and plumb, smooth trowel finished, free of waves and blemishes etc. to the full satisfaction of the consultant.

7.9.4 Cleaning and Protection.

Rubbish and debris shall be removed as necessary to make way for work of other trades and as directed by the consultant. As each room or space is completed all rubbish debris, scaffolding and tools should be removed to leave the room clean. Protect finished plaster from injury by the any source. Prior to plastering all Aluminum windows doors and finished metal shall be covered by plastic adhesive tape or any other approved system to completely protect it from damage and defacement. Contractor shall also protect walls, floors and work of other trades from plaster materials.

7.10 TYROLENE PLASTER (ROUGH CAST PLASTER)

a) Tyrolene plaster shall be applied on exterior/interior wall wherever specified and shown on drawings. Prepare plaster surface to receive tyrolene treatment. Mortar for tyrolene treatment shall be one part of ordinary Portland cement and two part of sand as approved by the consultant (1:2) and shall be applied to wall by machine over 12.7 mm rough plaster base (1:4). The thickness of tyrolene shall be a minimum of 6 mm. The texture of tyrolene plaster shall meet with consultant's approval. Where required 6 mm thick tyrolene plaster (1:2) shall be applied in white cement and colour pigment added as instructed by the consultant. Also 152 mm wide heavy duty metal lath share be installed over all joints of masonry and R.C.C. members.

b) The contractor shall prepare samples for consultant's approval before commencement of work. The work shall be carried out by experienced workmen only to ensure uniformity of colour and texture and shall match with the approved sample.

7.11 WATER PROOF PLASTER

Water Tanks & Other Structures

a) Where specified elsewhere in the drawings or bills of quantities and in accordance with Engineer's requirements, water retaining storage tanks, and other structures shall be given a waterproofing treatment on the inside. Waterproofing treatment shall be given to the bottom slabs and vertical walls of the tanks. The plaster shall be made by mixing waterproofing compound in the cement sand mix of 1:4 by volume according to the manufacturer's instructions for treatment of water tanks and applied in one layer of 19mm on all inner surfaces. Waterproofing compound in sealed containers only shall be allowed. Only water proofing compound duly approved by the consultant shall be allowed for use. In water tanks all corners, vertical as well as horizontal shall have triangular cant strips 152 mmx152 mm size in mortar 1:6. The internal surfaces of tanks to receive waterproofing treatment shall be made rough for bonding. After the surface has been made rough, metal lath (diamond mesh) shall be nailed to the entire wall and the bottom of the tanks in an approved manner. The layer of waterproofing plaster 19mm thick shall be then applied and its surface shall be made smooth by the use of a trowel or other suitable instrument. The layer shall be allowed to cure for a minimum of 14 days.

b) Waterproof plaster work shall not be started till all pipes have been installed by the plumbing contractor. Any damage or leak discovered in the tank shall be repaired by the contractor at his own cost.

7.12 CUTTING AND PATCHING

When so directed and prior to painting and finishing of cement plastered surfaces, contractor shall check all cement plastering throughout the work, doing any and all cutting, patching and refinishing required in a manner satisfactory to the consultant.

7.13 PROTECTION AND CLEANING

a) During the operation of cement plastering, protect the work of other trades against undue spoilage and damage by the exercise of reasonable care and precautions. Repair, replace, or both, any work so damaged, and soiled.

b) Upon completion of all work remove all rubbish, scaffolding and tools from the work and leave the premises clean and to the consultant's satisfaction.

7.14 MEASUREMENT AND PAYMENT

Plaster work will be measured and paid for the net area over which it is laid. All openings shall be deducted. The cost for drips and architectural grooves jambs and sills shall be included in the unit rate of plaster and no separate payment shall be made for these. The cost of providing, expanded metal lath at junction of RCC and Masonry shall be included in the unit rate of the contractor. All unit rates shall include cost of all materials, labour, scaffolding and curing. No

extra payment shall be made to the contractor for thicker plaster required due to unevenness in the masonry or defective masonry.

SECTION- 8
STRUCTURAL STEEL:

8.1 SCOPE OF WORK:

The work covered by this specification consists of furnishing and erecting of structural steel complete in strict accordance with this specification and the applicable drawings.

8.2 MATERIALS:

8.2.1 All structural steel shall be of standard sections as marked on the drawings and shall be free of scale, blisters, laminations, cracked edges and defects of any sort. If the structural steel is not supplied by the Department and the Contractor is required to bring such steel, the Contractor shall furnish duplicate copies of all mill orders and/ or also the test report received from the mills, to satisfy the Engineer-in-Charge.

8.2.2 All structural steel and electrodes shall comply in all respects with I.S.S. for structural steel.

8.3 WORKMANSHIP:

All workmanship shall be of first class quality in every respect to the greatest accuracy being observed to ensure that all parts will fit together properly on erection.
All ends shall be cut true to planes. They must fit the abutting surfaces closely.
All stiffeners shall be fit tightly at both ends.
All butt ends of compression members shall be in close contact through the area of the joints.
All holes in plates and section between 12 mm. and 20 mm. thick shall be punched to such diameter that 3 mm. of metal is left all around the hole to be cleaned out to correct size by reamer. The base connection shall be provided as shown on drawings and the greatest accuracy of workmanship shall be ensured to provide the best connections.
Figured dimensions on the drawings shall be taken.

8.4 ERECTION AND MARKING:

Erection and fabrication shall be according to I.S. 800-1984 section-11. During erection, the work shall be securely braced and fastened temporarily to provide safety for all erection stresses etc. No permanent welding shall be done until proper alignment has been obtained.
Any parts which do not fit accurately or which are not in accordance with the drawings and specifications shall be liable to rejection and if rejected, shall be at once be made good.
Engineer-in-Charge shall have full liberty at all reasonable times to enter the contractors premises for the purpose of inspecting the work and no work shall be taken down, painted or despatched until it has been inspected and passed.
The contractor shall supply free of charge all labour and tools required for testing of work.

8.5 DELIVERY AT SITE:

The contractor shall deliver the component parts of the steel work in an undamaged state at the site of the works and the Engineer-in-Charge shall be entitled to refuse acceptance of any portion which has been bent or otherwise damaged before actual delivery on work.

8.6 SHOP DRAWINGS:

The shop drawings of structural steel based on contract drawings shall be submitted to the Engineer-in- Charge. The necessary information for fabrication, erection, painting of structure etc. must be furnished immediately after acceptance of the tender.

8.7 PAINTING:

Painting should be strictly according to I.S. 1477-1971 (PartI-Pretreatment) and I.S. 1477-1971 (Part II-painting). Painting should be carried out on dry surfaces free from dust, scale etc. The paint shall be approved by the Engineer-in-Charge. One coat of shop paint (red lead) shall be applied on steel, except where it is to be encased in concrete or where surfaces are to be field welded.

8.8 WELDING:

Welding shall be in accordance with I.S. 816-1969, I.S. 819-1957, I.S. 1024-1979, I.S. 1261-1959, I.S. 1323-1982 and I.S. 9595-1980 as appropriate. For welding of any particular type of joint, welders shall give evidence of having satisfactory completed appropriate tests as described in any of I.S. 817-1966, I.S. 1393-1961, I.S. 7307 (Part-I)-1974, I.S. 7310 (Part-I)-1974 and I.S. 7318 (Part-I)-1974 as relevant.

8.8.1 Welding Consumables:

Covered electrodes shall conform to I.S. 814 (Part-I)-1974 and I.S.814 (Part-II)-1974 or I.S. 1395-1982 as appropriate. Filler rods and wires for gas welding shall conform to I.S. 1278-1972. The bare wire electrodes for submerged arc welding shall conform to I.S. 7280-1974. The combination of arc and flash shall satisfy the requirements of I.S. 3613-1974. The filler rods and bare electrodes for gas shielded metal, arc welding shall conform to I.S. 6419-1971 and I.S. 6560-1972 as appropriate.

8.8.2

Types of Welding: Arc welding (direct or alternating current) or Oxyacetylene welding may be used.Fie d welding may be used. Field welding shall be by D.C.

8.8.3

Size of Electrode Runs: The maximum gauge of the electrodes for welding any work and the size of run shall be based on the following tables.

Average thickness of plate or section	Maximum gauge or diameter of electrodes to be used.
Less than 3/16"	10 S.W.G.
3/16" and above but less than 5/16"	8 S.W.G.
5/16" and above but less than 3/8"	6 S.W.G.
3/8" and above but less than 5/8"	4 S.W.G.
5/8" and above but less than 1"	5/16"dia.
1" and above thick section	3/8" dia

Note : On any straight weld the first run shall not ordinarily be deposited with a larger gauge electrode than No. 8 S.W.G. For subsequent runs the electrode shall not be increased by more than two electrode size between consecutive runs.

8.8.4 We ding Contractors :

The contractor shall ensure that each welding operator employed on fabrication or

erection is an efficient and dependable welder, who has passed qualifying tests on the types of welds which will be called upon to make. Sample test shall have to be given by the contractor to the entire satisfaction of the Engineer-in-charge.

8.8.5 Welding Procedure :

a) Welding should be done with the structural steel in flat position in a down hand manner wherever possible. Adequate steps shall be taken to maintain the correct arc length, rate of travel, current and polarity for the type of electrode and nature of work. Welding plant capacity shall be adequate to carry out the welding procedure laid down. Adequate means of measuring the current shall be available either as a part of the welding plant or by the provision of a portable ammeter. In checking the welding current, a tolerance of 10% or 30 amperes from the specified value whichever is less shall be permitted.
b) The welding procedure shall be such as to ensure that the weld metal can be fully and satisfactory deposited through the length and thickness of all joints so that distortion and shrinkage stresses are reduced to the minimum and thickness of welds meet the requirements of quality specified.

8.9 WORKMANSHIP :

8.9.1 Preparation of Fusion Faces :
Fusion faces shall be cut by stearing machine or gas cutting and later dressed by filling or grinding so that they shall be free from irregularities such as would interfere with the deposition of the specified size of weld to cause the defects. Fusion faces and the surrounding surfaces shall be free from heavy slag, oil paint or any substance which might affect the quality of the weld or impede the progress of welding. The welding face shall be free of rust and shall have metal shine surfaces. The parts to be welded shall be brought into as close contact as possible and the gap due to faulty workmanship or incorrect fit up shall not exceed 1/16". If separation of 1/16" or more occurs locally, the size of the fillet weld shall be increased at such position by an amount of equal to the width of the gap.
The parts to be welded shall be maintained to their correct position during welding. They shall be securely held in position by means of tack welds, service bolts, clamps or rings before commencing welding so as to prevent and relative movement due to distortion, wind or any other cause.

8.9.2 Step Back Method Should be Used to Avoid Distortion :
The minimum leg length of a fillet weld as deposited should not be less than the specified size and the throat thickness as deposited should be not less than that tabulated below:

Throat Thickness of Fillet					
Angle between fusion faces	600-900	910-1000	1010-1060	1070-1130	1140-1200
Throat thickness in cms.	0.70	0.65	0.60	0.55	0.50

In no case should a concave weld be deposited without the specific approval of the Engineer-in-Charge unless the leg length is increased above the specified length so that the resultant throat thickness is as great as would have been obtained by the deposition of a flat.
All welds shall be deposited in a pre-arranged order and sequence taking due account of the effects of distortion and shrinkage stresses. After making each run of welding, all slag shall be removed and final run shall be protected by clean boiled linseed oil till approved.

The weld metal, as deposited, shall be free from crack, slag, excessive porosity, cavities and other faults. The weld metal shall be properly fused with the parent metal without overlapping or serious undercutting at the toes of the weld.
The surfaces of the weld shall have a uniform and consistent contour and regular appearance.
In welds containing crack, porosity or cavities in which the weld metal tends to overlap on the parent metal without proper fusion, the defective portions of the welds shall be out cut and re-welded. Where serious under cutting occurs, additional weld metal shall be deposited to make good reduction. Testing of welded joints shall be done as per relevant IS codes 3600, 3613, 4260, 7205, 7215, 7307, 7310, 7318.

8.10 MODE OF MEASUREMENT:

All structural steel shall be measured on weight basis in metric tonnes or quintals or kgs. as mentioned in the schedule of quantities. The length or areas of various members including gusset plates shall be measured correct to two places of decimals and the net weight worked out from the standard steel tables approved by British or ASTM standard Institution. No separate measurements shall be taken for welding, riveting, bolting, field connections
etc. The rate shall include cost of all labour, materials, scaffolding, transport and also cost of welding, riveting and bolting, field connections if any all to complete the job as per specifications.

SECTION - 9

BRICK MASONRY

9.1 SCOPE OF WORK:

The work covered by this section of the specifications consists of furnishing all plant, labour, equipment, appliances, and materials and in performing all the operations in connection with brick masonry work complete in strict accordance with the specifications herein and the applicable drawings and subject to the terms and conditions of the contract.

9.2 MATERIALS:

a) Cement: Shall be Portland cement meeting the requirements specified under clause of section-3 "CONCRETE".
b) Aggregates: Aggregates used shall meet the requirements specified under clause of section-3 "CONCRETE".
c) Water: Shall be as specified under clauses of the section-3 "CONCRETE".
d) Concrete Masonry Units:

I. The bricks shall be solid as required and shall be carefully made so that the are true in line and face with square corners and free from all defects.
II. The bricks are to be exposed to view they shall have clean, cut straight and true edges, smooth dense faces of uniform appearance without voids honey combs, projections or variation in texture and shall be free from cracks, spells ships, ragged edges or other defects detrimental to their appearance.
III. Where bricks are to be plastered the exposed surfaces shall have a coarse texture suitable for bonding the plaster as approved by the consultants.
IV. The average compressive strength of any five bricks picked at random shall be not less then the strength as specified for 1:3:6 concrete under clause of the section-3 "CONCRETE".
V. The average moisture content of all concrete masonry units shall not exceed 30 percent of the total absorption of the units.

9.3 MORTAR FOR MASONRY.

a) Cement shall be Portland as specified under clause of the section-3 "CONCRETE".
b) Fine aggregate shall be clean, hard, durable particles free from laminated material well graded from No.4 to 100 sieve.
c) Water shall be clean and free from injurious acids, alkalis and organic impurities.

d) All mortar for masonry shall be in proportion one (1) cement and four (4) sand (fine aggregate) and the ingredients shall be mixed by volume.

e) Mortar shall be mixed thoroughly in a drum type batch mixer for a period of not less than three minutes, using the quantity of water required to obtain the desired workability. Hand mixing shall be subject to approval by the Engineer and if he allows the mortar materials shall be mixed in a light mortar mixing box. In no case the mixing of mortar shall be done on open platform.

f) The mortar shall be subject to compressive strength test and the average compressive strength of three numbers 2 inch cubes of mortar shall be not less than 1800 lb. per Sq. inch at 28 days.

g) Mortar shall be used in the masonry within half an hour form addition of water into the mortar. The mortar which haw already set shall not be used in the masonry.

9.4 MASONRY AND JOINTING:

All masonry shall be laid plumb, true to line and level and accurately spaced coursed and with each course breaking joints with the coursed and with each course breaking joints with the course below. Bond shall be kept plumb; corners and reveals shall be plumb and true. Chases, grooves, reglet blocks and raked out joints shall be kept free form mortar and other debris.

a) The thickness and length of various walls shall be as indicated on the drawings.

b) Unless otherwise shown on the drawings or specified the spaces around from and other built in items shall be solidly filled with mortar except those joints that are to be caulked shall be raked out 3/4 inch.

c) Work required to be built in with masonry including anchors, wall plugs and accessories shall be built in as the work progresses. Wood plugs and blocking shall not be built into masonry.

d) All horizontal and vertical joints shall be completely and solidly filled with mortar when and as the bricks are laid.

e) The thickness of joints shall not exceed 3/8 inch and the joints shall be raked 1/2 inch deep when the mortar is still fresh so as to give proper bond to the plaster.

f) The top course of partitions under slabs beams shall not be laid until the forms have been removed and the roofing placed.

(l) Masonry walls shall be cured for at least ten (10) days from the day it is installed.

9.5 Measurement and Payment

9.5.1 Measurement:

Measurement of acceptably completed works of Brick masonry will be made on basis of number of cubic feet provided and installed in position as shown on the drawing or as directed by the engineer incharge.

9.5.2 Payment

Payment shall be made for acceptable measured quantity of Brick masonary on the basis of unit rate per Cubic feet quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the item.

SECTION -10

PAINTING :

10.1 SCOPE OF WORK :

The work covered under these specifications consist of furnishing the various types of paints and also the workmanship for these items, in strict compliance with these specifications, which are given in detail here-in-after with the item of schedule of quantities.

10.2 MATERIALS :

Paints, oils, varnishes etc. of approved brand and manufacture shall be used. Ready mixed paints as received from the manufacturer without any admixture shall be used.

If for any reason, thinning is necessary in case of ready mixed paint, the brand of thinner recommended by the manufacturer or as instructed by the Engineer-in-Charge shall be used. Approved paints, oils or varnishes shall be brought to the site of work by the contractor in their original containers in sealed condition. The materials shall be brought in at a time in adequate quantities to suffice for the whole work or atleast a fortnights work. The materials shall be kept in the joint custody of the contractor and the Engineer-in-charge. The empties shall not be removed from the site of work, till the relevant item of work has been completed and permission obtained from the Engineer- in-Charge.

The contractor shall associate the chemist of paint manufacturers before commencement of work, during and after the completion of work who shall certify the suitability of the surface to receive painting and the paint before use etc.

10.3 COMMENCING WORK :

Scaffolding : Wherever scaffolding is necessary, it shall be erected on double supports tied together by horizontal pieces, over which scaffolding planks shall be fixed. No ballies, bamboos or planks shall rest on or touch the surface which is being painted.

Where ladders are used, pieces of old gunny bags shall be tied on their tops to avoid damage or scratches to walls.

For painting of the ceiling, proper stage scaffolding shall be erected.

Painting shall not be started until and unless the Engineer-in-Charge has inspected the items of work to be painted, satisfied himself about their proper quality and given his approval to commence the painting work.

Painting, except the priming coat, shall generally be taken in hand after all other builders work, practically finished.

The rooms should be thoroughly swept out and the entire building cleaned up at least one day in advance of the paint work being started.

10.4 PREPARATION OF SURFACE :

The surface shall be thoroughly cleaned. All dirt, rust, scales, smoke and grease shall be thoroughly removed before painting is started. Minor patches if any in plastered/form finished surfaces shall be repaired and finished in line and level in C.M. 1:1 and cracks & crevices shall be filled with approved filler, by the contractor at no extra cost to the Department. The prepared surface shall have received the approval of the Engineer-in-Charge after inspection, before painting is commenced.

10.5 APPLICATION :

Before pouring into smaller containers for use, the paint shall be stirred thoroughly in its containers. When applying also, the paint shall be continuously stirred in the smaller containers so that consistency is kept uniform.

The external surfaces of the buildings under reference including the R.C.C. Jalli, fins and the panels above and below the window etc. shall be finished in different colours of approved shade. The contractor will make suitable samples at site for Departments approvel before taking up the work in hand and they will be allowed to proceed with the work only after getting Departments approval for the same.

The painting shall be laid on evenly and smoothly by means of crossing and laying off, the later in the direction of the grain in case of wood. The crossing & laying off consists of covering the area with paint, brushing the surface hard for the first time and then brushing alternately in opposite directions two or three time and then finally brushing lightly in direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying will constitute one coat.

Where so stipulated, the painting shall be done with spraying. Spray machine used may be (a) a high pressure (small air aperture) type or (b) a low pressure (large air gap) type, depending on the nature and location of work to be carried out. Skilled and experienced workmen shall be employed for this class of work. Paints used shall be brought to the requisite consistency by adding a suitable thinner. Spraying should be done only when dry condition prevails.

Each coat shall be allowed to dry out thoroughly and rubbed smooth before the next coat is applied. This should be facilitated by thorough ventilation.

Each coat except the last coat, shall be lightly rubbed down with sand paper or fine pumice stone and cleaned of dust before the next coat is laid.

No left over paint shall be put back into the stock tins. When not in use, containers shall be kept properly closed.

The final painted surface shall present a uniform appearance and no streaks, blisters, hair marks from the brush or clogging of paint puddles in the corners of panels, angles of mouldings etc. shall be left on the work.

In case of cement based paints/primers, the absorbent surfaces shall be evenly damped so as to give even suction. In any weather, freshly painted surfaces shall be kept damp for at least two days.

In painting doors and windows, the putty around the glass panes must also be painted, but care must be taken to see that no paint stains etc. are left on the glass. Tops of shutters and surfaces in similar hidden locations shall not be left out while painting. Perspect covers of electrical switch boxes have to be painted from inside by removing them. Care shall be taken while removing them in position after painting with respective approved paints. In painting steel work, special care shall be taken while painting over bolts, nuts, rivets, overlaps etc.

The additional specifications for primer and other coats of paints shall be as in accordance to the detailed specifications under the respective headings.

Any damage caused during painting work to the existing works/surfaces shall be made good by the contractor at his own cost.

10.6 BRUSHES AND CONTAINERS :

After work, the brushes shall be completely cleaned off paint and linseed oil by rinsing with turpentine. A brush in which paint has dried up is ruined and shall on no account be used for painting work. The containers, when not in use, shall be closed, kept air tight and shall be kept at a place free from dust. When the paint has been used, the containers shall be washed with turpentine and wiped dry with soft clean cloth, so that they are clean & can be used again.

10.7 MEASUREMENT :

a) Painting, unless otherwise stated shall be measured by area in square meter / Sft. Length and breadth shall be measured correct upto two places of decimal of a meter/ft.

b) No deduction shall be made for opening not exceeding 0.05 sqm. and no addition shall be made for painting to the beading, moulding edges, jambs, soffits, sills, architraves etc. of such openings.

c) In measuring painting, varnishing, oiling etc. of joinery and steel work etc., the co-efficient as in the following table shall be used to obtain the areas payable. The

co-efficient shall be applied to the areas measured flat and not girthed in all cases.

d) In case of painting of door shutter with push plates in plastic laminate, deduction will be made for area of such laminations.

10.7.1 Table of multiplying Co-efficient to be applied over areas of different surfaces to get equivalent plain areas is given in the Appendix-"C-2" of this book.

10.7.2 Explanatory notes on the table of Co-efficients.

1. Where doors, window etc. are of composite types other than those included in para 47.7 (c), the different portions shall be measured separately with their appropriate co-efficients, the centre line of the common rail being taken as the dividing line between the two portions.

2. Measurements for doors, windows etc. shall be taken flat (and not girthed) over all including chowkhats or frames, where provided. Where chowkhats or frames are not provided, the shutter measurements shall be taken.

3. Collapsible gates shall be measured for width from outside to outside of gate in its expanded position and for height from bottom to top of channel verticals. No separate measurements shall be taken for the top and bottom guide, rails, rollers, fittings etc.

4. Rolling shutters of interlocked laths shall be measured for the actual shutter width and the height from bottom of opening to the centre of the shaft. No separate measurements shall be taken for painting guides and other exposed features within or outside the shutter area. The painting of top cover or hood shall however be measured separately.

5. Co-efficients for sliding doors shall be the same as for normal types of doors as mentioned in the table. Measurements shall be taken outside of shutters, and no separate measurements shall be taken for painting guides, rollers, fittings etc.

6. Measurement of painting of doors, windows, collapsible gates, rolling shutters etc. as above shall be deemed to include painting all iron fittings in the same or different shade for which no extra will be paid.

7. The measurements as above shall be deemed to include also the painting of edges, blocks, cleats etc. for which no extra will be paid.

8. The co-efficients for doors and windows shall apply irrespective of the size of frames and shutter members.

9. When the two faces of a door, window etc. are to be treated with different specified finishes, measurable under separate items, the edges of frames and shutters shall be treated with the one or the other type of finish as ordered by the Engineer-in-Charge, and measurement of this will be deemed to be included in the measurement of the face treated with that finish.

10. In the case where shutters are fixed on both faces of the frames, the measurements for the door frame and shutter on one face shall be taken in the manner already described, while the additional shutter on the other face will be measured for the shutter area only excluding the frame.

11. Where shutters are provided with clearance at top or/and bottom, such openings shall be deducted from the over all measurements and relevant co-efficients shall be applied to obtain the area payable.

12. In case of trellis (or jaffri) work, the measurements shall include the painting of the frame member for which no separate measurements shall be taken. Trellis door or window shutters shall also be measured under terllis work.

13. Wherever air conditioning grill, lighting, fixtures etc. in false ceiling are painted along with, measurements shall be taken over all without deductions for opening in grills and no extra shall be paid for the grills. If grills, fixtures etc. are not painted, area of fixtures or grills as measured flat (not girthed) shall be deducted when it exceeds 0.05 sqm. individuals. Where walls and ceilings are painted in separate colours, the junctions of two paints shall be brought down on the walls in a straight line by about 6mm.to 12mm. if so desired, if the junctions of walls and ceilings are not even. Nothing extra shall be paid to the contractor on this account. Beading wherever provided shall not be measured separately but shall be deemed to be included in the area of false ceiling etc. measured flat (not girthed).

14. For painting open palisade fencing and gates etc., the height shall be measured from the bottom of the lowest rail, if the palisades do not go below it, (or from the lower end of the palisades, if they project below the lowest rail), upto the top of rails or palisades

whichever are higher, but not up to the top of standards when the latter are higher than the top rails or palisades.

15. In the case of asbestos cement corrugated or semi-corrugated sheeting and iron corrugated sheeting in roofs, side cladding etc., the work shall be measured flat (not girthed) as fixed.

16. For trusses, compound girders, stanchions, lattice girder and similar work, actual areas will be measured in sqm. and no extra shall be paid for painting on bolt heads, nuts, washers etc. even when they are picked out in a different tint to the adjacent work.

17. Painting of rain water, soil, waste, vent and water pipes etc. shall be measured in running metres of the particular diameter of the pipe concerned. Painting of specials such as bends, heads, branches, junctions, shoes etc. shall be included in the length and no separate measurements shall be taken for these or for painting brackets, clamps etc.

18. Measurements of wall surfaces and wood and other works not referred to already shall be recorded as per actual and opening exceeding 0.05 sqm. shall be deducted to get the net payable area. Length and breadth shall be measured correct upto two places of decimal of a metre and area so worked out shall be correct upto two places of decimal of a square metre.

19. In case the items of work requiring painting are inclusive of cost of painting, the painting carried out shall not be measured separately.

10.8 PRECAUTIONS :

All furniture's, lightings, fixtures, sanitary fittings, glazing, floors etc. shall be protected by covering and stains, smears, splashing, if any shall be removed and any damage done shall be made good by the contractor at his cost.

10.9 RATES:

Rates shall include cost of all labour and materials involved on all the operations described above and in the particular specifications given under the several items.

10.10 (A) PAINTING PRIMING COAT ON WOOD, IRON OR PLASTERED SURFACES :

10.10.1 Primer

1. The primer for wood work, iron work or plastered surface shall be as specified in the description of the item.

2. Primer for Wood work / Iron & Steel / Plastered / Aluminium surfaces shall be as specified below:

SURFACES PRIMER TO BE USED

a Wood work (hard & soft wood): Pink conforming to I.S.3536-1966

b Resinous wood and ply wood: Aluminium primer

c Iron & Steel, Aluminium and galvanised Steel work:

Zinc chromate primer conforming to I.S. 104-1962.

d Plastered surfaces, cement brick work, Asbestos surfaces for oil bound distemper and paint:

Cement Primer

3. The primer shall be ready mixed primer of approved brand and manufacture.

10.10.2 Preparation of surface :

a) Wood work : The wood work to be painted shall be dry and free from moisture.

The surface shall be thoroughly cleaned. All unevenness shall be rubbed down smooth with sand paper and shall be well dusted. Knots, if any, shall be covered with preparation of red lead made by grinding red lead in water and mixing with strong glue sized and used hot. Appropriate filler material with same shade as paint shall be used where so desired by the Engineer-in-charge.

The surface treated for knotting shall be dry before painting is applied. After the priming coat is applied, the holes and indentation on the surface shall be stopped with glaziers putty or wood putty (for specifications for glaziers putty and wood putty- refer as mentioned here-in-before). Stopping shall not be done before the priming coat is applied as the wood will absorb the oil in the stopping and the latter is therefore liable to crack.

(b) Iron and Steel Work : All rust and scales shall be removed by scrapping or by brushing with steel wire brushes. Hard skin of oxide formed on the surface of wrought iron during rolling which becomes loose by rusting, shall be removed.

All dust and dirt shall be thoroughly wiped away from the surface.

If the surface is wet, it shall be dried before priming coat is undertaken.

(c) Plastered Surface : The surface shall ordinarily not be painted until it has dried completely. Trial patches of primer shall be laid at intervals and where drying is satisfactory, painting shall be taken in hand. Before primer is applied, holes and undulations, shall be filled up with plaster of paris and rubbed smooth.

10.10.3 Application : The primer shall be applied with brushes, worked well into the surface and spread even and smooth. The painting shall be done by crossing and laying off as described here-in-before.

10.10.4 Other Details : The specifications for Painting (General) shall hold good so far as it is applicable.

10.11 (B): PAINTING WITH SUPERIOR QUALITY & FLAT OIL READY MIXED PAINTS ON NEW SURFACE :

10.11.1 Paint : Ready mixed paints shall be of approved brand and manufacture and of the required shades. They shall conform in all respects to the relevant I.S. specifications.

10.11.2 Preparation of Surface:

(a) Wood work : The surface shall be cleaned and all unevenness removed as in para 47.10.2 (a). Knots if visible, shall be covered with a preparation of red lead. Holes and indentations on the surface shall be filled in with glaziers putty or wood putty and rubbed smooth before painting is done. The surface should be thoroughly dry before painting.

(b) Iron and steel work : The primer coat shall have dried up completely before painting is started. Rust and scaling shall be carefully removed by scraping or by brushing with steel wire brushes. All dust and dirt shall be carefully and thoroughly wiped away.

(c) Plastered surfaces : The priming coat shall have dried up completely before painting is started. All dust or dirt that has settled on the priming coat shall be thoroughly wiped before painting is started.

10.11.3 Application : The specifications mentioned here-in-before shall hold good as far as applicable.

The number of coats to be applied will be as stipulated in the item. The painted surface shall present a uniform appearance1 and glossy/semiglossy finish, free from streaks, blisters etc.

10.11.4 Other details : The specifications for Painting (General) specified here-in-before shall hold good in so far as they are applicable.

10.12 (C) PAINTING WITH SYNTHETIC ENAMEL/SEMI GLOSSY PAINT ON NEW WORK:

1. Paint : Synthetic enamel/semi glossy paint of approved brand and manufacture and required shade shall be used for the top coat and an under coat of shade to match the top coat as recommended by the manufacturer shall be used. The paint shall be conforming to IS : 1932-1964.
2. Preparation of Surface : This shall be as per painting with superior quality ready mixed paint as mentioned here- in- before.

3. Application : The number of coats including the under coat shall be as stipulated in the item.

   3.1 Under Coat : One coat of the specified paint of shade suited to the shade of the top coat shall be applied and allowed to dry over night. It shall be rubbed next day with the finest grade of wet abrasive paper to ensure a smooth and even surface free from brush marks and all loose particles shall be dusted off. All the cracks, crevices, roughness etc. will be filled with approved putty as per manufacturers recommendations.

   3.2 Top Coat : Finishing coats of specified paint of the desired colour & shade shall be applied after the under coat is thoroughly dried. Additional finishing coats shall be applied if found necessary to ensure a proper and uniform semi glossy surface.

4. Other Details : The specifications for "Painting (General)" mentioned here-in-before shall hold good as far as they are applicable.

10.13 (D) PAINTING WITH ACRYLIC EMULSION/PLASTIC EMULSION PAINT.

1. This shall be polyvinyl based Acrylic/plastic emulsion paint of approved manufacture of the required shade, conforming to I.S.5411-1969.

2. Primer: The primer to be used for the painting with acrylic emulsion on cement concrete surfaces, plastered surfaces, A.C. sheets, timber and metal surfaces, if necessary, shall be of approved base and as per recommendations of the manufacturers.

3. Putty : Plaster filler to be used for filling up (putting) uneven surfaces, small cracks and holes etc. shall be of approved compound and as per recommendations of the manufacturers. No oil based putty shall be used. The putty should be made from a mixture of whiting and plastic emulsion paint or as per manufacturers recommendations.

4. Finishing coats : All the finishing coats shall be of matt finish or any other finish as required by the Engineer- in-charge. The number of finishing coats shall be as specified in the item.

MODE OF MEASUREMENT :

All the measurements for payment shall be taken on net surface area actually painted, unless otherwise specified. Deduction will be made from the areas for fixtures, grills, ventilation, outlets, electrical boxes and such obstructions not painted, if they are individually more than 0.05 sqm.

JOB REQUIREMENTS :

i) Acrylic emulsion paint is required to be provided on plastered and concrete surfaces in portions of the building. The Department shall reserve the option to delete or increase quantities in full or part from the scope of contract during progress of work.

ii) All wood surfaces are to be painted with semi glossy synthetic enamel paint with an approved primer.

iii) All shades and colours of paints shall be subjected to review and prior approval of Engineer-in-Charge shall be taken before the application.

10.14 WHITE WASHING WITH LIME

10.14.1 Preparation of Surface : Before new work is white washed, the surface shall be thoroughly brushed free from mortar droppings and foreign-matter.

In the case of old work, all loose pieces and scales shall be scrapped off and holes in plaster as well as patches of less than 0.05 sqm.area each shall be filled up with mortar of the same mix. Where so specifically ordered by the Engineer-in-charge, the entire surface of old white wash shall be thoroughly removed by scrapping and this shall be paid for separately.

10.14.2 Preparation of lime wash : The wash shall be prepared from fresh stone white lime "Katani" or equivalent. The lime shall be thoroughly slaked on the spot, mixed and stirred with sufficient water to make a thin cream. This shall be allowed to stand for a period of 24 hours and then shall be screened through a clean coarse cloth. 40 gm. of gum dissolved in hot water, shall be added to each 10 cubic decimetre of the cream. The approximate quantity of water to be added in making the cream will be 5 litres of water to one kg. of lime.

Indigo (Neel) up to 3 gm. per kg. of lime dissolved in water, shall then be added and wash stirred well. Water shall then be added at the rate of about 5 ltrs. per kg. of lime to produce a milky solution.

The lime shall be tested in a chemical laboratory and test certificate submitted, to conform the quality of lime with regard to its physical and chemical properties. The cost of testing lime shall be borne by the contractor.

10.14.3 White Washing : The white wash shall be applied with brushes or by spray in the specified number of coats. The operation for each coat in the case of brush

application shall consist of a stroke of the brush given from the top downwards, another from the bottom upwards over the first stroke, and similarly one stroke horizontally from the right and another from the left before it dries.

Each coat shall be allowed to dry before the next one is applied. Further each coat shall be inspected and approved by the Engineer-in-charge before the subsequent coat is applied. No portion of the surface shall be left out initially to be patched up later on.

For new work, three or more coats shall be applied till the surface present a smooth and uniform finish through which the plaster does not show. The finished dry surface shall not show any sign of cracking and peeling nor shall it come off readily on the hand when rubbed.

For old work, after the surface has been prepared as described here-in-before, a coat of white wash shall be applied over the patches and repairs. Then a single coat or two or more coats of white wash as stipulated in the description of the item shall be applied over the entire surface. The white washed surface should present a uniform finish through which the plaster patched do not appear. The washing on ceiling should be done prior to that on walls.

10.14.4 Protective Measures : Doors, windows, floors, articles of furniture etc. and such other parts of the building not to be white washed shall be protected from being splashed upon. Splashings and droppings, if any, shall be removed by the contractor at his own cost and the surfaces cleaned. Damages if any to painted surfaces, furnitures or fittings and fixtures etc. shall be recoverable from the contractor.

10.14.5 Measurements : All measurements for payment shall be taken on net surface areas actually white washed, unless otherwise specified. Deductions will be made from the areas for fixtures, grills, ventilation, outlets, electrical boxes and such obstruction not painted if they are individually more than 0.05 sqm. Length and breadth shall be taken correct upto two places of decimal of a metre and areas so worked out shall be correct upto two places of decimals of a square metre.

Corrugated surfaces shall be measured flat as fixed and the area so measured shall be increased by the following percentages to allow for the girthed area.

Corrugated asbestos cement sheets: 20%

Semi-corrugated asbestos cement sheets: 10% The number of coats of each treatment shall be stated. The item shall include removing nails, making good holes, cracks, patches etc. not exceeding 0.05 sqm. each with materials similar in composition to the surface to be prepared.

10.14.6 Rate : The rate shall include the cost of all materials and labour involved in all the operations described above.

10.15 COLOUR WASHING:

In the case of colour washing, mineral colours, not affected by lime, shall be added to white wash with proper glue. No colour wash shall be done until a sample of the colour wash to the required tint or shade has been got approved from the Engineer-in-Charge. The colour shall be of even tint or shade over the whole surface. If it is patchy or otherwise badly applied, it shall be redone by the contractor, at no extra cost to the Department.

For new work, the priming coat shall be of white wash lime or with whiting as specified in the description of the item. Two or three coats, shall then be applied as specified on the entire surface till it represents a smooth and uniform finish. Each coat after applying shall be got approved from the Engineer-in-Charge.

The finished dry surface shall not be powdery and shall not readily come off on the hand when rubbed.

Other specifications as detailed for Whitewashing with lime shall be applicable. Indigo (Neel) shall however, not be added.

10.16 DRY DISTEMPERING :

(a) Distemper : Dry distemper (IS:427-1965) of approved brand and manufacture, colour and required shade shall be used. The dry distemper shall be stirred slowly in clean water using 0.6 litre of water per kg. of distemper or as specified by the manufacturers. Warm water shall preferably be used. It shall be allowed to stand for atleast 30 minutes before use. The mixture shall be invariably well stirred before and during use to maintain an even consistency.

(b) Preparation of surface : This shall be as for Painting work mentioned here-in-before in so far as it is applicable.

(c) Application : In case of new work, the treatment shall consist of a priming coat followed by the application of two or more coats of distemper till the surface shows an even colour.

i) Priming coat : Priming coat of whiting shall be applied over the prepared surface. The whiting (ground white chalk) shall be dissolved in sufficient quantity of warm water and thoroughly stirred to form a thin slurry which shall then be screened through a clean coarse cloth. Two kg. of gum and 0.4 kg. of copper sulphate dissolved separately in hot water shall be added for every cum. of the slurry which shall then be diluted with water to the consistency of milk so as to make a wash ready for use. No white washing coat shall be used as a priming coat for distempering.

ii) The application of each coat as mentioned in the specifications for painting (General) here-in-before, shall hold good, as far as it is applicable.

10.17 OIL EMULSION (OIL BOUND) DISTEMPERING :

(a) Oil bound distemper (IS:428-1969) of approved brand and manufacture, colour and required shade shall be used. The primer where used as on new work shall be cement primer or distemper primer as specified in the item. These shall be of the same manufacture as distemper. The distemper shall be diluted with water or any other prescribed thinner in a manner recommended by manufacturer. Only sufficient quantity of distemper required for days work shall be prepared.

(b) Preparation of surfaces : The surface shall be prepared as described here- in- before for Painting work in so far as it is applicable and approved putty/filler shall be applied to the entire area to get uniform and smooth surface before application of primer.

Application: The cement primer or distemper primer shall be applied by brushing and not by spraying. Hurried priming work shall be avoided, particularly on absorbent surfaces. New plaster patches in old work before applying oil bound distemper shall be treated with cement primer/distemper primer. The surface shall be finished as uniformly as possible leaving no brush marks. priming coat shall be allowed to dry for at least 48 hours before oil bound distemper is applied. Before applying distemper,the surface shall be lightly sand prepared to make it smooth for receiving the oil bound distemper, taking care not to rub out the priming coat. A time interval of at least 24 hours shall be allowed between consecutive coats to permit the proper drying of the preceding coat. Two or more coats of distemper as are found necessary shall be applied over the priming coat to obtain an even shade.

c) Other details : The specifications for "Painting (General)" mentioned here-in-before shall hold good as far as it is applicable.

10.18 WATER PROOFING CEMENT BASED PAINT :

a) Material: Cement based paint (IS:5410-1969) of approved manufacture, quality, shade and colour only shall be used.

b) Preparation of surfaces : The surface shall be thoroughly cleaned off all mortar dropping, dirt, dust, algae, grease and other foreign matter by brushing and washing the surfaces. The surface shall be thoroughly wetted with clean water before the water proof cement paint is applied. The prepared surface shall be got approved before painting is commenced.

The water proof cement paint shall be mixed in such quantities as can be used up with in an hour of its mixing as otherwise the mixture will set and thicken, affecting flow and finish.

Water proof cement paint shall be mixed with water in two stages. The first stage shall comprise of 2 parts of water proof cement paint and one part of water stirred thoroughly and allowed to stand for 5 minutes. Care shall be taken to add the water proof cement paint gradually to the water and not vice versa. The second stage shall

comprise of adding further one part of water to the mix and stirring thoroughly to obtain liquid of workable and uniform consistency. In all cases the manufacturers instruction shall be followed meticulously.

c) Application: The solution shall be applied on the clean and wetted surface with brushes or spraying machine. The solution shall be kept well stirred during the period of application. To avoid direct heat of the sun during painting, the cement based paint shall be applied on the surface which is on the shady side. Cement based paint shall not be applied on the surfaces already treated with white wash, colour wash, dry or oil bound distemper, varnishes, paints etc. It shall not be applied on gypsum, wood and metal surfaces.

d) Other details : The specifications for Painting (General) mentioned here-in-before shall hold good as far as they are applicable.

e) Mode of measurement for dry distemper, oil bound distemper and water proof cement paint : All measurement for payment shall be taken on net surface area actually painted unless otherwise specified and no co- efficient shall be applied for working out areas. Deductions will be made from areas for opening/obstructions not painted, if they are individually more than 0.05 sqm. Length and breadth shall be taken correct upto two places of decimal of a meter and areas shall be worked out correct upto two places of decimal of a square meter.

Corrugated surfaces shall be measured flat as fixed and the area so measured shall be increased by the following percentage to allow the girthed area: a) Corrugated asbestos cement sheets - 20%; b) Semi corrugated asbestos cement sheets - 10%.

The number of coats of each treatement shall be stated in the schedule of quantities. The whole surface shall be applied with approved putty/filler to get uniform and smooth surface at no extra cost to the Department.

Rates : The rate shall include cost of all materials and labour involved in all the operation described above.

10.19 BEES WAXING OR POLISHING WITH READY MADE WAX POLISH:(NEW WORK) :

10.19.1 Materials : The polishing shall be done with bees waxing prepared locally or with ready made wax polish of approved brand and manufacture, as stipulated in the description of item.

a) Where bees waxing is to be prepared locally, the following specifications for the same shall apply:

Pure bees wax free from paraffin or stearing adulterants shall be used. Its specific gravity shall be 0.965 to 0.969 and melting point shall be 63 o C. The polish shall be

prepared from a mixture of bees wax, linseed oil, turpentine and varnish in the ratio of 2: 1.5: 1: 0.5 by weight.

The bees wax and boiled linseed oil shall be heated over a slow fire. When the wax is completely dissolved, the mixture shall be cooled till it is just warm and turpentine and varnish added to it in the required proportions and the entire mixture shall be well stirred.

10.19.2 Preparation of surface : Preparation of surface will be as mentioned here-in-under para 47.20.2 with the exception that knotting, holes and cracks shall be stopped with a mixture of fine saw dust formed of the wood being treated, beaten up with sufficient bees wax to enhance cohesion.

10.19.3 Application : The polish shall be applied evenly with a clean soft pad of cotton cloth in such a way that the surface is completely and fully covered. The surface is then rubbed continuously for half an hour.

When the surface is quite dry, a second coat shall be applied in the same manner and rubbed continuously for one hour or until the surface is dry.

The final coat shall then be applied and rubbed for two hours (more if necessary) until the surface has assumed a uniform gloss and is dry showing no sign of stickiness.

The final polish depends largely on the amount of rubbing which should be continuous and with uniform pressure, with frequent changes in the direction.

10.19.4 Other details : The specifications for painting (General) as mentioned here-in-before shall hold good as for as they are applicable.

10.20 FRENCH SPIRIT POLISHING: (ON NEW WORK WITH A COAT OF WOOD FILLER) :

10.20.1 Polish : Pure shellac varying from pale orange to lemon yellow colour, free from resin or dirt shall be dissolved in methylated spirit at the rate of 140 gm. of shellac to 1 litre of spirit. Suitable pigment shall be added to get the required shade.

10.20.2 Preparation of surface : The surface shall be cleaned. All unevenness shall be rubbed down smooth with sand paper and well dusted off. Knots if visible shall be covered with a preparation of red lead and glue size laid on while hot. Holes and indentations on the surface shall be stopped with glaziers putty. The surface shall then be given a coat of wood filler made by mixing whiting (ground chalk) in methylated spirit at the rate of 1.5 kg. of whiting per litre of spirit. The surface shall again be rubbed down perfectly smooth with glass paper and wiped clean.

10.20.3 Application : The number of coats of polish to be applied shall be as described in the item.

A pad of woolen cloth covered by fine cloth shall be used to apply the polish. The pad shall be moistened with the polish and rubbed hard on the wood, in a series of

overlapping circles applying the mixture sparingly but uniformly over the entire area to give an even level surface. A trace of linseed oil on the face of the pad facilitates this operation. The surface shall be allowed to dry and the remaining coats applied in the same way. To finish off, the pad shall be covered with a fresh piece of clean fine cotton cloth, slightly damped with methylated spirit and rubbed lightly and quickly with circular motions. The finished surface shall have a uniform texture and high gloss.

10.20.4 Measurement, Rate and other Details : These shall be as for Painting (General) mentioned here-in- before as far as they are applicable.

SECTION-11

M. S. GRILLS / RAILINGS:

11.1 GENERAL :

The contractor shall submit 6 copies of shop drawings covering all types of work under this specifications before manufacture. The drawing shall show all dimensions, details of construction, installation relating to the adjoining work.

11.2 MATERIALS :

All structural steel shall conform to I.S. 226 sections for grills and shall be free from loose mill scales, rusts, pittings or any other defects affecting its strength and durability.

11.3 FABRICATION :

The grill shall be fabricated to the design and pattern shown in the drawings. All joints shall be made in best workman like manner with slotting and welding as required to the specified size and shape. The edge of the M.S. flats shall be suitably mitred before welding to get the desired shape. The joints shall be filled to remove excess stay after welding. Screws, nuts, washers, bolts, rivets and any other miscellaneous fastenings, devices shall be of steel and shall be provided by the contractor.

Manufactured M.S. grills then be fixed in between the posts, balusters, M.S. frame work etc. to correct alingnment. Any undulations, bends etc.found shall be rectified by the contractor at his own cost. The complete assembly of grill/railing so fixed shall be firm and there shall not be any lateral movements.

11.4 SAMPLES :

Samples of grill and railings shall be submitted for approval of the Engineer-in-Charge and to be got approved before taking up for mass fabrication.

11.5 INSTALLATION :

The approved grills shall be fixed in position where specified and shown in drawings including in masonry walls, teakwood frames, hand railings etc. Any damages to walls, frames etc. caused during fixing the grills shall be made good by grouting with cement mortar/packing/repairing properly at the contractors cost.

11.6 PAINTING :

Painting shall be done as per the specifications specified under painting.

11.7 MODE OF MEASUREMENT:

Actual area of m.s. grill manufactured and fixed in position shall only be measured in kg for payment. All measurements shall be taken to two places of grams of a kg'sand area shall be calculated to second place of grams of a kg's.

The rate is to include the cost of all materials, labour, transporting, fabricating, installing, scaffolding if necessary, grouting etc. complete.

11.8 FINISHING/PAINTING/POLISHING FOR RAILING :

Teak wood hand rail shall be polished with wax polish/ french polish/solignum with two or more coats over one coat of wood primer or painted with two coats of synthetic enamel paint/flat oil paint of approved make and shade over one coat of approved primer. M.S. grills, balusters etc. also to be painted as per specifications specified under painting/polishing.

11.9 MODE OF MEASUREMENTS (HAND RAILS) :

Hand railing shall be measured for payment in running kg. The length shall be measured along the top centre line of the hand rail and shall be measured between ends of balusters, newels, posts as the case may be upto two places of grams of kg's . Rate shall include fabrication, leaving suitable pockets, grouting the same, providing and fixing suitable teak wood plugs, fixing, all labour, materials, transport, painting/polishing, finishing and scaffolding if necessary.

SPECIAL NOTES

SPECIAL NOTES

1. The bill of quantities (BOQ) forming part of this contract is only approximate. Contractor to verify quantity of each item from construction drawings or through on site measurement before ordering material for that item. Any short fall or excess procurement made based only on BOQ items will be contractor's own responsibility.
2. Payment shall be made against the quantities actually executed at site according to measurement.
3. Quoted rates shall remain valid for actual value of contract varying within ± 30% of bid value and contractor has no right to claim any extra on this account. It's difficult work in under construction area, contractor to make sure that no services/ utilities are disturbed in case any utility / service are disturbed contractor to make the damage good at his own cost. Contractor to arrange access for traffic and residents through temporary bridges or detours all cost involved for such works are to be covered in the unit rates of items of works in the BOQ.
4. The contractor will place the order for all the material to be used at site and in his scope of works well in time so that delivery of these materials should not affect the schedule of completion of works. No excuse for the late delivery of the materials by other manufacturers shall be accepted in this regard.
5. The contractor shall include in his rates the cost of the cable accessories such as copper lugs, glands, cable end box etc, wherever required. Increase in rate(s), will not be possible after approval of the rate(s) and during execution of works.
6. Contractor to submit all warranty and guarantee cards for equipments and appliances installed. The test certificates of Cables to be submitted before installation.
7. Contractor to submit samples for approval and maintain at site a sample room.
8. For extra works carried out according to instructions of the Client and/or Consultants, or their representatives, the rates claimed for these works will be approved by the Client/Consultants after mutual discussion with contractor.
9. Quoted Tender documents, Tender Drawings and Addendum (if any) etc, shall be submitted on the date Tender opening.
10. Contractors/Bidders are advised to visit and understand the quantum of works unvalued in existing areas before filling the BOQ
11. Contractors/Bidders may contact Consultants for clarification of each and every query before filling the BOQ. No alteration in the rates will be entertained after submission / approval of the Tender documents.
12. For all works contractor to employ qualified Engineer with knowledge of surveying. The Engineer to be present during works on full time basis.
13. Only Government of Sindh notified escalations after the date of opening this tender (new escalation) on any item shall be only payable to contractor.

LIST OF APPROVED MANUFACTURERS

LIST OF APPROVED MANUFACTURES/BRANDS

(Samples subject to physical approval by consultants)

Note: This project may not require some of following materials

S/No	Description	Company
1.	Reinforcement Steel	AFCO, Mughal, Amreli, Prime, Razzaq, Metropoliton, Nawab & Itehad
2.	Ceramic Tiles	EMCO, Shabir, Master
3.	Plastic/Vinyle enyle emulsion/Enamel (Matt or Gloss)	ICI Dulux , Burger Paint
4.	G.I Pipes	IIL, Jamal, KPM, Pioneer Steel
5.	Hardware stays, Handles (Bras)	Moosa, Pistol, Alfa, Yale, Babar
6.	Glass	Khawaja Glass, Nowshera Glass, Prince & Usmania Glass
7.	Stainless Steel Sink	Altas, Super Asia & Master
8.	Cost Iron *Spun) pipe, fitting & Fixtures	Alpine, Teepu
9.	Asbestos Pipe	Dadex
10.	UPVC Pipe & Fittings	Dadex, Beta & Galco
11.	ASTM RCC Pipes	Hume Pipe, Razia & Balochistan Pipe
12.	Sanitary Fixtures	Master, ICL-Bosch, Ceramika
13.	Flushing Tank	Golden, Rehber & Master
14.	Hot and Cold PVC Pipe	Dadex
15.	Anti Termite Water Proofing agents and concrete admixture	Termite, Biflex, Dursbin, Dyna Bond, Vanex, feb, Sika & Foscroc
16.	Acid proof Tiles	National Tiles
17.	Terrazzo Tiles	Capital Tiles, Noor Tiles
18.	Aluminum Section	Alcop, Japan Metal
19.	Wooden Door Shutter	Sterling & Interwood
20.	Light Fixtures	Phillips, ohms lighting, Britlite Engineering Company
21.	Distribution Boards	Siemens, Hussain & Co, PEL
22.	Cable & Wirers	Pakistan Cables, Newage cable, Allied cables
23.	PVC Conduit & Accessories	Beta, Galco, Dadex
24.	Steel conduits & Associates	Hilal Industries and International Industries

25.	Switches, socket etc	MK (UK) Clipsal (Aus)
26.	Fans	Pak Fan, Millat & Royal
27.	MCCB, MCB	Merlen Gerin, Siemens, Terasaki
28.	Sluice Valve	KSB Company
29.	Pumps	KSB Company, Grundfos
30.	Deep Well Turbine	KSB Company, Grundfos
31.	M.S Pipe all 6.4mm spirally welded	Indus Steel, Data Steel, Crescent Steel
32.	Non Return Valve	KSB Company
33.	Safety Valve	KSB Company
34.	PVC Pipe/Valves	Dadex
35.	Motors	Siemens
36.	Transformers	Siemens, J&P
37.	Generator	Siemens, FG Wilson
38.	Poles GI	IIL Material
39.	VCB	Alstom, PEL
40.	Cement (OPC/SR)	Dg Cement, Thatta Cement, Falcon cement
41.	External Epoxy Coating	SIKA, MBT, ICI, Burger
42.	Porcelain Tiles	Master, China
43	P.E Pipe	Dadex, Hi-Tech
44.	Kerb Stone, Hard Pavers	Envicrete, (Banu Mukhtar) Bincrete, Megnacrete
45.	Switches	Clipsal/MK(or equivalent to be approved by tendering authority/Engineer In-charge)
46.	Switches-socket outlet	Clipsal/MK(or equivalent to be approved by tendering authority/Engineer In-charge)
47.	Circuit Breakers	Make Terrasaki (Japan/Malaysia/Koria)
48.	Light Fittings / Fixtures	Philips/Sunlight (Models as per BOQ of work)
49.	Sweep ceiling Fan 56"	Millat/Asia/Pak Fans (Gujrat)
50.	Fans (wall Bracket)18"-24"	Pak Fan (Gujrat) /wahid Fan
51.	Sweep Exhaust Fan 8",12"	Millat/Asia/Pak Fans (Gujrat)
52.	Light Distribution Board of 14 SWG Steel sheets	Best Electric HYD/ Elmatec/ Baber Brothers/ Husain's & Co.
53.	Light Distribution Board as per BOQ	Best Electric HYD/ Elmatec/ Baber Brothers/ Hussain & Co.

BILL OF QUANTITIES

RCC CONSULTANTS

Drinking Water Rapid / Slow Sand Filtration Plants, Waste Water Treatment,
Solid Waste Management Water Supply, Sewerage System, Civil, Electrical, Mechanical
& Architectural Works, City Master Plans, GIS, Environmental Consultants
Phone No 022-2652957 Fax No 022-2655833
E-mail: rcc.consultants@rccgoc.com
www.rccgoc.com

Construction of 1.00 lac Gallons Under Ground Clear Water Tank & Pump Room Including Pumping Machinery For Z.A Bhutto Campus, Mehran University of Engineering and Technology Khairpur Mir's.

MAIN SUMMARY SHEET

S-No	Descriptions	Amount in Rs.
1	**Part-A**	
	Construction of 1.00 lac Gallons Under Ground Clear Water Tank & Pump Room (Amount Carried from Page:146)	
2	**Part-B**	
	P umbing Work for Pump House (Amount Carried from Page:147)	
3	**Part-C**	
	Electrical Work For Pump House (Amount Carried from Page:149)	
4	**Part-D**	
	Supply and Installation of Pumping Machinery for Water Supply System (Amount Carried from Page:152)	
	Total Amount in Rs.	

In words: ----------

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Note:

Cartage shall not be payable separately and that the bid offered, is inclusive of cost of cartage.

Any difference on steel, cement, Bitumen, wood and bricks if notified by Government of sindh after opening of this bid shall be payable based on executed quantities.

If any extra item is required during execution preference will be given to Govt. of Sindh Schedule of rates.

SIGNATURE OF BIDDER

SEAL OF BIDDER

RCC CONSULTANTS

Drinking Water Rapid / Slow Sand Filtration Plants, Waste Water Treatment,
Solid Waste Management Water Supply, Sewerage System, Civil, Electrical, Mechanical
& Architectural Works, City Master Plans, GIS, Environmental Consultants
Phone No 022-2652957 Fax No 022-2655833
E-mail: rcc.consultants@rccgoc.com
www.rccgoc.com

Construction of 1.00 lac Gallons Under Ground Clear Water Tank & Pump Room

Schedule-B

Part-A

S-No	Descriptions	Quantity	Unit	Unit Rate	Amount in Rs.
1	Excavation for tanks and reservoirs in soft soil i/c trimming and dressing sites to true alignment/design sections/profiles and shape levelling of beds of trenches to correct level and grade including laying of earth in 6" layer of construction of banks and dressing and disposal of surplus, excavated earth within one chain as directed by engineer incharge i/c providing fence guards, lights, flags where ever required lift upto 5ft (1.52m) and lead upto one chain (30.5m) (PHS I# 01, P# 67)	5628.00	%o Cft	3,000.00	16,884.00
2	Excavation for tanks and reservoirs in wet soils/ clay or mud i/c trimming and dressing sites to true alignment/design sections/profiles and shape levelling of beds of trenches to correct level and grade including laying of earth in 6" layer of construction of banks and dressing and disposal of surplus, excavated earth within one chain as directed by engineer incharge i/c providing fence guards, lights, flags where ever required lift upto 5ft (1.52m) and lead upto one chain (30.5m) (PHS I# 14, P# 74)	5628.00	%o Cft	4,800.00	27,014.40
3	Excavation for tanks and reservoirs in slushy or daldally soils i/c trimming and dressing sites to true alignment/design sections/profiles and shape levelling of beds of trenches to correct level and grade including laying of earth in 6" layer of construction of banks and dressing and disposal of surplus, excavated earth within one chain as directed by engineer incharge i/c providing fence guards, lights, flags where ever required lift upto 5ft (1.52m) and lead upto one chain (30.5m) (PHS I# 15, P# 74)	19698.00	%o Cft	7,200.00	141,825.60

S-No	Descriptions	Quantity	Unit	Unit Rate	Amount in Rs.
4	Add for additional lift of every three ft or part there of in item No 1 to 15 (A&B) for excavation for pipelines & storage tanks trenches and pits. (G.S.I. #16) P-74	33768.00	%o Cft	550.00	18,572.40
5	Full hire charges of the pumping set per day inclusive of wage of driver and Assistant fuel or electric energy plate forms required for placing pumps etc. at lower depth with suction and delivery pipes for pumping out water found at various depths from trenches i/c the cost of erection and dismantling after completion of the job. (i) For a pumping set of upto 10 H.P. (PHSI# 23 (i) , P#77)	480	P-Hour	250.00	120,000.00
6	Dry rammed brick or stone ballast 1-1/2" to 2" gauge. (GSI# 2, P# 14)	2814.00	% Cft	3,327.50	93,635.85
7	Cement concrete plain including placing compacting finishing and curing complete I/c washing of aggregates without shuttering (i) Ratio 1 4:8 (GSI 5 P-15)	1407.00	% Cft	11,288.75	158,832.71
8	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). (a) R.C.C work in roof slab, beams columns rafts, lintels and other structural member laid in situ or precast laid in position complete in all respects. (ii) Ratio (1:1.5:3) GSI# #6 ii P-15)	7122.18	P-Cft	349.00	2,485,640.82
9	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). R.C.C work in roof slab, beams columns rafts, lintels and other structural member laid in situ or precast laid in position complete in all respects. (I) Ratio 1:2:4. 90 lbs Cement, 2 Cft Sand and 4 Cft Shingle 1/8" to 1/4" gauge (GSI# #6 i P-16)	377.125	P-Cft	337.00	127,091.13

S-No	Descriptions	Quantity	Unit	Unit Rate	Amount in Rs.
10	Providing Fixing Mild Steel Reinforcement for cement concrete including cutting, bending laying in position making joints and fastening, cost of binding wire (also includes removal of rust from bars) (GSI # 8ii P-16)	442.78	P-Cwt	5,001.70	2,214,652.73
11	Bitumen Coating to plastered or cement concrete surface (GSI# 9, P# 70)	2376.00	% Sft	778.09	18,487.42
12	Pacca brick work in ground floor in (c) cement sand mortar 1:4 (GSI# 5, P# 20)	365.06	%Cft	13,227.41	48,287.98
13	Cement Plaster 1:4 upto 12ft height (b) 1/2" thick. (GSI# 11.b, P#51)	1734.00	% Sft	2,283.93	39,603.35
14	Cement Plaster 1:4 upto 12ft height (a) 3/8" thick. (GSI# 11.a, P#51)	1734.00	% Sft	2,197.52	38,105.00
15	Cement Plaster 1:3 upto 12ft height (c) 3/4" thick. (GSI# 10.c, P#51)	1947.50	% Sft	2,795.30	54,438.47
16	Rough Cost / Stucco Plaster 3/4" thick in position of 1:1-1/2":1-1/2" in cement hill sand and bajri in patterns. (GSI No 32, P No 54)	594.00	% Sft	2,306.10	13,698.23
17	Preparing the surface & painting with matt finish I/c rubbing the surface with Bathy (Silicon carbide rubbing brick) filling the voids with Zinc / chalk/plaster of Paris mixture, applying first coat premix making the surface smooth and then painting 3 coats with matt finish of approved make etc: complete (new surface) (GSI # 36 A P-54) (ICI OR equivalent:)	730.25	% Sft	2,717.00	19,840.89
18	Prime coat of chalk distempering (GSI# 23, P# 53)	250.13	% Sft	442.75	1,107.43
18a	Distempering (a) One coat 1st coat over Priming Coat) (b) Two coats (GSI# 24, P# 53)	250.13	% Sft	1,646.15	4,117.43
19	Preparing the surface and painting with weather coat I/c rubbing the surface with rubbing brick / sand Paper, filling the voids with chalk/ plaster of Paris and then painting with weather coat of approved make. (GSI # 38 A P-55) (ICI OR equivalent:) 2nd & subsequent coat (GSI # 36 B P-54) (ICI OR equivalent:)	998.00	% Sft	2,567.95	25,628.14
20	Providing laying single per layer of polythene sheet 0.13mm thick for water proofing as per instruction of Engineer incharge (GSI# 38, P# 37)	455.00	P-Sft	10.76	4,895.80
21	Two coats of bitumen laid hot using 34lbs for % Sft, over roof and blinded with sand at one cft per % Sft (GSI # 13, P# 34)	2951.00	% Sft	1,887.40	55,697.17

S-No	Descriptions	Quantity	Unit	Unit Rate	Amount in Rs.
22	Providing and laying 2" thick topping cement concrete (1:2:4) including Surface finishing and dividing into panels (GSI# 16.c, P# 41)	2951.00	% Sft	3,275.50	96,660.01
23	Supplying and filling sand under floor and plugging in walls. (GSI# 29, P# 25)	5720.00	% Cft	1,141.25	65,279.50
24	Providing and laying 3" thick topping cement concrete (1:2:4) including Surface finishing and dividing into panels (GSI# 16.d, P# 41)	2100.00	% Sft	4,411.82	92,648.22
25	Making & fixing steel grated doors complete with locking arrangement angle iron frame 2" x 2" 3/8"and 3/4" sq: bars 4" centre to centre.	28.00	P-Sft	594.57	16,647.96
26	Providing / Fixing C.I Ventilator (weight not less than 80 lbs /each in tank roof of approved design with water tight joint including painting etc complete (PHESI# 4, P#55)	4	Each	4,870.00	19,480.00
27	Cast iron rain water down pipe fixed in place excluding heads and shoes but including painting and clamps etc. (a) 4" dia cast iron down pipe (GSI# 22, P# 35)	80.00	P-Rft	423.13	33,850.40
28	Providing/Fixing in position in C.C foundation 1:3:6 M.S ladder of M.S angle iron 2" x 2" x 1/4" 1ft apart with M.S bar 3/4" dia spaced 1ft apart painting 3 coats with anticorrosive steel paint etc complete. (PHSI# 3, P# 55)	30.00	P-Rft	799.00	23,970.00
				Amount of Schedule Items	**6,076,593.03**
	Non Schedule Items				
29	Mild steel pipe hand railing comprising 16 gauge 2" dia top rail 2" dia 2 nos middle rail and 2" dia balustrade at alternate steps including embedding and including three coats of ICI paint complete in all respect as shown on the drawings, as per directions of engineer incharge. NSI.	42	P-Kg	200.00	8,400.00
30	Supplying and fixing MS Steel Windows with angle iron frame and 16 gauge MS sheet (weight no less than 2kg per sft) including cost of embedded in masonry / concrete with proper locking arrangement including cost of one coat red oxide and three coat of ICI enemal paint etc complete in all respects as per approved shop drawing or as per instructions of Engineer Incharge.	80	P-Kg	200.00	16,000.00

S-No	Descriptions	Quantity	Unit	Unit Rate	Amount in Rs.
31	Providing and Fixing 30" long 4" dia elbow type C I vent pipe etc complete	12	Each	1,000.00	12,000.00
	Amount of Non Schedule Items				**36,400.00**

A Total Amount of Schedule items in Rs. **6,076,593.03**

B I the Contractor M/s ----------

Here by quote ----------% premium above / below the schedule items. ----------

C Total Amount of Non Schedule items in Rs. **36,400.00**

Total Tender Amount of A+B+C in Rs. ----------

In words: ----------

Note:

Cartage shall not be payable separately and that the bid offered, is inclusive of cost of cartage.

Any difference on steel, cement, Bitumen, wood and bricks if notified by Government of sindh after opening of this bid shall be payable based on executed quantities.

If any extra item is required during execution preference will be given to Govt. of Sindh Schedule of rates.

SIGNATURE OF BIDDER

SEAL OF BIDDER

RCC CONSULTANTS

Drinking Water Rapid / Slow Sand Filtration Plants, Waste Water Treatment,
Solid Waste Management Water Supply, Sewerage System, Civil, Electrical, Mechanical
& Architectural Works, City Master Plans, GIS, Environmental Consultants
Phone No 022-2652957 Fax No 022-2655833
E-mail: rcc.consultants@rccgoc.com
www.rccgoc.com

Plumbing Work for Pump House

Schedule-B

Part-B

S-No	Descriptions	Quantity	Unit	Unit Rate	Amount
1	Providing G.I Pipes, specials & clamps etc including fixing cutting and fitting complete with and i/c the cost of breaking through walls and roof, making good etc with white Zink paint with pigment to match the colour of the building and testing with water to a pressure head of 200 feet and handling (WSIS# 1, P# 12)				
(vi)	1" dia	100.00	Rft	166.20	16,620.00
2	Providing and fixing handle valves (China) (PSI# 5, P# 17)				
(vi)	1" dia	2	Each	365.42	730.84
3	Supplying and fixing fiber glass tank of approved quality and design and wall thickness as specified i/c cost of nuts, bolts and fixing in platform of cement concrete 1:3:6 and making connections for in-let and outlet & cover flow pipe etc complete. (PSI# 3, P# 21)				
	(c) 500 gallons wall thickness 4.5mm	1	Each	37,505.42	37,505.42
	Total Amount of Plumbing Schedule Items				**54,856.26**

A **Total Amount of Schedule items in Rs.** **54,856.26**

I the Contractor M/s ----------

B

Here by quote ----------**% premium above / below the schedule items.** ----------

Total Tender Amount of A+B in Rs. ----------

In words: ----------

Note:

Cartage shall not be payable separately and that the bid offered, is inclusive of cost of cartage.
Any difference on steel, cement, Bitumen, wood and bricks if notified by Government of sindh after opening of this bid shall be payable based on executed quantities.
If any extra item is required during execution preference will be given to Govt. of Sindh Schedule of rates.

SIGNATURE OF BIDDER **SEAL OF BIDDER**

RCC CONSULTANTS

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E-mail: rcc.consultants@rccgoc.com
www.rccgoc.com

Electrical Work For Pump House

Schedule-B

Part-C

S-No	Descriptions	Qty	Unit	Rate	Amount
1	Wiring for light or fan point with (3/.029) PVC insulated wire in 20mm(3/4") PVC conduit recessed in the wall or column as required. (ESI# 124, P#15)	20	P-Point	1,130.00	22,600.00
2	Wire for plug point with (3/.029) PVC insulated wire in 20 mm (3/4") PVC conduit recessed in the wall or column as required.(ESI# 126 P#15)	4	P-Point	985.00	3,940.00
3	Providing and Laying (Main of Sub Main) PVC insulated with size 3-7/.029 copper conductor in 3/4" dia PVC Conduit on Surface (ESI#17 , P#3)	50	P-Meter	235.00	11,750.00
4	Providing and fixing one way SP 5 amp switch flush type. (ESI# 219, P# 33)	4	Per-No	54.00	216.00
5	Providing and fixing surface three pin 10/15 amp plug & socket flush type (ESI# 227, P# 33)	2	Each	162.00	324.00
6	Providing and Fixing Bakelite ceiling rose with two terminal. (ESI# 228, P# 33)	2	Per No	72.00	144.00
7	Providing and fixing Brass Ceiling fan 56" (good quality) (ESI# 235, P# 34)	2	Per No	3,185.00	6,370.00
			Amount of Schedule items		**45,344.00**
Non Schedule Items					
8	Providing and fixing 1-40 watts tube light complete with 40 watts 4ft long rod, chowk, starter and Patti with Philips components l/c necessary eclectic connection and fixing on wall or ceiling etc complete(M.R)	10	Each	1,500.00	15,000.00
9	Providing and fixing 25 watts energy saver superior quality l/c fixing on existing holder etc complete	4	Each	400.00	1,600.00
10	Providing, laying 16mm^2 3.5 core 660/1000 volt PVC/FVC unarmored cable laying the ground upto 2ft depth l/c excavation of earth in 2ft depth for laying the cable	100	Rft	350.00	35,000.00
11	Providing and fixing mild steel bar fan claimp 15.8mm 5/8" dia suitable for RCC roof	2	Each	200.00	400.00

S-No	Descriptions	Qty	Unit	Rate	Amount
12	Providing and fixing plate type earth electrode 24" x 24' x 3mm including 50mm dia GI pipe , 2 x 70 sq mm bare copper conductor including 12" x 2" x 6mm copper plate for earth connecting point & inspection chamber 18" x 18" with cover detail shown in drawing etc complete	2	Job	15,000.00	30,000.00
13	Providing and fixing Distribution board for light including main circuit breaker and distribution circuit breakers, lamp lights, wiring, ampre meter etc complete in all respects as per directions of engineer incharge.	2	Job	10,000.00	20,000.00
				Amount of Non Schedule items	102,000.00

A Total Amount of Schedule items in Rs. 45,344.00

B I the Contractor M/s ----------

Here by quote ----------% premium above / below the schedule items. ----------

C Total Amount of Non Schedule items in Rs. 102,000.00

Total Tender Amount of A+B+C in Rs. ----------

In words: ----------

Note:

Cartage shall not be payable separately and that the bid offered, is inclusive of cost of cartage.

Any difference on steel, cement, Bitumen, wood and bricks if notified by Government of sindh after opening of this bid shall be payable based on executed quantities.

If any extra item is required during execution preference will be given to Govt. of Sindh Schedule of rates.

SIGNATURE OF BIDDER

SEAL OF BIDDER

RCC CONSULTANTS

Drinking Water Rapid / Slow Sand Filtration Plants, Waste Water Treatment,
Solid Waste Management Water Supply, Sewerage System, Civil, Electrical, Mechanical
& Architectural Works, City Master Plans, GIS, Environmental Consultants
Phone No 022-2652957 Fax No 022-2655833
E-mail: rcc.consultants@rccgoc.com
www.rccgoc.com

Supply and Installation of Pumping Machinery for Water Supply System

Schedule-B

Part-D

S-No	Items	Quantity	Unit	Rate	Amount
1	Supply, Installation, testing and commissioning of approved KSB or equivalent Eta Norm pump, TypeM150-250, 400 IGPM, 100ft Head including 30BHP Electric motor Siemens, 1470 RPM, 3PH/50Hz mounted on common base steel frame including foundation bolts and Motor Control unit with all accessories and errection etc complete in all respects as per directions of engineer incharge.	2	Job	912,000.00	1,824,000.00
2	Supplying & Laying control cable for motors 4 core 25mm square *(Pakistan Cable or equivalent)* including 2" dia pvc conduit, sockets, bends and cutting of floor etc complete in all respects as per instruction of engineer.	150	P-Rft	757.00	113,550.00
3	Supplying & Laying 4 core 120mm square main cable *(Pakistan Cable or equivalent)* from transformer to Main Control Unit (MCU) etc complete in all respects as per instruction of engineer.	200	P-Rft	3,060.00	612,000.00
4	Providing and fixing plate type earth electrode 24" x 24" x 3mm including 50mm dia GI pipe , 2 x 70 sq mm bare copper conductor including 12" x 2" x 6mm copper plate for earth connecting point & inspection chamber 18" x 18" with cover detail shown in drawing etc complete.	1	Job	27,000.00	27,000.00
5	Providing, laying, jointing and testing approved 6.4mm thick M.S suction & delivery pipes etc complete in all respects as per instructions of engineer incharge.				
	a) 8" dia	100	P-Rft	2,172.00	217,200.00
	b) 6" dia	50	P-Rft	1,632.00	81,600.00

S-No	Items	Quantity	Unit	Rate	Amount
6	Providing and fixing approved 45°/90° C.I flanged Bends etc complete in all respects as per instructions of engineer incharge.				
	a) 8" dia (weight not less than 40 kg)	2	Each	10,680.00	21,360.00
	b) 6" dia (weight not less than 25 kg)	4	Each	6,900.00	27,600.00
7	Providing and fixing approved 6" dia Heavy duty Sluice valve etc complete in all respects as per directions of engineer incharge.	2	Each	16,200.00	32,400.00
8	Providing and fixing approved 6" dia Heavy duty Non Return Valve etc complete in all respects as per directions of engineer incharge.	2	Each	13,800.00	27,600.00
9	Providing and fixing approved 8" dia Foot Valve etc complete in all respects as per directions of engineer incharge.	2	Each	3,500.00	7,000.00
10	Providing and fixing approved 20mm thick 8" dia MS Flanges etc complete.	10	Each	1,140.00	11,400.00
11	Providing and fixing approved 20mm thick 6" dia MS Flanges etc complete.	10	Each	1,020.00	10,200.00
12	Providing flanged joints to pipes and specials including cost of nut bolts & rubber packing etc complete in all respects as per directions of engineer incharge.				
	a) 8" dia	10	Joint	500.00	5,000.00
	b) 6" dia	10	Joint	400.00	4,000.00
	c) 12" dia	6	Joint	3,000.00	18,000.00
13	Providing and fixing 8" x 6" C.I flanged Reducer etc complete in all respects as per directions of engineer incharge. (RA Attached)	2	Each	10,680.00	21,360.00
14	Providing and fixing approved 12" x 6" x 12" C.I flanged Tee including dressing coupling etc complete in all respects as per directions of engineer incharge.	2	Each	38,400.00	76,800.00
15	Providing and fixing 12" approved C.I short piece with flanges including cost of nut bolts etc complete in all respects as per directions of engineer incharge.	1	Each	20,760.00	20,760.00
16	Providing and fixing approved 12" dia 45°/90° C.I flanged Bends etc complete in all respects as per directions of engineer incharge.	2	Each	38,400.00	76,800.00
17	Construction of Pumps foundation in Ratio 1:2:4 Plain Cement Concrete as per pumps manufacturer's requirement etc compete.	2	Each	11,054.00	22,108.00
18	Providing, Laying, Jointing and Testing 6.4mm thick 12" dia MS manifold pipe including cost of water proofing epoxy coating etc complete in all respects as per directions of engineer incharge.	50	P-Rft	4,464.00	223,200.00

S-No	Items	Quantity	Unit	Rate	Amount
19	Supplying and installing Donkey pump 1/2 HP including providing power plug, service wire, 1-1/4" dia G.I pipe 20ft etc complete in all respects as instructions of engineer incharge.	1	Job	16,545.00	16,545.00
	Total Amount of Pumping Machinery Non Schedule Items				**3,497,483.00**

A Total Amount of Non Schedule items in Rs. **3,497,483.00**

B I the Contractor M/s ----------

Here by quote ----------% premium above / below the schedule items. ----------

Total Tender Amount of A+B in Rs. ----------

In words: ----------

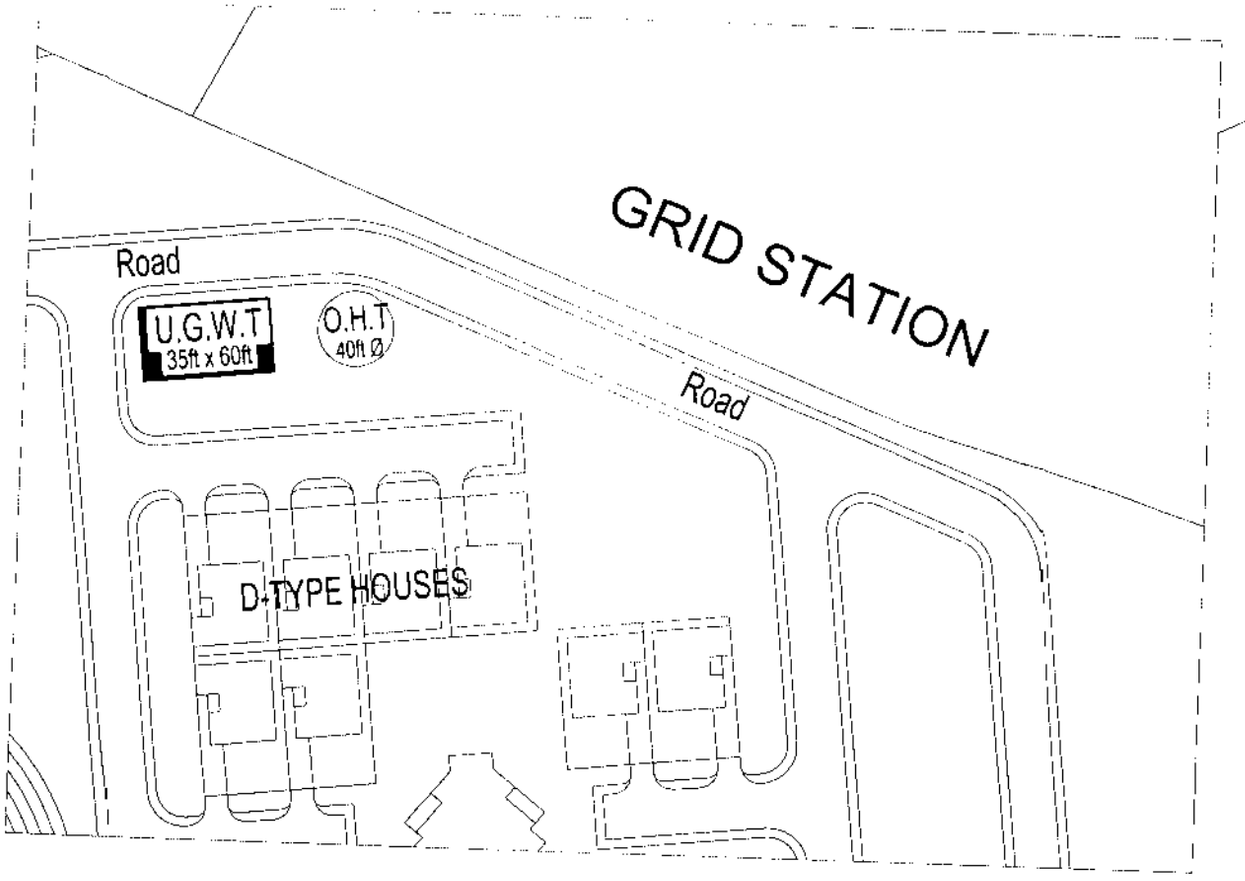
Note:

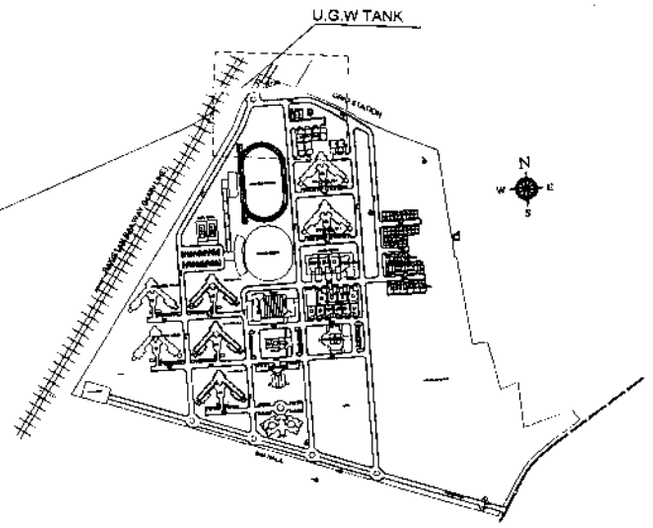
Cartage shall not be payable separately and that the bid offered, is inclusive of cost of cartage.

SIGNATURE OF BIDDER

SEAL OF BIDDER

TENDER DRAWINGS
(NOT VALID FOR CONSTRUCTION)





DWG# RCC/UGWT/01
DATE: 01-11-2014
REV# 00

NAVEED/D/RCC CONSULTANTS/UGWT

LOCATION PLAN OF 1.00 LAC UNDER GROUND WATER TANK

Z.A BHUTTO CAMPUS, MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY KHAIRPUR MIR'S.

RCC Consultants
Drinking Water Rapid / Slow Sand Filtration Plants, Waste Water Treatment, Solid Waste Management Water Supply, Sewerage System, Civil, Electrical, Mechanical & Architectural Works, City Master Plans, GIS, Environmental Consultants
A-2 Green Homes Phase-1 Gulshan-e-Iqbal Hyderabad.
Phone No 022-2652957 Fax No 022-2655933
E-mail: rcconsultants@rccpc.com
www.rccpc.com

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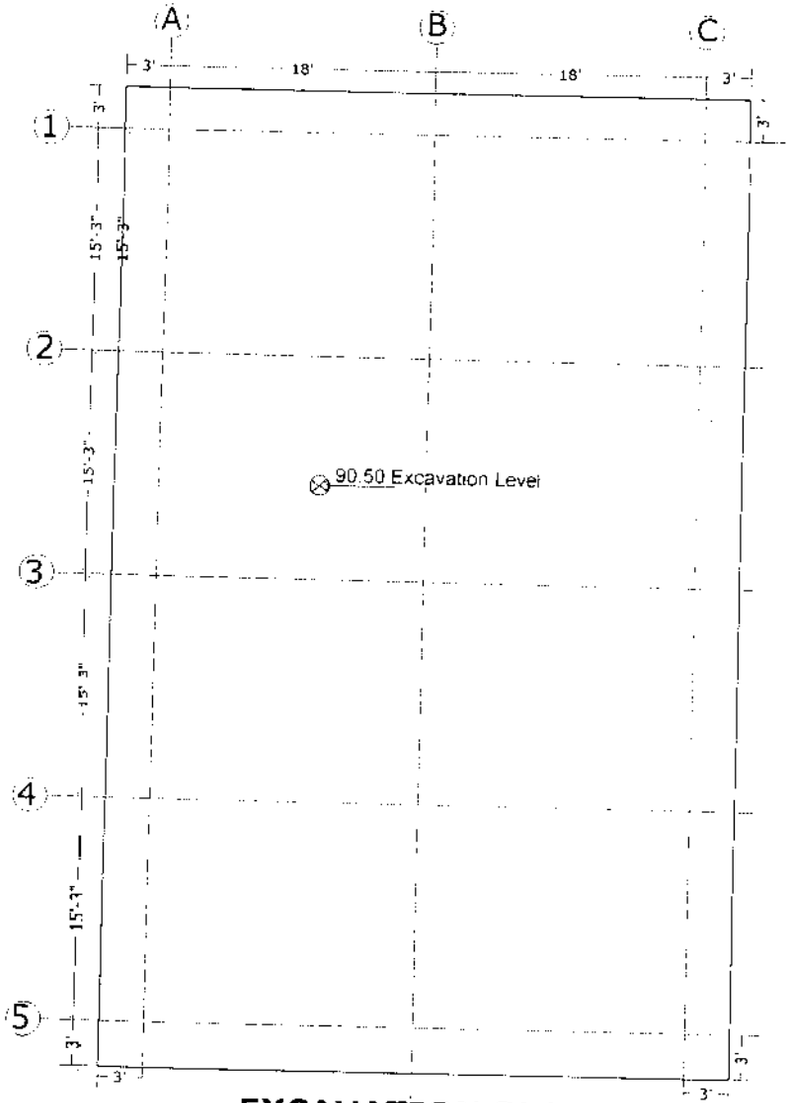
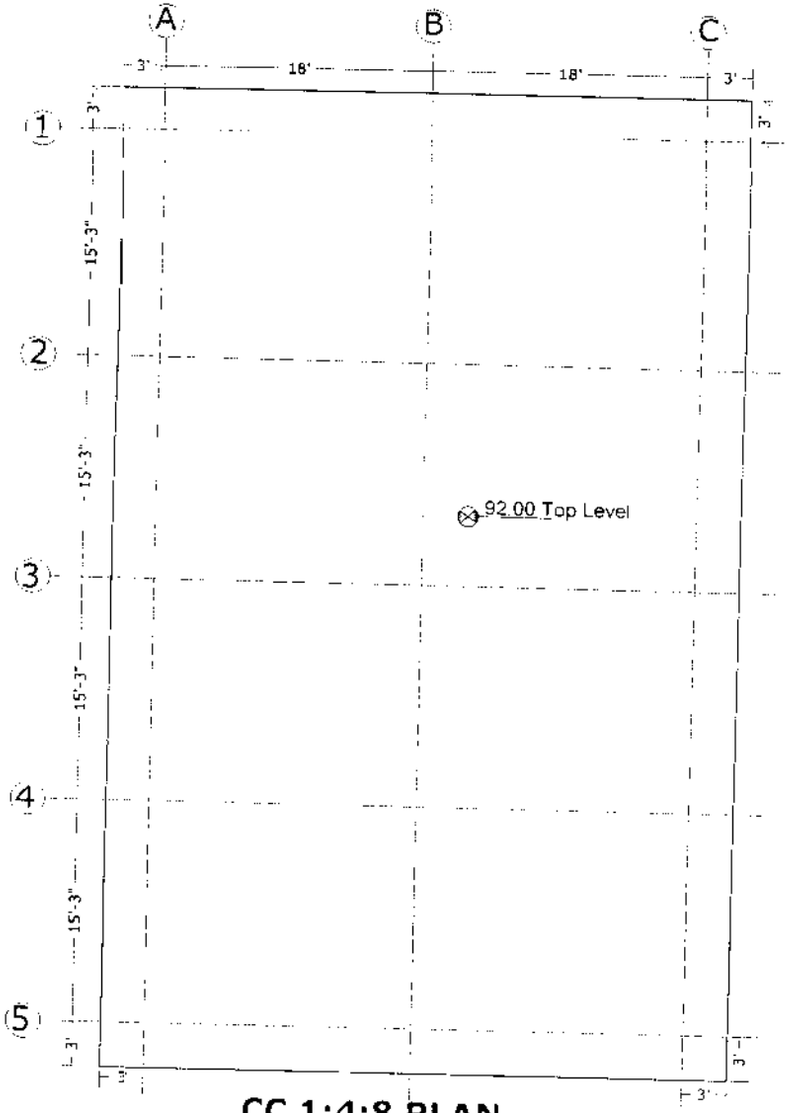


EXCAVATION PLAN



CC 1:4:8 PLAN

DWG# RCC/UGWT/C2
DATE: 01-11-2014
REV# 00

NAVEED/D/RCC CONSULTANTS/UGWT

PLAN & EXCAVATION PLAN OF 1.00 LAC UNDER GROUND CLEAR WATER TANK AND PUMP HOUSE

Z.A BHUTTO CAMPUS, MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY KHAIRPUR MIR'S.

RCC Consultants
Drinking Water Rapid / Slow Sand Filtration Plants, Waste Water Treatment, Solid Waste Management Water Supply, Sewerage System, Civil, Electrical, Mechanical & Architectural Works, City Master Plans, GIS, Environmental Consultants
A/6 Qasim Homes Phase-I Qasimabad Hyderabad
Phone No 022-2652937 Fax No 022-2659833
E-mail: rcconsultants@rccpac.com
www.rccpac.com

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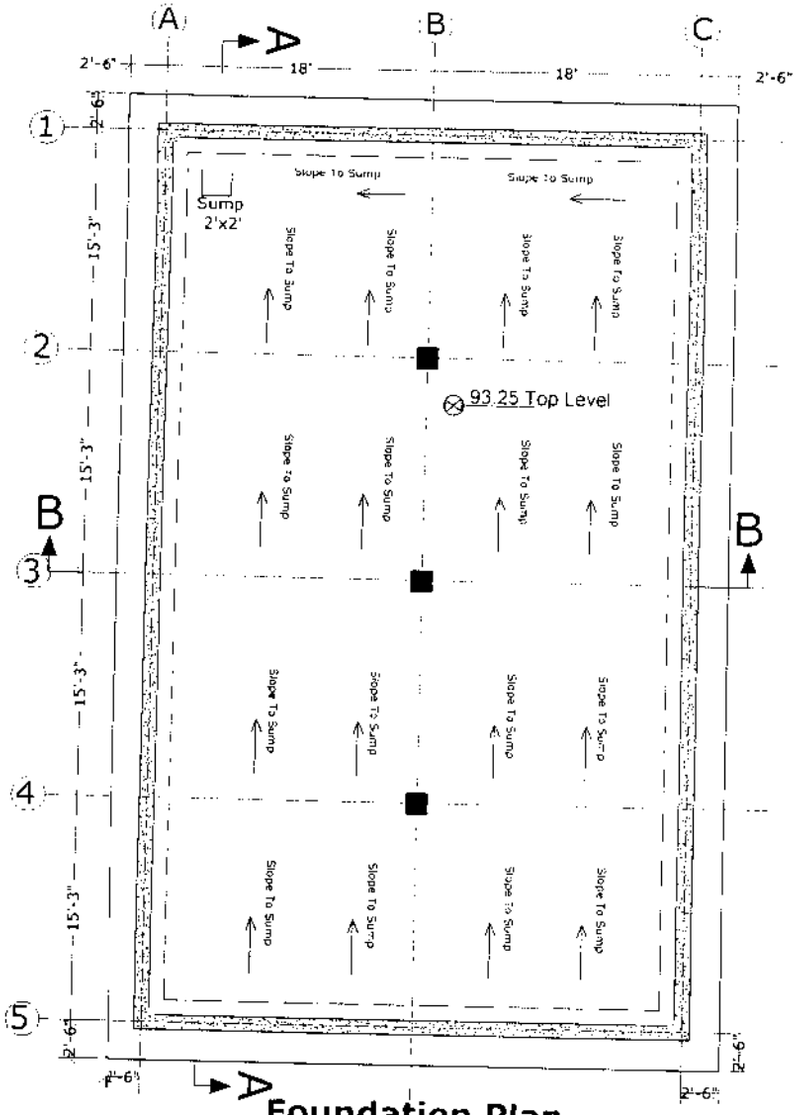
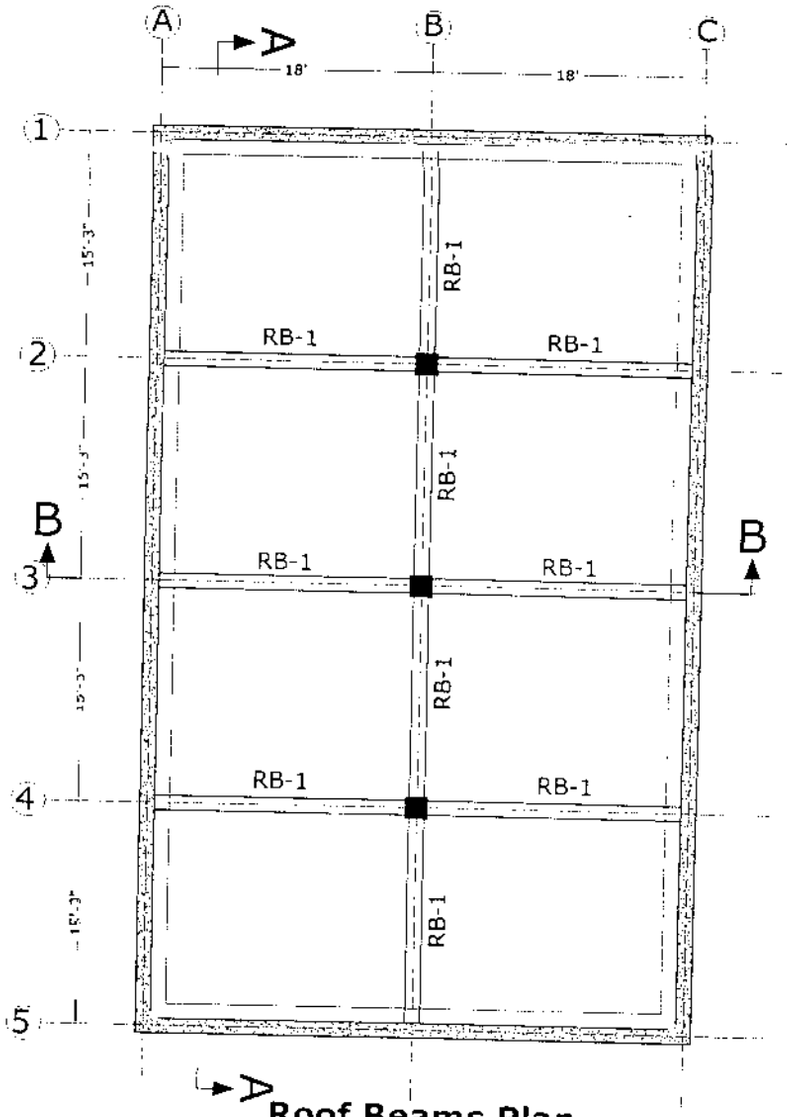


Foundation Plan



Roof Beams Plan

DWG# RCC/UGWT/03 DATE: 01-11-2014 REV# 00 NAVEED/D/RCC CONSULTANTS/UGWT	FOUNDATION AND ROOF BEAMS PLAN OF 1.00 LAC UNDER GROUND CLEAR WATER TANK AND PUMP HOUSE Z.A BHUTTO CAMPUS, MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY KHAIRPUR MIR'S.	RCC Consultants Drinking Water Rapid / Slow Sand Filtration Plants, Waste Water Treatment, Solid Waste Management Water Supply, Sewerage System, Civil, Electrical, Mechanical & Architectural Works, City Master Plans, GIS, Environmental Consultants A-3 Green Homes Phase-I Gaslabad Hyderabad. Phone No 022-2652957 Fax No 022-2650833 E-mail: rccconsultants@rccpdc.com www.rccpdc.com

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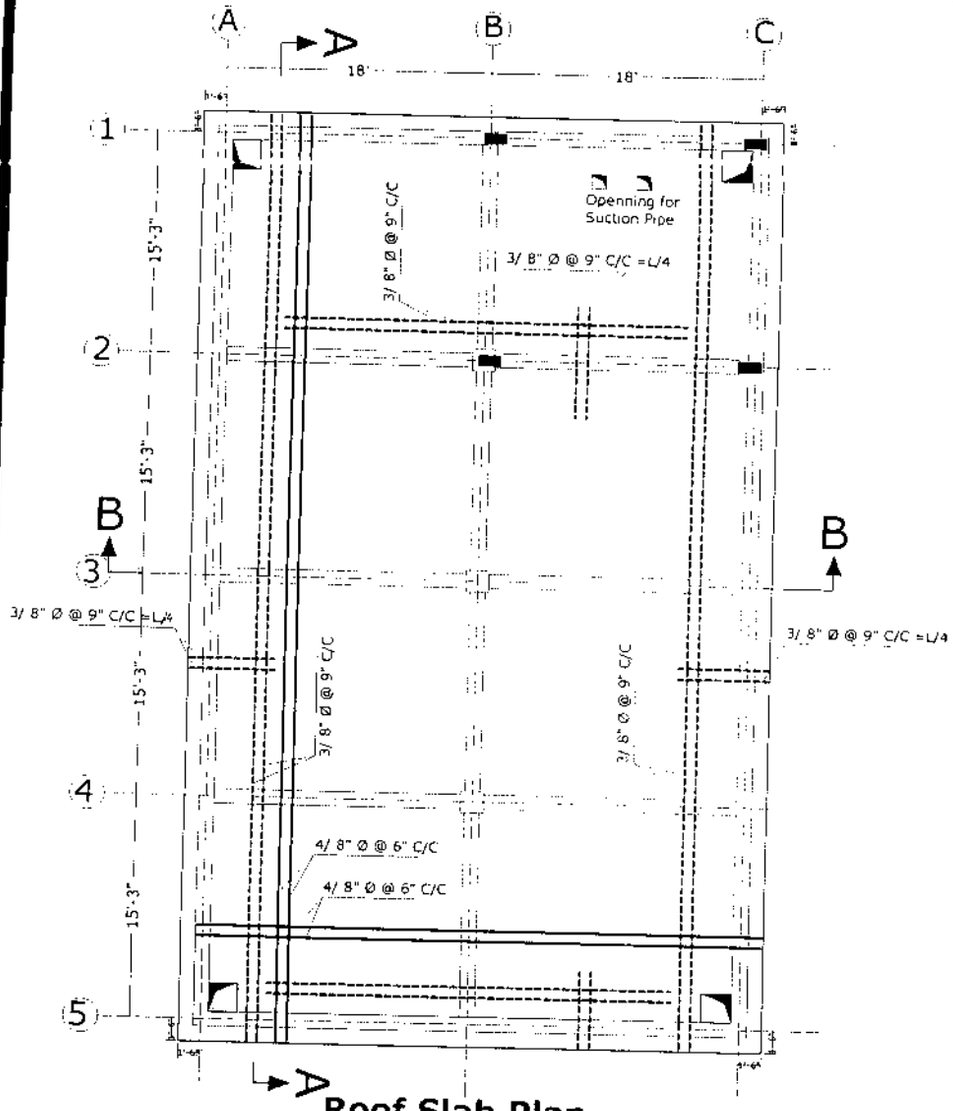
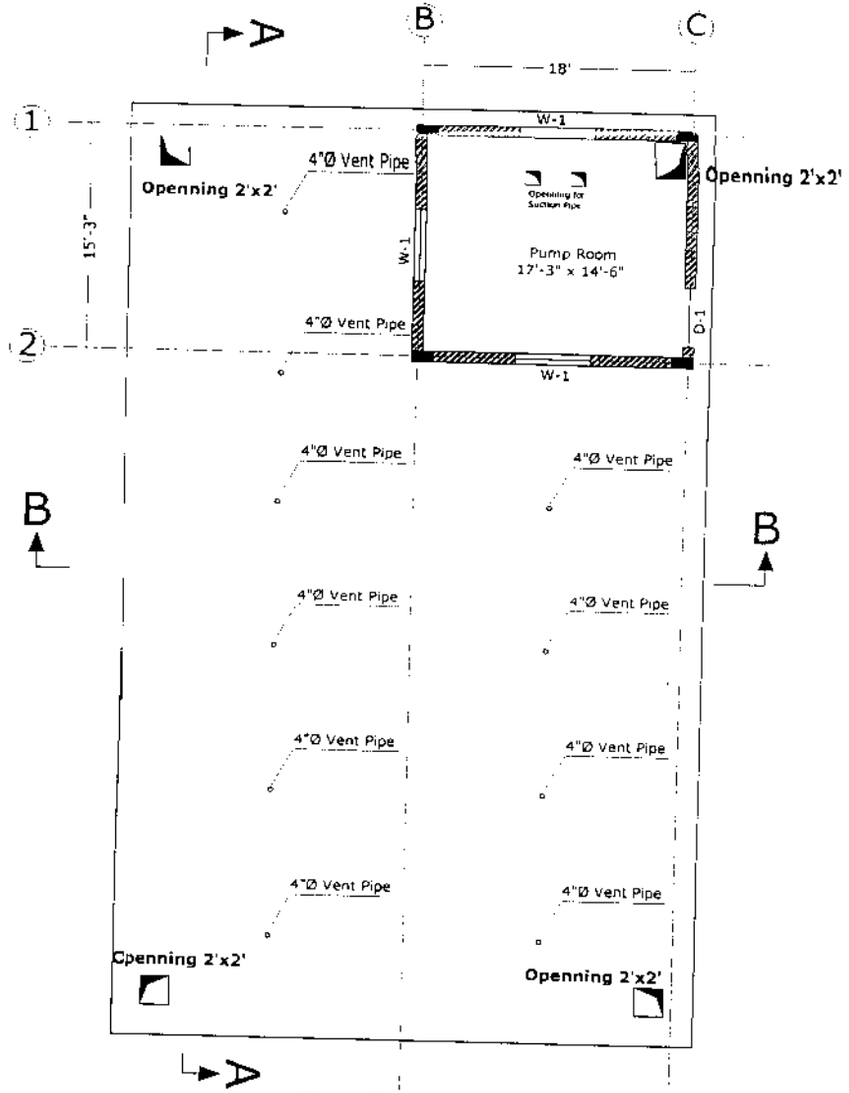


Roof Slab Plan



Roof Top Plan

DWG# RCC/UGWT/04
DATE: 01-11-2014
REV# 00

NAVEED/D/RCC CONSULTANTS/UGWT

ROOF SLAB PLAN OF 1.00 LAC UNDER GROUND CLEAR WATER TANK AND PUMP HOUSE

Z.A BHUTTO CAMPUS, MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY KHAIRPUR MIR'S.

RCC Consultants

Drinking Water Rapid / Slow Sand Filtration Plants, Waste Water Treatment, Solid Waste Management Water Supply, Sewerage System, Civil, Electrical, Mechanical & Architectural Works, City Master Plans, GIS, Environmental Consultants

A-9 Green Homes, Phase-I, Gulshan-e-Hadeed, Hyderabad.
Phone No 022-2652957 Fax No 022-2655833
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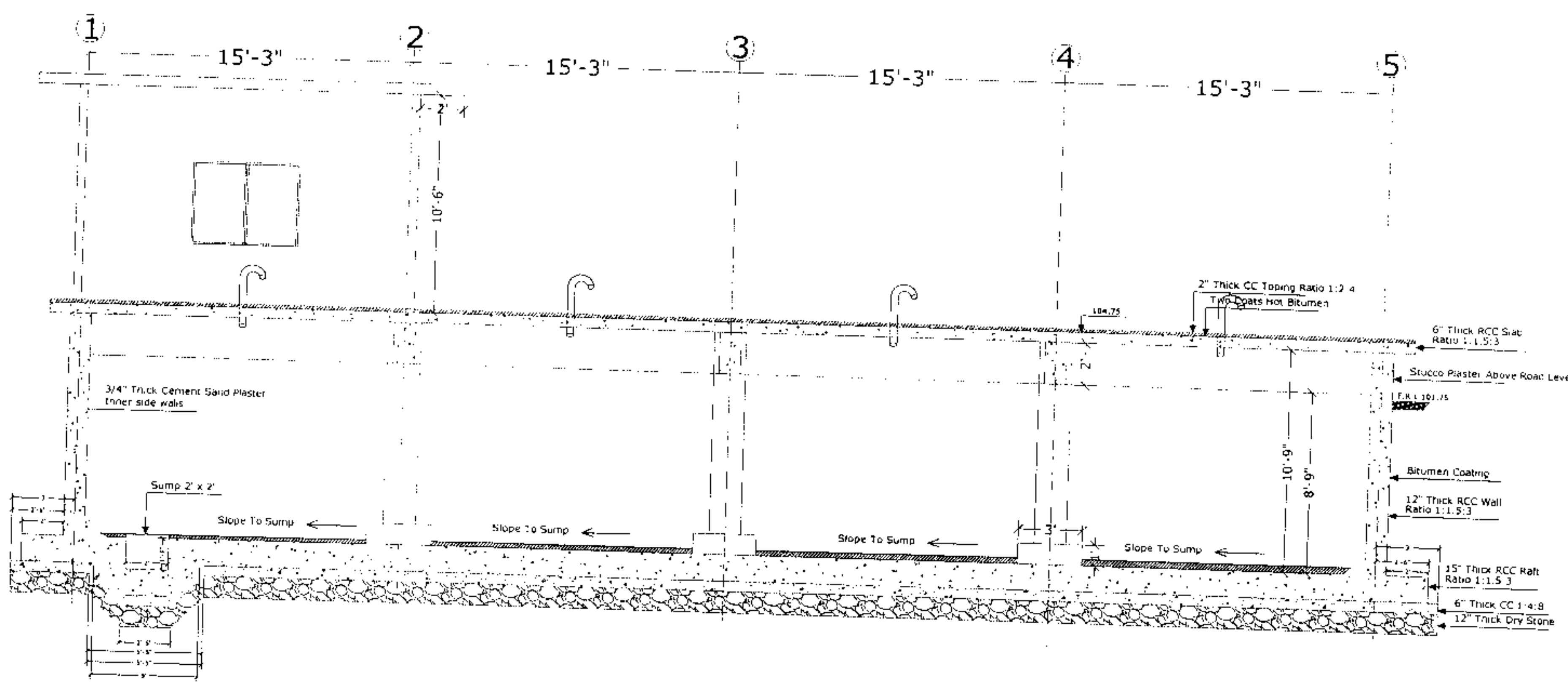

SECTION A-A

DWG# RCC/UGWT/05
DATE: 01-11-2014
REV# 00

NAVEED/D/RCC CONSULTANTS/UGWT

SECTION A-A OF UNDER GROUND WATER TANK

Z.A BHUTTO CAMPUS, MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY KHAIRPUR MIR'S.

RCC Consultants

Drinking Water Rapid / Slow Sand Filtration Plants, Waste Water Treatment, Solid Waste Management Water Supply, Sewerage System, Civil, Electrical, Mechanical & Architectural Works, City Master Plans, GIS, Environmental Consultants

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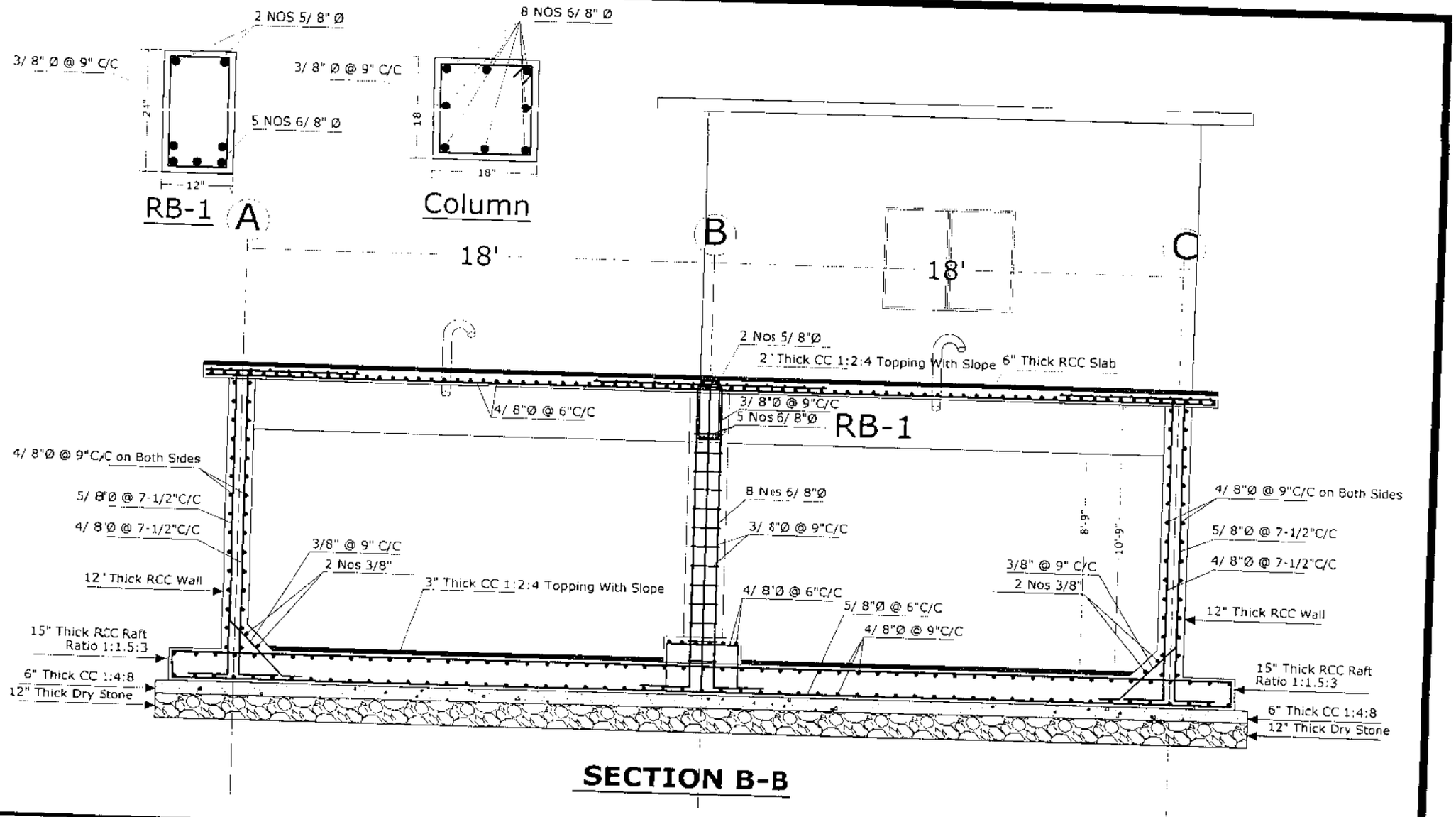

SECTION B-B

DWG# RCC/UGWT/06
DATE: 01-11-2014
REV# 00

NAVEED/D/RCC CONSULTANTS/UGWT

DETAIL SECTION B-B OF UNDER GROUND WATER TANK

Z.A BHUTTO CAMPUS, MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY KHAIRPUR MIR'S.

RCC Consultants
Drinking Water Rapid / Slow Sand Filtration Plants, Waste Water Treatment, Solid Waste Management Water Supply, Sewerage System, Civil, Electrical, Mechanical & Architectural Works, City Master Plans, GIS, Environmental Consultants
A-6 Green Homes Phase-I Qasimabad Hyderabad.
Phone No 022-2652957 Fax No 022-2653833
E-mail: rccconsultants@rccpdc.com
www.rccpdc.com

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MEHRAN UNIVERSITY OF ENGINEERING & TECHNOOGY Z.A BHUTTO CAMPUS KHAIRPUR

TENDER DOCUMENTS

NAME OF WORK

PROVIDING, LAYING, JOINTING & TESTING WATER SUPPLY DISTRIBUTION NETWORK FOR Z.A BHUTTO CAMPUS AT MUET KHAIRPUR

JUNE- 2015

Client:
MEHRAN UNIVERSITY OF ENGINEERING & TECHNOOGY Z.A BHUTTO CAMPUS KHAIRPUR

Consultants:

RCC Consultants
GROUD FLOOR RCC COMPLEX MAIN,
QASIMABAD HYDERABAD
TEL: 0-22-2652957 , 2650709
MOB-0323-2608043
RCC.CONSULTANTS@RCCGOC.COM
WWW.RCCGOC.COM

INSTRUCTIONS TO PROCURING AGENCIES

INSTRUCTIONS TO PROCURING AGENCIES
(Not to be included in Bidding Documents)

A. Basis of Documents

These Documents have been prepared as a global document intended to be used by different agencies/users according to their requirements. This document is envisaged for National Competitive Bidding (NCB), meant for use for Works costing not more than Rs. 25 Million. These documents may be tailored according to the scope of works as well as in case of contracts on International Competitive Bidding (ICB) basis, funded by international financial institutions/donors, with payments in foreign currencies. Procuring agencies are then to tailor the relevant clauses to suit their requirements including appropriate modifications in the relevant sections of the documents in the light of SPPRA Bidding Documents for Large Works.

The Procuring Agency is expected to manage the Contract itself. The role of Engineer may be added by the Procuring Agency, if the Procuring Agency wishes to engage a consultant. The role of the Engineer with specific delegated powers under various clauses of Instructions to Bidders such as clarifications of Bid Documents, Amendment of Bid Documents, evaluation of Bids etc. and to administer the Contract under various clauses of Conditions of Contract should have been specified. The Procuring Agency will be required to set out in the specifications and drawings the full scope of work including the extent of design to be done by the Contractor, if any.

B. Contents of Documents

As stated in Clause IB.4 of Instructions to Bidders, the complete Bidding Documents in addition to Invitation for Bids shall comprise items listed therein including any addendum to Bidding Documents issued in accordance with IB.6. The Standard Form of Bidding Documents (for Small Contracts) includes the following:

1. Instructions to Bidders & Bidding Data
2. Form of Bid & Schedules to Bid
3. Conditions of Contract & Contract Data
4. Standard Forms
5. Specifications
6. Drawings, if any

In addition, Instructions to procuring agencies are also provided at various locations of this document within parenthesis or as a Note(s). Procuring agencies are expected to edit or finalise this document accordingly, by filling in all the relevant blank spaces and forms as per the scope of the work, deleting all notes and instructions intended to help the bidders.

The procuring agency is required to prepare the following for completion of the Bidding Documents:

(i) Invitation for Bids

(ii) Bidding Data
(iii) Schedules to Bid (Samples)
(iv) Schedule of Prices (Format)
(v) Contract Data
(vi) Specifications
(vii) Drawings, if any

The Procuring agency's attention is drawn to the following while finalizing the Bidding Documents.

C. Notice Inviting Tender/ Invitation for Bids/ Request for Expression of Interest

The "Notice Inviting Tender" is meant for publication of tenders for calling bids in the newspapers and SPPRA Website.

The blank spaces wherever shown are required to be filled by the Procuring Agency before issuance of Bidding Documents.

The Procuring Agency may modify para 1 of Notice Inviting Tender as per its requirements. The notice should be published so as to give the interested bidders sufficient working period for preparation and submission of bids – not less than 15 days for National Competitive Bidding and 45 days for International Competitive Bidding (SPP Rule 18).

1. The eligible bidders are defined in IB.2; the text can be amended by the Procuring Agency as deemed appropriate.

2. The non-refundable fee for the sale of Bidding Documents should be nominal so as to cover printing/reproduction and mailing costs and to ensure that only bona-fide bidders shall apply (SPP Rule 20).

3. The amount of Bid Security should be a lump sum figure or a percentage, but not less than 1% and more than 5% of bid price and should be in accordance with IB.13.1 (SPP Rule 37).

4. If the venue of receipt of bids and the opening of bids is the same, the times for receipt and opening of bids are to be entered in last Para of the Notice Inviting Tender, otherwise indicate the name, address and exact location for the opening of bids. However the date for the receipt and the opening of bids shall be same (SPP Rule 41).

D. Instructions to Bidders

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

The Instructions to Bidders can be used as given. Procuring agency may have to make changes under Bidding Data.

The Procuring Agency's or Engineer's Representative, if any, shall exercise powers of the Engineer/Procuring Agency under and in connection with Clauses IB.5, IB.6, IB.16, etc. In

case an Engineer has been appointed by the Procuring Agency, the aforesaid clauses may be modified accordingly to specify the role of the Engineer by the Procuring Agency, otherwise the Engineer's reference wherever exist, except Sub-Clause 1.1.20 & Clause 15 of Conditions of Contract and Item 1.1.20 of Contract Data, shall be deleted.

E. Bidding Data

The blank spaces wherever shown in Bidding Data are required to be filled by the Engineer/Procuring Agency before issuance of Bidding Documents.

1. Contents of IB.10.3 may be retained or modified by the Procuring Agency.
2. Procuring Agency should insert required experience in IB.11.2.
3. Referring to IB.14.1, the period of bid validity may range from 30 to 90 days depending upon the size and nature of the works. Number of days shall be filled in as per Procuring Agency's requirements.
4. Contents of IB.16.3 to IB.16.8 may be retained or modified by the Procuring Agency in accordance with its requirements.

F. Schedules to Bid

Specimen of Schedules to Bid including format of Schedule of Prices are provided in this document. The Procuring Agency may add/delete/modify as per its requirement.

The blank spaces wherever shown are required to be filled by the Engineer/Procuring Agency before issuance of Bidding Documents except those required to be provided by the Contractor.

G. Conditions of Contract

The procuring agency while preparing Contract Data, shall ensure that no Clause of Conditions of Contract is deleted and that the changes included in Contract Data shall be such as not to change the spirit of the document. Any adjustment or change in clauses of Conditions of Contract to meet specific project features shall be made with care and incorporated in Contract Data.

H. Contract Data

The blank spaces wherever shown are required to be filled by the Engineer/Procuring Agency before issuance of Bidding Documents.

1. Referring to Sub-Clause 1.1.1 of Conditions of Contract, the Engineer/Procuring Agency may add, in order of priority, such other documents as to form part of the Contract, in Sub-Clause 1.3 of the Contract Data.

2. The Procuring Agency's Representative, if any, shall exercise powers of the Procuring Agency under and in connection with Sub-Clauses 1.3, 2.3, 4.2, 4.3, 5.1, 7.3, 8.2, 9.1, 9.2, 10.1, 10.2. 10.5, 11.1, 11.5, 12.1, 13.2 and 14.1 of the Conditions of Contract. In case an Engineer has been appointed by the Procuring Agency, the aforesaid clauses may be modified accordingly by the Procuring Agency.

3. The sum insured for different insurances including minimum amount of third party insurance should be assessed by the Engineer/Procuring Agency and entered in Contract Data. Such insurance cover shall be carried out with Insurance Company having at least AA rating from PACRA / JCR in the favour of the procuring agency.

4. The time for completion of the whole of the works should be assessed by the Engineer/Procuring Agency and entered in the Contract Data.

5. The Conditions of Contract contain no overall limit on the Contractor's liability. The amount of **liquidated damages** per day of delay shall be entered by the Engineer/Procuring Agency in Contract Data. Usually the liquidated damages are set between **0.05 percent and 0.10 percent per day and the maximum limit as 10 percent of contract price stated in the Letter of Acceptance.**

6. Any amendment and/or additions to the Conditions of the Contract that are specific to a given Bid/Contract should be included by the Procuring agency. This may include but not be limited to the provisions regarding the following:

   a) Terms of Payment should be prepared and incorporated in Contract Data by the Engineer/Procuring Agency.

   b) The Engineer/Procuring Agency to make sure that all taxes and duties are included by the Bidders/Contractors in their prices.

I. Specifications

To be prepared and incorporated by the Engineer/Procuring Agency

J. Drawings

To be prepared and incorporated by the Engineer/Procuring Agency, if required.

Summary of Contents

INVITATION FOR BIDS

INVITATION FOR BIDS

Bid Reference No.: PD/MUET/KHP/145 dated:05.06.2015

1. The Procuring Agency, **Mehran University of Engineering & Technology Khairpur Mirs** invites sealed Percentage/Item Rate Tenders from contractor/firm registered in Pakistan Engineering Council in category C-6 and above for the work, **Providing, Laying, Jointing & Testing Water Supply Distribution Network for Z.A Bhutto Campus at Mehran University of Engineering & Technology Khairpur Mirs,** which will be completed in (03) three months.

2. A complete set of Bidding Documents may be purchased by an interested eligible bidder on submission of a written application to the office given below and upon payment of a non-refundable fee of Rupees 3000/- Bidders may acquire the Bidding Documents from the Office of the Procuring Agency, at **Mehran University of Engineering & Technology Khairpur Mirs**

3. All bids must be accompanied by a Bid Security/Earnest Money in the amount of two percentage (2%) of bid price in the form of *pay order / demand draft* and must be delivered to office and in favor of **Mehran University of Engineering & Technology Khairpur Mirs** on or before 12:00 noon, on date 26.06.2015 Bids will be opened at 12:30 pm on the same day in the presence of bidder's representatives who choose to attend, at the same address. Any bid with conditional or un-accompanied of the earnest money will not be considered in the bidding process.

INSTRUCTIONS
TO BIDDERS
&
BIDDING DATA

Notes on the Instructions to Bidders

This section of the bidding documents should provide the information necessary for bidders to prepare responsive bids, in accordance with the requirements of the Procuring Agency. It should also give information on bid submission, opening and evaluation, and on the award of contract.

Matters governing the performance of the Contract or payments under the Contract, or matters affecting the risks, rights, and obligations of the parties under the Contract are not normally included in this Section, but rather in the appropriate sections of the *Conditions of Contract* and/or *Contract Data.*

TABLE OF CONTENTS

INSTRUCTIONS TO BIDDERS

INSTRUCTIONS TO BIDDERS

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

A. GENERAL

IB.1 Scope of Bid & Source of Funds

1.1 Scope of Bid

The Procuring Agency as defined in the Bidding Data (hereinafter called "the Procuring Agency") wishes to receive Bids for the Works summarized in the Bidding Data (hereinafter referred to as "the Works").

Bidders must quote for the complete scope of work. Any Bid covering partial scope of work will be rejected as non-responsive.

1.2 Source of Funds

The Procuring Agency has arranged funds from its own sources or *Federal/ Provincial /Donor agency or any other source,* which may be indicated accordingly in bidding data towards the cost of the project/scheme.

IB.2 Eligible Bidders

2.1 Bidding is open to all firms and persons meeting the following requirements:

a) duly licensed by the Pakistan Engineering Council (PEC) in the appropriate category for value of works.

Provided that the works costing Rs. 2.5 million or less shall not require any registration with PEC .

b) duly pre-qualified with the Procuring Agency. (*Where required*).

In the event that prequalification of potential bidders has been undertaken, only bids from prequalified bidders will be considered for award of Contract.

c) if prequalification has not undertaken , the procuring agency may ask information and documents not limited to following:-
   (i) company profile;
   (ii) works of similar nature and size for each performed in last *3/5* years;
   (iii) construction equipments;
   (iv) qualification and experience of technical personnel and key site management;

(v) financial statement of last 3 years;
(vi) information regarding litigations and abandoned works if any.

IB.3 Cost of Bidding

3.1 The bidder shall bear all costs associated with the preparation and submission of its bid and the Procuring Agency will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process (SPP Rules 24 & 25).

B. BIDDING DOCUMENTS

IB.4 Contents of Bidding Documents

4.1 In addition to Invitation for Bids, the Bidding Documents are those stated below, and should be read in conjunction with any Addendum issued in accordance with Sub-Clause IB.6.1.

1. Instructions to Bidders & Bidding Data
2. Form of Bid, Qualification Information & Schedules to Bid
   Schedules to Bid comprise the following:
   (i) Schedule A: Schedule of Prices/ Bill of Quantities (BoQ).
   (ii) Schedule B: Specific Works Data
   (iii) Schedule C: Works to be Performed by Subcontractors
   (iv) Schedule D: Proposed Programme of Works
   (v) Schedule E: Method of Performing Works
   (vi) Schedule F: Integrity Pact (works costing Rs 10 million and above)
3. Conditions of Contract & Contract Data
4. Standard Forms:
   (i) Form of Bid Security,
   (ii) Form of Performance Security;
   (iii)Form of Contract Agreement;
   (iv) Form of Bank Guarantee for Advance Payment.
5. Specifications
6. Drawings, if any

IB.5 Clarification of Bidding Documents

5.1 A prospective bidder requiring any clarification(s) in respect of the Bidding Documents may notify the Engineer/Procuring Agency at the Engineer's/ Procuring Agency's address indicated in the Bidding Data.

5.2 An interested bidder, who has obtained bidding documents, may request for clarification

of contents of bidding documents in writing and procuring agency shall respond to such quarries in writing within three calendar days, provided they are received at least five calendar days prior to the date of opening of bid (SPP Rule 23-1).

IB.6 Amendment of Bidding Documents (SPP Rules 22(2) & 22).

6.1 At any time prior to the deadline for submission of Bids, the Procuring Agency may, for any reason, whether at his own initiative or in response to a clarification requested by a interested bidder, modify the Bidding Documents by issuing addendum.

6.2 Any addendum thus issued shall be part of the Bidding Documents pursuant to Sub-Clause 6.1 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 Procuring Agency.

6.3 To afford interested bidders reasonable time in which to take an addendum into account in preparing their Bids, the Procuring Agency may at its discretion extend the deadline for submission of Bids.

C. PREPARATION OF BIDS

IB.7 Language of Bid

7.1 All documents relating to the Bid shall be in the language specified in the Contract Data.

IB.8 Documents Comprising the Bid

8.1 The Bid submitted by the bidder shall comprise the following:

(a) Offer /Covering Letter
(b) Form of Bid duly filled, signed and sealed, in accordance with IB.14.3.
(c) Schedules (A to F) to Bid duly filled and initialed, in accordance with the instructions contained therein & in accordance with IB.14.3.
(d) Bid Security furnished in accordance with IB.13.
(e) Power of Attorney in accordance with IB 14.5.
(f) Documentary evidence in accordance with IB.2(c) & IB.11
(g) Documentary evidence in accordance with IB.12.

IB.9 Sufficiency of Bid

9.1 Each bidder shall satisfy himself before Bidding as to the correctness and sufficiency of his Bid and of the premium on the rates of CSR / rates and prices quoted/entered in the Schedule of Prices, which rates and prices shall except in so far as it is otherwise expressly provided in the Contract, cover all his obligations under the Contract and all matters and things necessary for the proper completion of the works.

9.2 The bidder is advised to obtain for himself at his own cost and responsibility all information that may be necessary for preparing the bid and entering into a Contract for execution of the Works.

IB.10 Bid Prices, Currency of Bid and Payment

10.1 The bidder shall fill up the Schedule of Prices (Schedule A to Bid) indicating the percentage above or below the Composite Schedule of Rates/unit rates and prices of the Works to be performed under the Contract. Prices in the Schedule of Prices/Bill of Quantities shall be quoted entirely in Pak Rupees keeping in view the instructions contained in the Preamble to Schedule of Prices.

10.2 Unless otherwise stipulated in the Conditions of Contract, prices quoted by the bidder shall remain fixed during the bidder's performance of the Contract and not subject to variation on any account.

10.3 The unit rates and prices in the Schedule of Prices or percentage above or below on the composite schedule of rates shall be quoted by the bidder in the currency as stipulated in Bidding Data.

10.4 Items for which no rate or price is entered by the Bidder will not be paid for by the Procuring Agency when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities.

IB.11 Documents Establishing Bidder's Eligibility and Qualifications

11.1 Pursuant to Clause IB.8, the bidder shall furnish, as part of its bid, documents establishing the bidder's eligibility to bid and its qualifications to perform the Contract if its bid is accepted.

11.2 Bidder must possess and provide evidence of its capability and the experience as stipulated in Bidding Data and the Qualification Criteria mentioned in the Bidding Documents.

IB.12 Documents Establishing Works' Conformity to Bidding Documents

12.1 The documentary evidence of the Works' conformity to the Bidding Documents may be in the form of literature, drawings and data and the bidder shall furnish documentation as set out in Bidding Data.

12.2 The bidder shall note that standards for workmanship, material and equipment, and references to brand names or catalogue numbers, if any, designated by the Procuring Agency in the Technical Provisions are intended to be descriptive only and not restrictive.

IB.13 Bid Security

13.1 Each bidder shall furnish, as part of his bid, at the option of the bidder, a Bid Security as percentage of bid price/estimated cost or in the amount stipulated in Bidding Data in Pak. Rupees in the form of *Deposit at Call/ Payee's Order or a Bank Guarantee* issued by a Scheduled Bank in Pakistan in favour of the Procuring Agency valid for a period up to twenty eight (28) days beyond the bid validity date (*Bid security should not be below 1%.and not exceeding 5% of bid price/estimated cost SPP Rule 37*).

13.2 Any bid not accompanied by an acceptable Bid Security shall be rejected by the Procuring Agency as non-responsive.

13.3 The bid securities of unsuccessful bidders will be returned upon award of contract to the successful bidder or on the expiry of validity of Bid Security whichever is earlier.

13.4 The Bid Security of the successful bidder will be returned when the bidder has furnished the required Performance Security, and signed the Contract Agreement (SPP Rule 37).

13.5 The Bid Security may be forfeited:

(a) if a bidder withdraws his bid during the period of bid validity; or
(b) if a bidder does not accept the correction of his Bid Price, pursuant to Sub-Clause 16.4 (b) hereof; or
(c) in the case of a successful bidder, if he fails within the specified time limit to:

(i) furnish the required Performance Security or
(ii) sign the Contract Agreement.

IB.14 Validity of Bids, Format, Signing and Submission of Bid

14.1 Bids shall remain valid for the period stipulated in the Bidding Data after the date of bid opening.

14.2 In exceptional circumstances, Procuring Agency may request the bidders to extend the period of validity for a additional period but not exceeding 1/3 of the original period.The request and the bidders' responses shall be made in writing or by cable. A Bidder may refuse the request without forfeiting the Bid Security. A Bidder agreeing to the request will not be required or permitted to otherwise modify the Bid, but will be required to extend the validity of Bid Security for the period of the extension, and in compliance with IB.13 in all respects (SPP Rule 38).

14.3 All Schedules to Bid are to be properly completed and signed.

14.4 No alteration is to be made in the Form of Bid except in filling up the blanks as directed. If any alteration be made or if these instructions be not fully complied with, the bid may be rejected.

14.5 Each bidder shall prepare Original and number of copies specified in the Bidding Data of the documents comprising the bid as described in IB.8 and clearly mark them "ORIGINAL" and "COPY" as appropriate. In the event of discrepancy between them, the original shall prevail.

14.6 The original and all copies of the bid shall be typed or written in indelible ink and shall be signed by a person or persons duly authorized to sign (in the case of copies, Photostats are also acceptable). This shall be indicated by submitting a written Power of Attorney authorising the signatory of the bidder to act for and on behalf of the bidder. All pages of the bid shall be initialed and official seal be affixed by the person or persons signing the bid.

14.7 The Bid shall be delivered in person or sent by registered mail at the address to Procuring Agency as given in Bidding Data.

D. SUBMISSION OF BID

IB.15 Deadline for Submission, Modification & Withdrawal of Bids

15.1 Bids must be received by the Procuring Agency at the address/provided in Bidding Data not later than the time and date stipulated therein.

15.2 The inner and outer envelopes shall

(a) be addressed to the Procuring Agency at the address provided in the Bidding Data;
(b) bear the name and identification number of the Contract as defined in the Bidding and Contract Data; and
(c) provide a warning not to open before the specified time and date for Bid opening as defined in the Bidding Data.
(d) in addition to the identification required in 15.2, the inner envelopes shall indicate the name and address of the Bidder to enable the Bid to be returned unopened in case it is declared late.
(e) If the outer envelope is not sealed and marked as above, the Procuring Agency will assume no responsibility for the misplacement or premature opening of the Bid.

15.3 Bids submitted through telegraph, telex, fax or e-mail shall not be considered.

15.4 Any bid received by the Procuring Agency after the deadline for submission prescribed in Bidding Data will be returned unopened to such bidder.

15.5 Any bidder may modify or withdraw his bid after bid submission provided that the modification or written notice of withdrawal is received by the Procuring Agency prior to the deadline for submission of bids.

15.6 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 pursuant to IB.13.5 (a).

E. BID OPENING AND EVALUATION

IB.16 Bid Opening, Clarification and Evaluation (SPP Rules 41, 42 & 43)

16.1 The Procuring Agency will open the bids, in the presence of bidders' representatives who choose to attend, at the time, date and in the place specified in the Bidding Data.

16.2 The bidder's name, Bid Prices, any discount, the presence or absence of Bid Security, and such other details as the Procuring Agency at its discretion may consider appropriate, will be announced by the Procuring Agency at the bid opening. The Procuring Agency will record the minutes of the bid opening. Representatives of the bidders who choose to attend shall sign the attendance sheet.

Any Bid Price or discount which is not read out and recorded at bid opening will not be taken into account in the evaluation of bid.

16.3 To assist in the examination, evaluation and comparison of Bids the Engineer/Procuring Agency may, at its discretion, ask the bidder for a clarification of its Bid. The request for clarification and the response shall be in writing and no change in the price or substance of the Bid shall be sought, offered or permitted (SPP Rule 43).

16.4 (a) Prior to the detailed evaluation, pursuant to IB.16.7 to 16.9, the Engineer/Procuring Agency will determine the substantial responsiveness of each bid to the Bidding Documents. For purpose of these instructions, a substantially responsive bid is one which conforms to all the terms and conditions of the Bidding Documents without material deviations. It will include determining the requirements listed in Bidding Data.

(b) Arithmetical errors will be rectified on the following basis:

If there is a discrepancy between the unit price and total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected. If there is a discrepancy between the words and figures the amount in words shall prevail. If there is a discrepancy between the Total Bid price entered in Form of Bid and the total shown in Schedule of Prices-Summary, the amount stated in the Form of Bid will be corrected by the Procuring Agency in accordance with the Corrected Schedule of Prices.

If the bidder does not accept the corrected amount of Bid, his Bid will be rejected and his Bid Security forfeited.

16.5 A Bid determined as substantially non-responsive will be rejected and will not subsequently be made responsive by the bidder by correction of the non-conformity.

16.6 Any minor informality or non-conformity or irregularity in a Bid which does not constitute a material deviation **(major deviation)** may be waived by Procuring Agency,

provided such waiver does not prejudice or affect the relative ranking of any other bidders.

(A). Major (material) Deviations include:-

(i) has been not properly signed;
(ii) is not accompanied by the bid security of required amount and manner;
(iii) stipulating price adjustment when fixed price bids were called for;
(iv) failing to respond to specifications;
(v) failing to comply with Mile-stones/Critical dates provided in Bidding Documents;
(vi) sub-contracting contrary to the Conditions of Contract specified in Bidding Documents;
(vii) refusing to bear important responsibilities and liabilities allocated in the Bidding Documents, such as performance guarantees and insurance coverage;
(viii) taking exception to critical provisions such as applicable law, taxes and duties and dispute resolution procedures;
(ix) a material deviation or reservation is one :
  (a) which affect in any substantial way the scope, quality or performance of the works;
  (b) adoption/rectification whereof would affect unfairly the competitive position of other bidders presenting substantially responsive bids.

(B) Minor Deviations

Bids that offer deviations acceptable to the Procuring Agency and which can be assigned a monetary value may be considered substantially responsive at least as to the issue of fairness. This value would however be added as an adjustment for evaluation purposes only during the detailed evaluation process.

16.7 The Engineer/Procuring Agency will evaluate and compare only the bids previously determined to be substantially responsive pursuant to IB.16.4 to 16.6 as per requirements given hereunder. Bids will be evaluated for complete scope of works. The prices will be compared on the basis of the Evaluated Bid Price pursuant to IB.16.8 herein below.

Technical Evaluation: It will be examined in detail whether the works offered by the bidder complies with the Technical Provisions of the Bidding Documents. For this purpose, the bidder's data submitted with the bid in Schedule B to Bid will be compared with technical features/criteria of the works detailed in the Technical Provisions. Other technical information submitted with the bid regarding the Scope of Work will also be reviewed.

16.8 Evaluated Bid Price

In evaluating the bids, the Engineer/Procuring Agency will determine for each bid in addition to the Bid Price, the following factors (adjustments) in the manner and to the extent indicated below to determine the Evaluated Bid Price:

(i) making any correction for arithmetic errors pursuant to IB.16.4 hereof.

(ii) discount, if any, offered by the bidders as also read out and recorded at the time of bid opening.

(iii) excluding **provisional sums** and the provisions for **contingencies** in the Bill of Quantities **if any**, but including **Day work,** where priced competitively.

IB.17 Process to be Confidential

17.1 Subject to IB.16.3 heretofore, no bidder shall contact Engineer/Procuring Agency on any matter relating to its Bid from the time of the Bid opening to the time the bid evaluation result is announced by the Procuring Agency. The evaluation result shall be announced at least seven (07) days prior to award of Contract (SPP Rule 45). 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.

17.2 Any effort by a bidder to influence Engineer/Procuring Agency in the Bid evaluation, Bid comparison or Contract Award decisions may result in the rejection of his Bid. Whereas any bidder feeling aggrieved, may lodge a written complaint to Complaint Redressal Committee as per terms and conditions mentioned in SPP Rules 31 & 32. However, mere fact of lodging a complaint shall not warrant suspension of procurement process.

17.3 Bidders may be excluded if involved in **"Corrupt and Fraudulent Practices"** means either one or any combination of the practices given below SPP Rule2(q);

(i) **"Coercive Practice"** means any impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence the actions of a party to achieve a wrongful gain or to cause a wrongful loss to another party;

(ii) **"Collusive Practice"** means any arrangement between two or more parties to the procurement process or contract execution, designed to achieve with or without the knowledge of the procuring agency to establish prices at artificial, noncompetitive levels for any wrongful gain;

(iii) **"Corrupt Practice"** means the offering, giving, receiving or soliciting, directly or indirectly, of anything of value to influence the acts of another party for wrongful gain;

(iv) **"Fraudulent Practice"** means any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;

(v) **"Obstructive Practice"** means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in a procurement process, or affect the execution of a contract or deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements before investigators in order to materially impede an investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation, or acts intended to materially impede the exercise of inspection and audit rights provided for under the Rules.

F. AWARD OF CONTRACT

IB.18. Post Qualification

18.1 The Procuring Agency, at any stage of the bid evaluation, having credible reasons for or *prima facie* evidence of any defect in contractor's capacities, may require the 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.

18.2 The determination will take into account the bidder's financial and technical capabilities. It will be based upon an examination of the documentary evidence of the bidders' qualifications submitted under B.11, as well as such other information required in the Bidding Documents.

IB.19 Award Criteria & Procuring Agency's Right

19.1 Subject to IB.19.2, the Procuring Agency 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 qualified to satisfactory perform the Contract in accordance with the provisions of the IB.18.

19.2 Not withstanding IB.19.1, the Procuring Agency 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 to inform the affected bidders of the grounds for the Procuring Agency's action except that the grounds for its rejection of all bids shall upon request be communicated, to any bidder who submitted a bid, without justification of the grounds. Notice of the rejection of all the bids shall be given promptly to all the bidders (SPP Rule 25).

IB.20 Notification of Award & Signing of Contract Agreement

20.1 Prior to expiration of the period of bid validity prescribed by the Procuring Agency, the Procuring Agency will notify the successful bidder in writing ("Letter of Acceptance") that his bid has been accepted (SPP Rule 49).

20.2 Within seven (07) days from the date of furnishing of acceptable Performance Security under the Conditions of Contract, the Procuring Agency will send the successful bidder the Form of Contract Agreement provided in the Bidding Documents, incorporating all agreements between the parties.

20.3 The formal Agreement between the Procuring Agency and the successful bidder duly stamped at rate of ----% of bid price(updated from time to time) stated in Letter of Acceptance shall be executed within seven (07) days of the receipt of Form of Contract Agreement by the successful bidder from the Procuring Agency.

IB.21 Performance Security

21.1 The successful bidder shall furnish to the Procuring Agency a Performance Security in the form and the amount stipulated in the Conditions of Contract within a period of fourteen (14) days after the receipt of Letter of Acceptance (SPP 39).

21.2 Failure of the successful bidder to comply with the requirements of Sub-Clauses IB.20.2 & 20.3 or 21.1 or Clause IB.22 shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Security.

21.3 Publication of Award of Contract: within seven days of the award of contract, the procuring shall publish on the website of the authority and on its own website, if such a website exists, the results of the bidding process, identifying the bid through procurement identifying Number if any and the following information:

(1) Evaluation Report;

(2) Form of Contract and letter of Award;

(3) Bill of Quantities or Schedule of Requirements. (SPP Rule 50)

IB.22 Integrity Pact The Bidder shall sign and stamp the Form of Integrity Pact provided at Schedule-F to Bid in the Bidding Document for all Sindh Government procurement contracts exceeding Rupees ten (10) million. Failure to provide such Integrity Pact shall make the bid non-responsive (SPP Rule 89).

BIDDING DATA

The following specific data for the works to be tendered 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 Procuring Agency: Mehran University of Engineering & Technology Khairpur Mirs**

Brief Description of Works: This work consists of **Providing, Laying, Jointing & Testing Sewerage Cum Storm Water Lines Including Rcc Manhole Covers in (Phase-I) for Z.A Bhutto Campus at Mehran University of Engineering & Technology Khairpur Mirs,**

5.1 (a) Procuring Agency's address: Mehran University of Engineering & Technology Khairpur Mirs,

(b) Engineer's address:

RCC Consultants
Ground Floor RCC Complex Main
Road, Qasimabad Hyderabad
Phones No 022-2652957,
Fax no 022-2655833
E-mail: rcc.consultants@rccgoc.com

10.3 Bid shall be quoted entirely in Pak. Rupees. The payment shall be made in Pak. Rupees.

11.2 The bidder has the financial, technical and constructional capability necessary to perform the Contract as follows:
i. Financial capacity: (must have annual average turnover of Rs 10 Million of last 05 years);
ii. Technical capacity: Category of registration with PEC C-6 or above

12.1 (a) A detailed description of the Works, essential technical and performance characteristics.

(b) Comp ete set of technical information, description data, literature and drawings as required in accordance with BOQ, Specific Works Data. This will include but not be limited to a sufficient number of drawings, photographs, catalogues, illustrations and such other information as is necessary to illustrate clearly the significant characteristics such as general construction dimensions and other relevant information about the works to be performed.

13.1 Amount of Bid Security/Earnest Money: 2% of total bid amount

14.1 Period of Bid Validity: 90 days

14.4 Number of Copies of the Bid to be submitted: One original only.

14.6 (a) Procuring Agency's Address for the Purpose of Bid Submission:

Project Director Mehran University of Engineering & Technology Khairpur Mir's

15.1 Deadline for Submission of Bids: Time: 12:00 Noon

16.1 Venue, Time, and Date of Bid Opening

Venue: Project Director Mehran University of Engineering & Technology Khairpur Mir's

Time: 12:30 p.m

Date: 26.06.2015

16.4 Responsiveness of Bids

(i) Bid is valid till required period,

(ii) Bid prices are firm during currency of contract/Fixed Price Contract;
(iii) Completion period offered is within specified limits,
(iv) Bidder is eligible to Bid and possesses the requisite experience, capability and qualification.
(v) Bid does not deviate from basic technical requirements and
(vi) Bics are generally in order, etc.

(a) **Fixed Price contract**: In these contracts no escalation will be provided during currency of the contract.

(b) **Price adjustment contract**: In these contracts escalation will be paid only on those items and in the manner as notified by Finance Department, Government of Sindh, after bid opening during currency of the contract. **(NOT APPLICABLE)**

FORM OF BID
(LETTER OF OFFER)

Bid Reference No. _____

_____

_____

(Name of Works)

To:

_____

_____

_____

Gentlemen,

1. Having examined the Bidding Documents including Instructions to Bidders, Bidding Data, Conditions of Contract, Contract Data, Specifications, Drawings, if any, Schedule of Prices and Addenda Nos. _____ for the execution of the above-named works, we, the undersigned, being a company doing business under the name of and address _____ _____ and being duly incorporated under the laws of Pakistan hereby offer to execute and complete such works and remedy any defects therein in conformity with the said Documents including Addenda thereto for the Total Bid Price of Rs_____(Rupees_____) or such other sum as may be ascertained in accordance with the said Documents.

2. We understand that all the Schedules 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 _____ _____ drawn in your favour or made payable to you and valid for a period of twenty eight (28) days beyond the period of validity of Bid.

4. We undertake, if our Bid is accepted, to commence the Works and to deliver and complete the Works comprised in the Contract within the time(s) stated in Contract Data.

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 undertake, if our Bid is accepted, to execute the Performance Security

referred to in Conditions of Contract for the due performance of the Contract.

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

9. We do hereby declare that the Bid is made without any collusion, comparison of figures or arrangement with any other person or persons making a bid for the Works.

Dated this _____day of _____, 20

Signature _____

in the capacity of _____duly authorized to sign bid for and on behalf of _____

(Name of Bidder in Block Capitals)

(Seal)

Address

_____

_____

_____

Witness:

(Signature)_____

Name:_____

Address: _____

_____

[SCHEDULES TO BID INCLUDE THE FOLLOWING:

- Schedule A to Bid: Schedule of Prices
- Schedule B to Bid: Specific Works Data
- Schedule C to Bid: Works to be Performed by Subcontractors
- Schedule D to Bid: Proposed Program of Works
- Schedule E to Bid: Method of Performing Works
- Schedule F to Bid: Integrity Pact]

SCHEDULE – A TO BID

SCHEDULE OF PRICES

** [To be prepared by the Engineer/Procuring Agency]*

PREAMBLE TO SCHEDULE OF PRICES

1. General

1.1 The Schedule of Prices shall be read in conjunction with the Conditions of Contract, Contract Data together with the Specifications and Drawings, if any.

1.2 The Contract shall be for the whole of the works as described in these Bidding Documents. Bids must be for the complete scope of works.

2. Description

2.1 The general directions and descriptions of works and materials are not necessarily repeated nor summarized in the Schedule of Prices. References to the relevant sections of the Bidding Documents shall be made before entering prices against each item in the Schedule of Prices.

3. Units & Abbreviations

3.1 Units of measurement, symbols and abbreviations expressed in the Bidding Documents shall comply with the Systeme Internationale d' Unites (SI Units).

_____

_____

(Note: The abbreviations to be used in the Schedule of Prices to be defined by the Procuring Agency).

4. Rates and Prices

4.1 Except as otherwise expressly provided under the Conditions of Contract, the rates and amounts entered in the Schedule of Prices shall be the rates at which the Contractor shall be paid and shall be the full inclusive value of the works set forth or implied in the Contract; except for the amounts reimbursable, if any to the Contractor under the Contract.

4.2 Unless otherwise stipulated in the Contract Data, the premium, rates and prices entered by the bidder shall not be subject to adjustment during the performance of the Contract.

4.3 All duties, taxes and other levies payable by the Contractor shall be included in the rates and prices.

4.4 The whole cost of complying with the provisions of the Contract shall be included in the items provided in the Schedule of Prices, 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 and no separate payment will be made for those items.

The rates, prices and amounts shall be entered against each item in the Schedule of Prices. Any item against which no rate or price is entered by the bidder will not be paid for by the Procuring Agency when executed and shall be deemed covered by the rates and prices for other items in the Schedule of Prices.

4.5 (a) The bidder shall be deemed to have obtained all information as to and all requirements related thereto which may affect the bid price.

(b) The Contractor shall be responsible to make complete arrangements for the transportation of the plant to the site. Such cost shall be inbuilt in his quoted rates.

4.6 The Contractor shall provide for all parts of the Works to be completed in every respect. Notwithstanding that any details, accessories, etc. required for the complete installation and satisfactory operation of the Works, are not specifically mentioned in the Specifications, such details shall be considered as included in the Contract Price.

5. Bid Prices

5.1 Break-up of Bid Prices

The various elements of Bid Prices shall be quoted as detailed by the Procuring Agency in the format of Schedule of Prices. The bidder shall recognize such elements of the costs which he expects to incur the performance of the Works and shall include all such costs in the rates and amounts entered in the Schedule of Prices.

5.2 Total Bid Price

The total of bid prices in the Schedule of Prices shall be entered in the Summary of Bid Prices.

6. Provisional Sums and Day work

6.1 Provisional Sums included and so designated in the Schedule of Prices if any, shall be expended in whole or in part at the direction and discretion of the Engineer/Procuring Agency. The Contractor will only receive payment in respect of Provisional Sums, if he has been instructed by the Engineer/Procuring Agency to utilize such sums.

6.2 Day work rates in the contractor's bid are to be used for small additional amounts of work and only when the Engineer have given written instructions in advance for additional work to be paid for in that way.

SCHEDULE OF PRICES – SUMMARY OF BID PRICES (Sample)

Bill No.	Description	Total Amount (Rs)
	(A) Building Work	
1.	Civil works	
2	Internal sanitary and water supply	
3	Electrification	
4	External Development works	
5	Miscellaneous Items	
	(B) Road Work.	
1.	Earthwork	
2.	Hard Crust and Surface Treatment	
3.	Culverts and Bridges	
4.	Miscellaneous Items	
	(C) Public Health Engineering Works.	
1.	Earthwork	
2.	Subsurface Drains	
3.	Pipe Laying and Man holes	
4.	Tube wells, Pump houses	
5.	Compound wall	
6.	Miscellaneous Items	
	Total Bid Price (The amount to be entered in Paragraph 1 of the Form of Bid) (In words).	

NOT APPLICABLE

SCHEDULE OF PRICES

Item No.	Description	Quantity	Unit Rate(Rs)	Total Amount (Rs)
	I. (Civil works)			
1.				
2.				
3.				
	II.Internal sanitary and water supply.			
1.				
2.				
3.				
	III. Electrification.			
1.				
2.				
3.				
	IV. External Development works.			
1.				
2.				
3.				
	V. Miscellaneous Items			
1.				
2.				
3.				
Total (*to be carried to Summary of Bid Price*)				

Add/ Deduct the percentage quoted above/below on the prices of items based on Composite Schedule of Rates.

NOT APPLICABLE

SCHEDULE - B TO BID

*SPECIFIC WORKS DATA

(To be prepared and incorporated by the Procuring Agency)

NOT APPLICABLE

(Note: The Procuring Agency shall spell out the information & data required to be filled out by the bidder and to furnish complementary information).

SCHEDULE – C TO BID

WORKS TO BE PERFORMED BY SUBCONTRACTORS*

The bidder will do the work with his own forces except the work listed below which he intends to sub-contract.

Items of Works to be Sub-Contracted	Name and address of Sub-Contractors	Statement of similar works previously executed. *(attach evidence)*

Note:

* *The Procuring Agency should decide whether to allow subcontracting or not.*

In case Procuring Agency decides to allow subcontracting then following conditions shall be complied with:

1. No change of Sub-Contractors shall be made by the bidder without prior approval of the Procuring Agency.

2. The truthfulness and accuracy of the statement as to the experience of Sub-Contractors is guaranteed by the bidder. The Procuring Agency's judgment shall be final as to the evaluation of the experience of Sub-Contractors submitted by the bidder.

3. Statement of similar works shall include description, location & value of works, year completed and name & address of the clients.

PROPOSED PROGRAMME OF WORKS

Bidder shall provide a programme in a bar-chart or Program Evaluation and Review Technique (PERT) or Critical Path Method (CPM) showing the sequence of work items by which he proposes to complete the works of the entire Contract. The programme should indicate the sequence of work items and the period of time during which he proposes to complete the works including the activities like designing, schedule of submittal of drawings, ordering and procurement of materials, manufacturing, delivering, construction of civil works, erection, testing and commissioning of works to be supplied under the Contract.

SCHEDULE – E TO BID

METHOD OF PERFORMING WORKS

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

- The sequence and methods in which he proposes to carry out the Works, including the number of shifts per day and hours per shift, he expects to work.
- A list of all major items of construction and plant erection, tools and vehicles proposed to be used in delivering/carrying out the works at site.
- The procedure for installation of equipment and transportation of equipment and materials to the site.
- Organisation chart indicating head office & field office personnel involved in management, supervision and engineering of the Works to be done under the Contract.

SCHEDULE – F TO BID

(INTEGRITY PACT)

DECLARATION OF FEES, COMMISSION AND BROKERAGE ETC PAYABLE BY CONTRACTORS
(FOR CONTRACTS WORTH RS. 10.00 MILLION OR MORE)

Contract No._____ Dated _____
Contract Value: _____
Contract Title: _____

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

Without limiting the generality of the foregoing, [name of Contractor] represents and warrants that it has fully declared the brokerage, commission, 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, from Procuring Agency (PA) except that which has been expressly declared pursuant hereto.

[name of Contractor] accepts full responsibility and strict liability 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 PA and has not taken any action or will not take any action to circumvent the above declaration, representation or warranty.

[name of Contractor] 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 PA under any law, contract or other instrument, be voidable at the option of PA.

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

.....
[Procuring Agency]

[Contractor]

CONDITIONS OF CONTRACT

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CONDITIONS OF CONTRACT

CONDITIONS OF CONTRACT

1. GENERAL PROVISIONS

1.1 Definitions

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

The Contract

1.1.1 "Contract" means the Contract Agreement and the other documents listed in the Contract Data.

1.1.2 "Specifications" means the document as listed in the Contract Data, including Procuring Agency's requirements in respect of design to be carried out by the Contractor (if any), and any Variation to such document.

1.1.3 "Drawings" means the Procuring Agency's drawings of the Works as listed in the Contract Data, and any Variation to such drawings.

Persons

1.1.4 "Procuring Agency" means the person named in the Contract Data and the legal successors in title to this person, but not (except with the consent of the Contractor) any assignee.

1.1.5 "Contractor" means the person named in the Contract Data and the legal successors in title to this person, but not (except with the consent of the Procuring Agency) any assignee.

1.1.6 "Party" means either the Procuring Agency or the Contractor.

Dates, Times and Periods

1.1.7 "Commencement Date" means the date fourteen (14) days after the date the Contract comes into effect or any other date named in the Contract Data.

1.1.8 "Day" means a calendar day

1.1.9 "Time for Completion" means the time for completing the Works as stated in the Contract Data (or as extended under Sub-Clause 7.3), calculated from the Commencement Date.

Money and Payments

1.1.10 "Cost" means all expenditure properly incurred (or to be incurred) by the Contractor, whether on or off the Site, including overheads and similar charges but

does not include any allowance for profit.

Other Definitions

1.1.11 "Contractor's Equipment" means all machinery, apparatus and other things required for the execution of the Works but does not include Materials or Plant intended to form part of the Works.

1.1.12 "Country" means the Islamic Republic of Pakistan.

1.1.13 "Procuring Agency's Risks" means those matters listed in Sub-Clause 6.1.

1.1.14 "Force Majeure" means an event or circumstance which makes performance of a Party's obligations illegal or impracticable and which is beyond that Party's reasonable control.

1.1.15 'Materials" means things of all kinds (other than Plant) to be supplied and incorporated in the Works by the Contractor.

1.1.16 "Plant" means the machinery and apparatus intended to form or forming part of the Works.

1.1.17 "Site" means the places provided by the Procuring Agency where the Works are to be executed, and any other places specified in the Contract as forming part of the Site.

1.1.18 "Variation" means a change which is instructed by the Engineer/Procuring Agency under Sub-Clause 10.1.

1.1.19 'Works" means any or all the works whether Supply, Installation, Construction etc. and design (if any) to be performed by the Contractor including temporary works and any variation thereof.

1.1.20 "Engineer" means the person notified by the Procuring Agency to act as Engineer for the purpose of the Contract and named as such in Contract Data.

1.2 **Interpretation**

Words importing persons or parties shall include firms and organisations. Words importing singular or one gender shall include plural or the other gender where the context requires.

1.3 **Priority of Documents**

The documents forming the Contract are to be taken as mutually explanatory of one another. If an ambiguity or discrepancy is found in the documents, the priority of the documents shall be in accordance with the order as listed in the Contract Data.

1.4 **Law**

The law of the Contract is the relevant Law of Islamic Republic of Pakistan.

1.5 **Communications**

All Communications related to the Contract shall be in English language.

1.6 **Statutory Obligations**

The Contractor shall comply with the Laws of Islamic Republic of Pakistan and shall give all notices and pay all fees and other charges in respect of the Works.

2. THE PROCURING AGENCY

2.1 **Provision of Site**

The Procuring Agency shall provide the Site and right of access thereto at the times stated in the Contract Data.
Site Investigation Reports are those that were included in the bidding documents and are factual and interpretative reports about the surface and subsurface conditions at the Site.

2.2 **Permits etc.**

The Procuring Agency shall, if requested by the Contractor, assist him in applying for permits, licences or approvals which are required for the Works.

2.3 **Engineer's/Procuring Agency's Instructions**

The Contractor shall comply with all instructions given by the Procuring Agency or the Engineer, if notified by the Procuring Agency, in respect of the Works including the suspension of all or part of the works.

2.4 **Approvals**

No approval or consent or absence of comment by the Engineer/Procuring Agency shall affect the Contractor's obligations.

3. ENGINEER'S/PROCURING AGENCY'S REPRESENTATIVES

3.1 **Authorised Person**

The Procuring Agency shall appoint a duly authorized person to act for him and on his behalf for the purposes of this Contract. Such authorized person shall be duly identified in the Contract Data or otherwise notified in writing to the Contractor as soon as he is so appointed. In either case the Procuring Agency shall notify the Contractor, in writing, the precise scope of the authority of such authorized person at the time of his appointment.

3.2 **Engineer's/Procuring Agency's Representative**

The name and address of Engineer's/Procuring Agency's Representative is given in Contract Data. However the Contractor shall be notified by the Engineer/Procuring Agency, the delegated duties and authority before the Commencement of works.

4. THE CONTRACTOR

4.1 **General Obligations**

The Contractor shall carry out the works properly and in accordance with the Contract. The Contractor shall provide all supervision, labour, Materials, Plant and Contractor's Equipment which may be required

4.2 **Contractor's Representative**

The Contractor shall appoint a representative at site on full time basis to supervise the execution of work and to receive instructions on behalf of the Contractor but only after obtaining the consent of the Procuring Agency for such appointment which consent shall not be withheld without plausible reason(s) by the Procuring Agency. Such authorized representative may be substituted/ replaced by the Contractor at any time during the Contract Period but only after obtaining the consent of the Procuring Agency as aforesaid.

4.3 **Subcontracting**

The Contractor shall not subcontract the whole of the works. The Contractor shall not subcontract any part of the works without the consent of the Procuring Agency.

4.4 **Performance Security**

The Contractor shall furnish to the Procuring Agency within fourteen (14) days after receipt of Letter of Acceptance a Performance Security at the option of the bidder, in the form of Payee's order /Bank Draft or Bank Guarantee from scheduled bank for the amount and validity specified in Contract Data.

5. DESIGN BY CONTRACTOR

5.1 **Contractor's Design**

The Contractor shall carry out design to the extent specified, as referred to in the Contract Data. The Contractor shall promptly submit to the Engineer/Procuring Agency all designs prepared by him, within fourteen (14) days of receipt the Engineer/Procuring Agency shall notify any comments or, if the design submitted is not in accordance with the Contract, shall reject it stating the reasons. The

Contractor shall not construct any element of the works designed by him within fourteen (14) days after the design has been submitted to the Engineer/Procuring Agency or which has been rejected. Design that has been rejected shall be promptly amended and resubmitted. The Contractor shall resubmit all designs commented on taking these comments into account as necessary.

5.2 **Responsibility for Design**

The Contractor shall remain responsible for his bided design and the design under this Clause, both of which shall be fit for the intended purposes defined in the Contract and he shall also remain responsible for any infringement of any patent or copyright in respect of the same. The Engineer/Procuring Agency shall be responsible for the Specifications and Drawings.

6. PROCURING AGENCY'S RISKS

6.1 **The Procuring Agency's Risks**

The Procuring Agency's Risks are:-

a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies, within the Country;

b) rebellion, terrorism, revolution, insurrection, military or usurped power, or civil war, within the Country;

c) riot, commotion or disorder by persons other than the Contractor's personnel and other employees including the personnel and employees of Sub-Contractors, affecting the Site and/or the Works;

d) 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 of such an assembly, except to the extent to which the Contractor/Sub-Contractors may be responsible for the use of any radio-active material;

e) Pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds;

f) use or occupation by the Procuring Agency of any part of the Works, except as may be specified in the Contract;

g) late handing over of sites, anomalies in drawings, late delivery of designs and drawings of any part of the Works by the Procuring Agency's personnel or by others for whom the Procuring Agency is responsible;

h) a suspension under Sub-Clause 2.3 unless it is attributable to the Contractor's failure; and

i) physical obstructions or physical conditions other than climatic conditions, encountered on the Site during the performance of the Works, for which the Contractor immediately notified to the Procuring Agency and accepted by the Procuring Agency.

7. TIME FOR COMPLETION

7.1 Execution of the Works

The Contractor shall commence the Works on the Commencement Date and shall proceed expeditiously and without delay and shall complete the Works, subject to Sub-Clause 7.3 below, within the Time for Completion.

7.2 Programme

Within the time stated in the Contract Data, the Contractor shall submit to the Engineer/Procuring Agency a programme for the Works in the form stated in the Contract Data.

7.3 Extension of Time

The Contractor shall, within such time as may be reasonable under the circumstances, notify the Procuring Agency/Engineer of any event(s) falling within the scope of Sub-Clause 6.1 or 10.3 of these Conditions of Contract and request the Procuring Agency/Engineer for a reasonable extension in the time for the completion of works. Subject to the aforesaid, the Procuring Agency/Engineer shall determine such reasonable extension in the time for the completion of works as may be justified in the light of the details/particulars supplied by the Contractor in connection with the such determination by the Procuring Agency/Engineer within such period as may be prescribed by the Procuring Agency/Engineer for the same; and the Procuring Agency may extend the time for completion as determined.

7.4 Late Completion

If the Contractor fails to complete the Works within the Time for Completion, the Contractor's only liability to the Procuring Agency for such failure shall be to pay the amount as **liquidity damages** stated in the Contract Data for each day for which he fails to complete the Works.

8. TAKING-OVER

8.1 Completion

The Contractor may notify the Engineer/Procuring Agency when he considers that the Works are complete.

8.2 **Taking-Over Notice**

Within fourteen (14) days of the receipt of the said notice of completion from the Contractor the Procuring Agency/Engineer shall either takeover the completed works and issue a Certificate of Completion to that effect or shall notify the Contractor his reasons for not taking-over the works. While issuing the Certificate of Completion as aforesaid, the Procuring Agency/Engineer may identify any outstanding items of work which the Contractor shall undertake during the Maintenances Period.

9. REMEDYING DEFECTS

9.1 **Remedying Defects**

The Contractor shall for a period stated in the Contract Data from the date of issue of the Certificate of Completion carry out, at no cost to the Procuring Agency, repair and rectification work which is necessitated by the earlier execution of poor quality of work or use of below specifications material in the execution of Works and which is so identified by the Procuring Agency/Engineer in writing within the said period. Upon expiry of the said period, and subject to the Contractor's faithfully performing his aforesaid obligations, the Procuring Agency/Engineer shall issue a Maintenance Certificate whereupon all obligations of the Contractor under this Contract shall come to an end.

Failure to remedy any such defects or complete outstanding work within a reasonable time shall entitle the Procuring Agency to carry out all necessary works at the Contractor's cost. However, the cost of remedying defects not attributable to the Contractor shall be valued as a Variation.

9.2 **Uncovering and Testing**

The Engineer/Procuring Agency may give instruction as to the uncovering and/or testing of any work. Unless as a result of an uncovering and/or testing it is established that the Contractor's design, materials, plant or workmanship are not in accordance with the Contract, the Contractor shall be paid for such uncovering and/or testing as a Variation in accordance with Sub-Clause 10.2.

10. VARIATIONS AND CLAIMS

10.1 **Right to Vary**

The Procuring Agency/Engineer may issue Variation Order(s) in writing. Where for any reason it has not been possible for the Procuring Agency/Engineer to issue such Variations Order(s), the Contractor may confirm any verbal orders given by the Procuring Agency/Engineer in writing and if the same are not refuted/denied by the Procuring Agency/Engineer within ten (10) days of the receipt of such confirmation the same shall be deemed to be a Variation Orders for the purposes of this Sub-Clause.

10.2 **Valuation of Variations**

Variations shall be valued as follows:

a) at a lump sum price agreed between the Parties, or

b) where appropriate, at rates in the Contract, or

c) in the absence of appropriate rates, the rates in the Contract shall be used as the basis for valuation, or failing which

d) at appropriate new rates, as may be agreed or which the Engineer/Procuring Agency considers appropriate, or

e) if the Engineer/Procuring Agency so instructs, at day work rates set out in the Contract Data for which the Contractor shall keep records of hours of labour and Contractor's Equipment, and of Materials, used.

10.3 **Changes in the Quantities.**

a) If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25 percent, provided the change exceeds 1 percent of the Initial Contract Price, the Procuring Agency/Engineer shall adjust the rate to allow for the change and will be valued as per sub clause 10.2.

b) The Engineer shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 15 percent, except with the prior approval of the Procuring Agency.

c) If requested by the Engineer, the contractor shall provide the Engineer with a detailed cost breakdown of any rate in the Bill of Quantities.

10.4 **Early Warning**

The Contractor shall notify the Engineer/Procuring Agency in writing as soon as he is aware of any circumstance which may delay or disrupt the Works, or which may give rise to a claim for additional payment.

To the extent of the Contractor's failure to notify, which results to the Engineer/Procuring Agency being unable to keep all relevant records or not taking steps to minimise any delay, disruption, or Cost, or the value of any Variation, the Contractor's entitlement to extension of the Time for Completion or additional payment shall be reduced/rejected.

10.5 **Valuation of Claims**

If the Contractor incurs Cost as a result of any of the Procuring Agency's Risks, the Contractor shall be entitled to the amount of such Cost. If as a result of any

Procuring Agency's Risk, it is necessary to change the Works, this shall be dealt with as a Variation subject to Contractor's notification for intention of claim to the Engineer/Procuring Agency within fourteen (14) days of the occurrence of cause.

10.6 **Variation and Claim Procedure**

The Contractor shall submit to the Engineer/Procuring Agency an itemised detailed breakdown of the value of variations and claims within twenty eight (28) days of the instruction or of the event giving rise to the claim. The Engineer/Procuring Agency shall check and if possible agree the value. In the absence of agreement, the Procuring Agency shall determine the value.

11. CONTRACT PRICE AND PAYMENT

11.1 (a) **Terms of Payments**

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 11.3, be paid by the Procuring Agency to the Contractor within 30 days after such Interim Payment Certificate has been jointly verified by Procuring Agency and Contractor, or, in the case of the Final Certificate referred to in Sub Clause 11.5, within 60days after such Final Payment Certificate has been jointly verified by Procuring Agency and Contractor;

Provided that the Interim Payment shall be caused in thirty (30) days and Final Payment in 60 days in case of foreign funded project. In the event of the failure of the Procuring Agency to make payment within 90 days then Procuring Agency shall pay to the Contractor compensation at the 28 days rate of KIBOR+2% per annum in local currency and LIBOR+1% for foreign currency, upon all sums unpaid from the date by which the same should have been paid.

(b) **Valuation of the Works**

The Works shall be valued as provided for in the Contract Data, subject to Clause 10.

11.2 **Monthly Statements**

The Contractor shall be entitled to be paid at monthly intervals:

a) the value of the Works executed less to the cumulative amount paid previously; and
b) value of secured advance on the materials and valuation of variations (if any).

The Contractor shall submit each month to the Engineer/Procuring Agency a statement showing the amounts to which he considers himself entitled.

11.3 **Interim Payments**

Within a period not exceeding seven (07) days from the date of submission of a statement for interim payment by the Contractor, the Engineer shall verify the same and within a period not exceeding thirty (30/60) days from the said date of submission by the Contractor, the Procuring Agency shall pay to the Contractor the sum subject to adjustment for deduction of the advance payments and retention money.

11.4 **Retention**

Retention money shall be paid by the Procuring Agency to the Contractor within fourteen (14) days after either the expiry of the period stated in the Contract Data, or the remedying of notified defects, or the completion of outstanding work, all as referred to in Sub-Clause 9.1, whichever is the later.

11.5 **Final Payment**

Within twenty one (21) days from the date of issuance of the Maintenance Certificate the Contractor shall submit a final account to the Engineer to verify and the Engineer shall verify the same within fourteen (14) days from the date of submission and forward the same to the Procuring Agency together with any documentation reasonably required to enable the Procuring Agency to ascertain the final contract value.

Within sixty (60) days from the date of receipt of the verified final account from the Engineer, the Procuring Agency shall pay to the Contractor any amount due to the Contractor. While making such payment the Procuring Agency may, for reasons to be given to the Contractor in writing, withhold any part or parts of the verified amount.

11.6 **Currency**

Payment shall be in the currency stated in the Contract Data.

12. DEFAULT

12.1 **Defaults by Contractor**

If the Contractor abandons the Works, refuses or fails to comply with a valid instruction of the Engineer/Procuring Agency or fails to proceed expeditiously and without delay, or is, despite a written complaint, in breach of the Contract, the Procuring Agency may give notice referring to this Sub-Clause and stating the default.
If the Contractor has not taken all practicable steps to remedy the default within fourteen (14) days after receipt of the Procuring Agency's notice, the Procuring Agency may by a second notice given within a further twenty one (21) days, terminate the Contract. The Contractor shall then demobilize from the Site leaving behind any Contractor's Equipment which the Procuring Agency instructs, in the second notice, to be used for the completion of the Works at the risk and cost of the Contractor.

12.2 **Defaults by Procuring Agency**

If the Procuring Agency fails to pay in accordance with the Contract, or is, despite a written complaint, in breach of the Contract, the Contractor may give notice referring to this Sub-Clause and stating the default. If the default is not remedied within fourteen (14) days after the Procuring Agency's receipt of this notice, the Contractor may suspend the execution of all or parts of the Works.

If the default is not remedied within twenty eight (28) days after the Procuring Agency's receipt of the Contractor's notice, the Contractor may by a second notice given within a further twenty one (21) days, terminate the Contract. The Contractor shall then demobilise from the Site.

12.3 **Insolvency**

If a Party is declared insolvent under any applicable law, the other Party may by notice terminate the Contract immediately. The Contractor shall then demobilise from the site leaving behind, in the case of the Contractor's insolvency, any Contractor's Equipment which the Procuring Agency instructs in the notice is to be used for the completion of the Works.

12.4 **Payment upon Termination**

After termination, the Contractor shall be entitled to payment of the unpaid balance of the value of the works executed and of the Materials and Plant reasonably delivered to the site, adjusted by the following:

a) any sums to which the Contractor is entitled under Sub-Clause 10.4,

b) any sums to which the Procuring Agency is entitled,

c) if the Procuring Agency has terminated under Sub-Clause 12.1 or 12.3, the Procuring Agency shall be entitled to a sum equivalent to twenty percent (20%) of the value of parts of the Works not executed at the date of the termination, and

d) if the Contractor has terminated under Sub-Clause 12.2 or 12.3, the Contractor shall be entitled to the cost of his demobilisation together with a sum equivalent to ten percent (10%) of the value of parts of the works not executed at the date of termination.

The net balance due shall be paid or repaid within twenty eight (28) days of the notice of termination.

13. RISKS AND RESPONSIBILITIES

13.1 **Contractor's Care of the Works**

Subject to Sub-Clause 9.1, the Contractor shall take full responsibility for the care

of the Works from the Commencement Date until the date of the Procuring Agency's/Engineer's issuance of Certificate of Completion under Sub-Clause 8.2. Responsibility shall then pass to the Procuring Agency. If any loss or damage happens to the Works during the above period, the Contractor shall rectify such loss or damage so that the Works conform with the Contract.

Unless the loss or damage happens as a result of any of the Procuring Agency's Risks, the Contractor shall indemnify the Procuring Agency, or his agents against all claims loss, damage and expense arising out of the Works.

13.2 **Force Majeure**

If Force Majeure occurs, the Contractor shall notify the Engineer/Procuring Agency immediately. If necessary, the Contractor may suspend the execution of the Works and, to the extent agreed with the Procuring Agency demobilize the Contractor's Equipment.

If the event continues for a period of eighty four (84) days, either Party may then give notice of termination which shall take effect twenty eight (28) days after the giving of the notice.

After termination, the Contractor shall be entitled to payment of the unpaid balance of the value of the Works executed and of the Materials and Plant reasonably delivered to the Site, adjusted by the following:

a) any sums to which the Contractor is entitled under Sub-Clause 10.4,

b) the cost of his demobilization, and

c) less any sums to which the Procuring Agency is entitled.

The net balance due shall be paid or repaid within thirty five (35) days of the notice of termination.

14. INSURANCE

14.1 **Arrangements**

The Contractor shall, prior to commencing the Works, effect insurances of the types, in the amounts and naming as insured the persons stipulated in the Contract Data except for items (a) to (e) and (i) of the Procuring Agency's Risks under Sub-Clause 6.1. The policies shall be issued by insurers and in terms approved by the Procuring Agency. The Contractor shall provide the Engineer/Procuring Agency with evidence that any required policy is in force and that the premiums have been paid.

14.2 **Default**

If the Contractor fails to effect or keep in force any of the insurances referred to in the previous Sub-Clause, or fails to provide satisfactory evidence, policies or receipts, the Procuring Agency may, without prejudice to any other right or

remedy, effect insurance for the cover relevant to such as a default and pay the premiums due and recover the same plus a sum in percentage given in Contractor Data from any other amounts due to the Contractor.

15. RESOLUTION OF DISPUTES

15.1 Engineer's Decision

If a dispute of any kind whatsoever arises between the Procuring Agency and the Contractor in connection with the works, 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 twenty eight (28) days after the day on which he received such reference, the Engineer shall give notice of his decision to the Procuring Agency (Superintending Engineer) and the Contractor.

Unless the Contract has already been repudiated or terminated, the Contractor shall, in every case, continue to proceed with the work with all due diligence, and the Contractor and the Procuring Agency (Superintending Engineer)shall give effect forthwith to every such decision of the Engineer unless and until the same shall be revised, as hereinafter provided in an arbitral award.

15.2 Notice of Dissatisfaction

If a Party is dissatisfied with the decision of the Engineer of consultant or if no decision is given within the time set out in Sub-Clause 15.1 here above, the Party may give notice of dissatisfaction referring to this Sub-Clause within fourteen (14) days of receipt of the decision or the expiry of the time for the decision. If no notice of dissatisfaction is given within the specified time, the decision shall be final and binding on the Parties. If notice of dissatisfaction is given within the specified time, the decision shall be binding on the Parties who shall give effect to it without delay unless and until the decision of the Engineer is revised by an arbitrator.

If a contractor is dissatisfied with the decision of the Engineer of the department or decision is not given in time then he can approach Superintending Engineer within 14 days, in case of dissatisfaction with decision of Superintending Engineer or not decided within 28 days, then arbitration process would be adopted as per clause 15.3.

15.3 Arbitration

A dispute which has been the subject of a notice of dissatisfaction shall be finally settled as per provisions of Arbitration Act 1940 (Act No. X of 1940) and Rules made there under and any statutory modifications thereto. Any hearing shall be held at the place specified in the Contract Data and in the language referred to in Sub-Clause 1.5.

16 INTEGRITY PACT

16.1 If the Contractor or any of his Sub-Contractors, agents or servants is found to have violated or involved in violation of the Integrity Pact signed by the Contractor as Schedule-F to his Bid, then the Procuring Agency 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 Sub-Contractors, agents or servants;
(b) terminate the Contract; and
(c) recover from the Contractor any loss or damage to the Procuring Agency as a result of such termination or of any other corrupt business practices of the Contractor or any of his Sub-Contractors, agents or servants.

On termination of the Contract under Sub-Para (b) of this Sub-Clause, the Contractor shall demobilize from the site leaving behind Contractor's Equipment which the Procuring Agency instructs, in the termination notice, to be used for the completion of the works at the risk and cost of the Contractor. Payment upon such termination shall be made under Sub-Clause 12.4, in accordance with Sub-Para (c) thereof, after having deducted the amounts due to the Procuring Agency under Sub-Para (a) and (c) of this Sub-Clause.

CONTRACT DATA

Sub-Clauses of
Conditions of Contract

1.1.3 Procuring Agency's Drawings: Attached Separately at page no. ____

1.1.4 **The Procuring Agency** means — the person or entity named in the Contract Data and the legal successors in title to this person, but not (except with the consent of the Contractor) any assignee. Here P/A is **Mehran University of Engineering & Technology Khairpur Mir's**

1.1.5 **The Contractor** means a firm which is employed by the P/A. The contractor is responsible for providing all of the material, labor, equipment and services necessary for the construction of the project.

1.1.7 Commencement Date means the date of issue of Engineer's Notice/Work Order to Commence which shall be issued within fourteen (07) days of the signing of the Contract Agreement.

1.1.9 Time of Completion:- 03 Month

1.1.20 Consultants

RCC Consultants
Ground Floor RCC Complex Main Road, Qasimabad Hyderabad
Phones No 022-2652957, Fax no 022-2655833
E-mail: rcc.consultants@rccgoc.com

1.3 Documents forming the Contract listed in the order of priority:
(a) The Contract Agreement
(b) Letter of Acceptance
(c) The completed Form of Bid
(d) Contract Data
(e) Conditions of Contract
(f) Bill of Quantities (BOQ)
(g) The Drawings
(h) The Specifications
(i) Special Conditions of Contract

2.1 Provision of Site: On the Commencement Date

3.1 Authorized person: Project Director Mehran University of Engineering & Technology Khairpur Mirs

3.2 Name and address of Engineer's/Procuring Agency's representative:

Project Director Mehran University of Engineering & Technology Khairpur Mirs

4.4 **Performance Security: (Not Applicable)**

5.1 **Requirements for Contractor's design (if any):** Contractor to confirm design of any components if necessary.

7.2 **Programme:**

Time for submission: Within fourteen (07) days of the Commencement Date.

Form of programme: *Bar Chart / CPM/PERT*

7.4 Amount payable due to failure to complete shall be 0.05% per day up to a maximum of (10%) of sum stated in the Letter of Acceptance **(Not Applicable)**

7.5 Early Completion (Not Applicable)
In case of earlier completion of the Work, the Contractor is entitled to be paid bonus Up-to limit and at a rate equivalent to 50% of the relevant limit and rate of liquidated damages stated in the contract data.

9.1 Period for remedying defects (Defects Liability Period): (06) **six months**

10.2 (e) **Variation procedures: (Not Applicable)**
Day work rates_____
_____(details)

11.1 Terms of Payments

a) Mobilization Advance

(1) Procuring Agency will decide.

(i) on submission by the Contractor of a Mobilization Advance Guarantee for the full amount of the Advance in the specified form from a Scheduled Bank in Pakistan to the Procuring Agency;

(ii) Contractor will pay interest on the mobilization advance at the rate of 10% per annum on the advance; and

(iii) This Advance including the interest shall be recovered in 5 equal installments from the five (05) R.A bills and in case the number of bills is less than five (05) then 1/5th of the advance **inclusive of the interest** thereon shall be recovered from each bill and the balance together with interest be recovered from the final bill. It may be insured that there is sufficient amount in the final bill to enable recovery of the Mobilization Advance.

2) **Secured Advance on Materials**

(a) The Contractor shall be entitled to receive from the Procuring Agency Secured Advance against an INDENTURE BOND in P W Account Form No. 31(Fin.R. Form No. 2 acceptable to the Procuring Agency of such sum as the Engineer may consider proper in respect of non-perishable materials brought at the Site but not yet incorporated in the Permanent Works provided that:

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

(ii) Such materials have been delivered to the Site and are properly stored and protected against loss or damage or deterioration to the satisfaction and verification of the Engineer but at the risk and cost of the Contractor;

(iii) The Contractor's records of the requirements, orders, receipts and use of materials are kept in a form approved by the Engineer, and such records shall be available for inspection by the Engineer;

(iv) The Contractor shall submit with his monthly statement the estimated value of the materials on Site together with such documents as may be required by the Engineer for the purpose of valuation of materials and providing evidence of ownership and payment therefore;

(v) Ownership of such materials shall be deemed to vest in the Procuring Agency and these materials shall not be removed from the Site or otherwise disposed of without written permission of the Procuring Agency;

(vi) The sum payable for such materials on Site shall not exceed 75 % of the (i) landed cost of imported materials, or (ii) ex-factory / ex-warehouse price of locally manufactured or produced materials, or (iii) market price of stands other materials.

(vii) Secured Advance should not be allowed unless &until the previous advance, if an, fully recovered;

(viii) Detailed account of advances must be kept in part II of running account bill; and

(ix) Secured Advance may be permitted only against materials/quantities anticipated to be consumed / utilized on the work within a period of 3 months from the date of issue of secured advance and definitely not for full quantities of materials for the entire work/contract

(b) Recovery of Secured Advance:

(i) Secured Advance paid to the Contractor under the above provisions shall be effected from the monthly payments on actual consumption basis, but not later than period specified in the rules not more than three months (even if unutilized); other conditions.

(ii) As recoveries are made the outstanding accounts of the items concerned in Part II should be reduced b making deduction entries in the column; —deduct quantity utilized in work measured since previous bill,‖ equivalent to the quantities of materials used by the contractor on items of work shown as executed in part I of the bill.

(c) Interim payments: The Contractor shall submit to the Engineer monthly statements of the estimated value of the work completed less the cumulative amount certified previously.

(i) The value of work completed comprises the value of the quantities of the items in the Bill of Quantities completed.

(ii) Value of secured advance on the materials and valuation of variations (if any).

(iii) Engineer may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

(v) Retention money and other advances are to be recovered from the bill submitted by contractor.

11.2 *(a) **Valuation of the Works:**

Measurement of executed quantities at quoted rates.

11.3 Percentage of retention: Eight percent (8%) (Bid Security)

11.6 Currency of payment: Pak Rupees

14.1 Insurances: (Not Applicable)

Type of cover

The works

Amount of cover

The sum stated in the letter of acceptance plus fifteen percent

Type of cover
Contractor's equipment

Amount of cover
Full replacement cost

Type of cover
Third party injury to persons and damage t property

Workers:

Other cover:

14.2 Amount to be recovered (not applicable)

Premium plus_____ percent (%)

15.3 Arbitration

Place of Office of the **Project Director Mehran University of Engineering & Technology Khairpur Mirs.**

STANDARD FORMS

(Note. Standard Forms provided in this document for securities are to be issued by a bank. In case the bidder chooses to issue a bond for accompanying his bid or performance of contract or receipt of advance, the relevant format shall be tailored accordingly without changing the spirit of the Forms of securities).

FORM OF BID SECURITY
(Bank Guarantee)

Guarantee No._____
Executed on _____

(Letter by the Guarantor to the Procuring Agency)

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

Name of Principal (Bidder) with address:_____

_____

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

_____

Bid Reference No._____ Date of Bid _____

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

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted the accompanying Bid numbered and dated as above for _____ (Particulars of Bid) to the said Procuring Agency; and

WHEREAS, the Procuring Agency has required as a condition for considering the said Bid that the Principal furnishes a Bid Security in the above said sum to the Procuring Agency, conditioned as under:

(1) that the Bid Security shall remain valid for a period of twenty eight (28) days beyond the period of validity of the bid;

(2) that in the event of;

(a) the Principal withdraws his Bid during the period of validity of Bid, or

(b) the Principal does not accept the correction of his Bid Price, pursuant to Sub-Clause 16.4 (b) of Instructions to Bidders, or

(c) failure of the successful bidder to

(i) furnish the required Performance Security, in accordance with Sub-Clause IB-21.1 of Instructions to Bidders, or

(ii) sign the proposed Contract Agreement, in accordance with Sub-Clauses IB-20.2 & 20.3 of Instructions to Bidders,

the entire sum be paid immediately to the said Procuring Agency for delayed completion and not as penalty for the successful bidder's failure to perform.

NOW THEREFORE, if the successful bidder shall, within the period specified therefore, on the prescribed form presented to him for signature enter into a formal Contract Agreement with the said Procuring Agency in accordance with his Bid as accepted and furnish within fourteen (14) days of receipt of Letter of Acceptance, a Performance Security with good and sufficient surety , as may be required, upon the form prescribed by the said Procuring Agency for the faithful performance and proper fulfilment of the said Contract or in the event of non-withdrawal of the said Bid within the time specified then this obligation shall be void and of no effect, but otherwise to remain in full force and effect.

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

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

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

_____
Guarantor (Bank)

Witness:

1. _____

_____
Corporate Secretary (Seal)

2. _____

_____
(Name, Title & Address)

1. Signature _____

2. Name _____

3. Title _____

Corporate Guarantor (Seal)

FORM OF PERFORMANCE SECURITY
(Bank Guarantee)

Guarantee No._____
Executed on _____
Expiry Date

(Letter by the Guarantor to the Procuring Agency)

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

Name of Principal (Contractor) with address:_____
_____

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

Letter of Acceptance No._____ Dated _____

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

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has accepted the Procuring Agency's above said Letter of Acceptance for _____ _____ (Name of Contract) for the _____

_____ (Name of Project).

NOW THEREFORE, if the Principal (Contractor) shall well and truly perform and fulfill all the undertakings, covenants, terms and conditions of the said Documents during the original terms of the said Documents and any extensions thereof that may be granted by the Procuring Agency, with or without notice to the Guarantor, which notice is, hereby, waived and shall also well and truly perform and fulfill all the undertakings, covenants terms and conditions of the Contract and of any and all modifications of the said Documents that may hereafter be made, notice of which modifications to the Guarantor being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue till all requirements of Clause 9, Remedying Defects, of Conditions of Contract are fulfilled.

Our total liability under this Guarantee is limited to the sum stated above and it is a condition of any liability attaching to us under this Guarantee that the claim for payment in writing shall

be received by us within the validity period of this Guarantee, failing which we shall be discharged of our liability, if any, under this Guarantee.

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

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

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

_____
Guarantor (Bank)

Witness:

1. _____

_____
Corporate Secretary (Seal)

2. _____

_____
(Name, Title & Address)

1. Signature _____

2. Name _____

3. Title _____

_____
Corporate Guarantor (Seal)

FORM OF CONTRACT AGREEMENT

THIS CONTRACT AGREEMENT (hereinafter called the "Agreement") made on the _____ day of _____ 200 _____ between _____(hereinafter called the "Procuring Agency") of the one part and _____ (hereinafter called the "Contractor") of the other part.

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

NOW this Agreement witnesseth as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.

2. The following documents after incorporating addenda, if any except those parts relating to Instructions to Bidders, shall be deemed to form and be read and construed as part of this Agreement, viz:

   (a) The Letter of Acceptance;
   (b) The completed Form of Bid along with Schedules to Bid;
   (c) Conditions of Contract & Contract Data;
   (d) The priced Schedule of Prices/Bill of quantities (BoQ);
   (e) The Specifications; and
   (f) The Drawings

3. In consideration of the payments to be made by the Procuring Agency to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Procuring Agency to execute and complete the Works and remedy defects therein in conformity and in all respects within the provisions of the Contract.

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

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

Signature of the Contactor

(Seal)

Signature of the Procuring Agency

(Seal)

Signed, Sealed and Delivered in the presence of:

Witness:

(Name, Title and Address)

Witness:

(Name, Title and Address)

MOBILIZATION ADVANCE GUARANTEE

Guarantee No._____

Executed on_____

(Letter by the Guarantor to the Procuring Agency)

WHEREAS the _____ (hereinafter called the Procuring Agency) has entered into a Contract for _____

_____

_____ (Particulars of Contract), with _____

_____ (hereinafter called the Contractor).

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

AND WHEREAS the Procuring Agency has asked the Contractor to furnish Guarantee to secure the advance payment for the performance of his obligations under the said Contract.

AND WHEREAS _____ (Scheduled Bank) (hereinafter called the Guarantor) at the request of the Contractor and in consideration of the Procuring Agency agreeing to make the above advance to the Contractor, has agreed to furnish the said Guarantee.

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

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

This Guarantee shall come into force as soon as the advance payment has been credited to the account of the Contractor.

This Guarantee shall expire not later than _____

by which date we must have received any claims by registered letter, telegram, telex or telefax.

It is understood that you will return this Guarantee to us on expiry or after settlement of the total amount to be claimed hereunder.

_____
Guarantor (Scheduled Bank)

Witness:

1. _____

_____
Corporate Secretary (Seal)

2. _____

_____
(Name, Title & Address)

1. Signature _____

2. Name _____

3. Title _____

_____
Corporate Guarantor (Seal)

INDENTURE FOR SECURED ADVANCES.

(For use in cases in which is contract is for finished work and the contractor has ente ed into an agreement for the execution of a certain specified quantity of work in a given time).

This INDENTURE made the .... day of ..... ----- ..... ----------.....-197--"- BETWEEN (hereinafter called "the Contractor" which expression shall where the context so admits or implied be deemed to include his heirs, executors, administrators and assigns) of the one part and THE GOVERNOR OF SINDH (hereinafter called "the Government" of the other part).

WHEREAS by an agreement, dated (hereinafter called the said agreement, the contractor has agreed to perform the under-mentioned works (hereinafter referred to as the said work):-

(Here enter (the description of the works).[1]

AND WHEREAS the contractor has applied to the .... —... ... ----- for an advance to him of Rupees ----------. (Rs. .....) on the security of materials absolutely belonging to him and brought by him to the site of the said works the subject of the said agreement for use in the construction of such of the said works as he has undertaken to execute at rates fixed for the f nished work (inclusive of the cost of materials and labour and other charge) AND WHEREAS the Government has agreed to advance to the Contractor the sum of Rupees, (Rs. . .....) on the security of materials the quantities and other particulars of which are detailed in Part II of Running Account Bill (E). the said works signed by the contractor Fin R.Form.17.A on--- -------- .....— and on such covenants and conditions as are hereinafter contained and the Government has reserved to itself the option of marking any further advance or advances on the security of other materials brought by the Contractor to the site of the said works.

NOW THIS INDENTURE WTTNESSETH that in pursuance of the said agreement and in consideration of the sum of Rupees..... ---------- .....-.....— ..... (Rs. ------ ..... -----) on or before the execution of these presents paid to the Contractor by the Government (the receipt whereof the Contractor doth hereby acknowledge) and of such further advances (if any) as may be made to him as aforesaid (all of which advances are hereinafter collectively referred to as the said amount) the Contractor doth hereby assign unto the Government the said materials by way of security for the said amount

And doth hereby covenant and agree with the Government and declare ay follow :-

(1) That the said sum of Rupees .....-..... ----------..... ---------- (RF. ----------) so advanced by the Government to the Contractor as aforesaid and all or any further sum or sums which may be advanced aforesaid shall be employed by the contractor in or towards expending the execution of the said works and for no other purpose whatsoever.

(2) That the materials detailed in the said Running Account Bill (B) which have been
Fin R Form No. 17-A
Offered to and accepted by (he Government as security for the said amount are absolutely by the Contractors own property free from encumbrances of any kind and the Contractor will not make any application for or receive a further advance on the security of materials which are not absolutely his own property and free from encumbrances of any kind and the contractor hereby agrees, at all times, to indemnify and save harmless the Government against all claims whatsoever to any materials in respect of which an advance has been made to him as aforesaid.

(3) That the said materials detailed in the said Running Account Bill (B) and all other
Fin. R. Form No. 17-A
Materials on the security of which any further advance or advances may hereafter be made as aforesaid (hereinafter called the said materials) shall be used by the Contractor solely in *the* execution of the said works in accordance with the directions of the Divisional Officer----------(hereinafter called the Divisional Officer) and in the terms of the said agreement.

(4) That the Contractor shall make at his own cost all necessary and adequate arrangement for the proper watch, safe custody and protection against all risks of the said material and that until used in construction as aforesaid the said materials shall remain at the site of the said works in the Contractor's custody and at his own risk and on his own responsibility and shall at all times be open to inspection by (he Divisional Officer or any officer authorized by him. In the event of the said materials of any part (hereof being stolen, destroyed or damaged or becoming deteriorated in a grater degree than is due to reasonable use and wear thereof Contractor will forthwith replace the same with other materials of like qualify or repair and make good the same as required by the Divisional Officer and the materials so brought to replace the said materials so repaired and made good shall also be considered as security for the said amount.

(5) 'Hurt the said materials shall not on any account be removed from the site of the said works except with the written permission of the Divisional Officer or an officer authorized by him in that behalf

(6) That the said amount shall be payable in full when or before the Contractor receives payment, from the Government of the price payable to him for the said works under the terms and provisions of the said agreement PROVIDED THAT if any intermediate payments are made to the contractor on account of work done then on the occasion of each such payment the Government will be at liberty to make a recovery from the Contractors Bill for such payment by deducting there from in the value of the said materials (hen actually used in the construction and in respect of which recovery has not been made previously the value for this purpose being determined in respect of each description of material at (he rates at which the amount of the advances made under these presents were calculated.

(7) That if the Contractor shall at any time make any default in the performance or observation in any respect of any of the terms and provisions of the said agreement or of these presents the total amount of the advance or advances that may still be owing to the Government shall immediately on the happening of such default be repayable by the Contractor to the Government together with interest thereon at twelve

percent per annum from the date or respective dates of such advance or advances to the date or repayment and with all costs, charges, damages and expenses incurred by the Government in or for the recovery thereof or the enforcement of this security or otherwise by reason of (he default of the Contractor and any moneys so becoming due and payable shall constitute a debt due from the Contractor to the Government and the Contractor hereby covenants and agrees with the Government to repay and the same respectively to it accordingly.

(8) That the Contractor hereby charges all the said materials with the repayment to the Government of the said sum of Rupees ..... - ..... (Rs.....) and any further sum or sums which may be advanced as aforesaid and all costs charges damages and expenses payable under these present PROVIDED ALWAYS and it is hereby agreed and declared that not withstanding anything in the said agreement and without prejudice to the powers contained therein if and whether the covenant for payment and repayment hereinbefore contained shall become enforceable and the money owing shall not be paid to accordingly.

Once therewith the Government may at any time thereafter adopt all or any of following courses as it may deem best ;-

(a) Seize and utilize the said materials or any part thereof in the completion of the said works on behalf of the Contractor in accordance with the provisions in that behalf contained in the said agreement debiting the Contractor with the actual cost of effecting such completion the amount due in respect of advances under these presents and crediting the Contractor with the value of work done as he had carried it out in accordance with the said agreement and at the rates thereby provided. If the balance is against the Contractor he is to pay the same to the Government on demand.

(b) Remove and sell by public auction the seized materials or any part thereof and out of the moneys arising from the sale retain all the sums aforesaid repayable to the Government under these presents and pay over the surplus (if any) to the Contractor.

(c) Deduct all or any part of the moneys owing out of the security deposit or any sum due to the Contractor under the said agreement.

(9) That except as is expressly provided by the presents interest on the aid advance shall not be payable.

(10) That in the event of any conflict between the provisions of these presents and the said agreement the provisions of these presents shall prevail and in the event of any dispute or difference arising over the construction or effect of these presents the settlement of which has not been hereinbefore expressly provided for the same shall be referred to the Superintending Engineer..... Circle whose..... decision shall be final and the provisions of the Indian Arbitration Act for the time being in force so far as they are applicable shall apply to any such reference.

In witnesses whereof the* ---------- on behalf of the Governor of Sindh and the said ---------- have hereunto set their respective hands and seals the day and first above written.

Signed, sealed and delivered by* In the presence of

Seal

1st witness 2nd witness

Signed, sealed and delivered by* In the presence of

Seal

1st Witness 2nd witness

SPECIFICATIONS FOR CIVIL WORKS

SECTION - 1

1 Standard Specifications, Standard and Codes for PE (Polyethylene) Piping Systems

1.1 Standard Requirements for PE Piping Materials

Polyethylene (PE) is a complex polymer with properties that can be optimized based on the desired end use. Such modifications are effected by choice of catalyst system, polymerization conditions and, the use of a small quantity of co-monomer (a monomer or monomers other than ethylene). All these changes allow PE to be tailor made to a wide range of processing and performance requirements.

For classifying this wide array of property variations that find use in piping applications, ASTM issued standard D 3350, "Standard Specification for Polyethylene Plastic Pipe and Fittings Materials". This standard recognizes six properties that are considered important in the manufacture of PE piping, in the heat fusion joining of this material and, in defining its long-term performance capabilities. Each property is assigned into a "Cell" and, each cell consists of a number of "Classes". A cell number covers a narrow range of the larger overall range that is covered by a property "cell". These D 3350 property cells and classes are identified in Table 1.

TABLE 1

Cell Classification System from ASTM D 3350-06 [1,2]

Property	Test method	0	1	2	3	4	5	6	7	8
Density,g/cm 3	D1505	un-specified	0.925 or lower	>0.925 – 0.940	>0.940-0.947	>0.940 – 0.955	>0.955	-	specify value	-
Melt index	D 1238	un-specified	> 1.0	1.0 to 0.4	<0.4 to 0.15	<0.15	A	-	specify value	-
Flexural modulus,mpa (psi),2% secant	D 790	un-specified	<138 (<20,000)	138-<276(20,000 to <40,000)	278-<552 (40,000 to<80,000)	552-<758 (40,000 to <11,000)	758-<1103(110,000 to <160,000)	>1103 (>160,000)	specify value	-
Tensile strength at yield, mpa(psi)	D638	un-specified	<15 (<2000)	15-<18(2200-<2600)	18-<21(2600-<3000)	21-<24(3000-<3500)	24-<28(3500-<4000)	>28(>4000)	specify value	-
slow crack growth resistance ESCR	D1693	un-specified								

a. Condition b. Test duration hrs c. Failure, max, %			A 48 50	B 24 50	C 192 20	C 600 20	- - -	- - -	- - -	specify value
slow crack growth resistance II. PENT (hours) molded plaque, 80c 2.4Mpa, notch depth table 1	F1473	un-specified	-	-	-	10	30	100	500	specify value
hydrostatic strength classification I.Hydrostatic design basis, Mpa (psi)(23 degreeC	D2837	NPR	5.52 (800)	6.89(1000)	8.62 (1250)	11.03 (1600)	-	-	-	-
hydrostatic strength classification II.Minimum Required strength, Mpa (psi) 23 degreeC	ISO 12162	-	-	-	-	-	8 (1160)	10 (1450)	-	-

Notes to table1 _A: refer to 10.1.4.1(ASTM D3350 B:NPR=Not Pressure Rated

In addition, by means of a Code letter, ASTM D3350 designates whether the material includes a colorant and also, the nature of the stabilizer that is included for protecting The material against the potential damaging effects of the ultraviolet (UV) rays in sunlight. Table 2 lists the Code letters that are used in D 3350 and what they represent

TABLE 2

Code Letter Representation

Code Letter	Color and UV Stabilizer
A	Natural
B	Colored
C	Black with 2% minimum carbon black
D	Natural with UV stabilizer
E	Colored with UV stabilizer

For designating a PE material in accordance with ASTM D 3350 the cell number for each cell property is identified, and this is done in the same order as shown in Table 1. This is then followed by an appropriate Code letter to indicate color and stabilization as shown in Table 2. An example of this material designation system is presented in Table 3 for the case of a PE material having designation code PE445574C.

TABLE 3

Properties of a Cell number PE445574 Material

Designating the Applicable Property Cell(1)	Class Number or Code Letter	Corresponding Value of Property (From Table1)
1st Digit Density of PE base resin, gm/cm^3	4	>0.947-0.955
2nd Digit - Melt Index of compound, gm/10 minutes	4	<0.15
3rd Digit - Flexural Modulus of compound,psi (MPa)	5	110,000 - < 160,000 (758 - <1103)
4th Digit - Tensile Strength at Yield of compound, psi (MPa)	5	3,500 - <4,000 (24 - <28)
5th Digit - Resistance to Slow Crack Growth of compound (SCG), hrs.	7	500 minimum based on PENT test
6th Digit - Hydrostatic Design Basis for water at 73°F(23°C), psi of compound (MPa)	4	1600 (11.03)
Code Letter	C	Black with 2% minimum carbon black

A PE material that complies with the Table 3 cell designation i.e. PE445574C would be a higher density (higher crystallinity), lower melt index (higher molecular weight) material that exhibits exceptionally high resistance to slow crack growth. In addition, it offers a hydrostatic design basis (HDB) for water at 73°F (23°C) of 1600 psi (11.03 MPa). Finally, it would be black and contain a minimum of 2% carbon black.

The cell classification system provides the design engineer with a very useful tool in specifying the requirements of PE materials for piping projects.

.1.2 Standard PE Piping Material Designation Code

While all PE piping standards specify minimum material requirements based the on the cell requirements of ASTM D3350, a simpler, short-hand, ASTM recognized material designation code is commonly used for quickly identifying the most significant engineering properties of a PE pipe material. An important feature of this designation code is that it identifies the maximum recommended hydrostatic design stress (HDS) for water, at

73°F(23°C). Originally, this designation code was devised to only apply to materials intended for pressure piping. However, there is a recognition that even in non-pressure applications stresses are generated which makes it prudent to use a stress rated material. This has led to the common practice of using this material designation code for quickly identifying all PE piping materials intended for pipes of solid wall or, of profile wall construction.

This code is defined in ASTM F412, "Standard Terminology Relating to Plastic Piping Systems", under the definition for the term code, thermoplastic pipe materials designation. It consists of the ASTM approved abbreviation for the pipe material followed by four digits (e.g., PE4710). The information delivered by this code is as follows:

• The ASTM recognized abbreviation for the piping material. PE, in the case of polyethylene materials.

• The first digit identifies the density range of the base PE resin, in accordance with ASTM D3350, that is used in the material. As discussed in Chapter 3, the density of a PE polymer reflects the polymer's crystallinity which, in turn, is the principal determinant of the final material's strength and stiffness properties.

• The second digit identifies the compound's resistance to slow crack growth (SCG), also in accordance with ASTM D3350. A material's resistance to SCG relates very strongly to its long-term ductility, a property that defines the material's capacity for safely resisting the effects of localized stress intensifications.

• The last two numbers identify the compound's maximum recommended hydrostatic design stress (HDS) category [1] for water, at 73°F(23°C). This recommendation is established in consideration of various factors but, primarily the following: The capacity for safely resisting the relatively well distributed stresses that are generated only by internal pressure, and, the capacity for safely resisting add-on effects caused by localized stress intensifications.

The Standard Designation Codes for materials which are recognized as of this writing by current ASTM, AWWA, CSA and other standards are listed in Table 4. This table gives a brief explanation of the significance of the code digits. It should be recognized that a new material may be commercialized which qualifies for a code designation that has not been recognized as of this writing. For a listing of the most current recognized code designations the reader is invited to consult the periodically updated PPI publication TR-4.

TABLE 4

Standard Designation Codes for Current Commercially Available PE Piping Compositions

Standard Designation Code	What the Digits in the Code Denote		
	The 1st Digit	The 2nd Digit	last two Digits [1]

	Cell Number Based on the Density Cell In accordance with ASTM D3350 (See Table 1)	Cell Number Based on the Resistance to SCG Cell In accordance with ASTM D3350 (2) (See Table 1)	ommended ndard Recommended Standard Hydrostatic Design Stress(HDS) Category, for water, at 73°F (23°C) (psi)
PE2406	Cell number 2	Cell number 4	630
PE2708		Cell number 7	800
PE3408	Cell number 3	Cell number 4	800
PE3608		Cell number 6	
PE3708		Cell number 7	800
PE3710			1000
PE4708	Cell number 4	Cell number 7	800
PE4710			1000

(1) The last two digits code the Standard HDS Category in units of 100psi. For example, 06 is the code for 630psi and 10 is the code for 1,000psi.

(2) It should be noted that the lowest Cell number for SCG resistance for pipe is Based on research and experience a rating of at least 4 has been determined as sufficient for the safe absorption of localized stresses for properly installed PE pipe.

1.3 Codes, Standards and Recommended Practices for PE Piping Systems

There are a large number of codes, standards and practices that apply to the use of PE piping. These consensus documents cover a broad range of applications for PE pipe and fittings. Some standards pertain to the product performance requirements for a specific application, while other standards are guidelines and practices detailing how a certain type of activity is to be performed. Some are test methods that define exactly how a particular test is to be run so that a direct comparison can be made between results. There are several organizations that issue standards, codes of practice, manuals, guides, and recommendations that deal with the manufacture, testing, performance, and use of PE pipe and fittings. Some of the major ones are discussed below. A more inclusive listing can be found in the Appendix of this chapter.

1.3.1 Plastics Pipe Institute (PPI)

The Plastics Pipe Institute is a trade association dedicated to promoting the proper and effective use of plastics piping systems. The assignment of a recommended hydrostatic design basis for a thermoplastic material falls under the jurisdiction of the Hydrostatic Stress Board - HSB - of the Plastics Pipe Institute. The Hydrostatic Stress Board has the responsibility of developing policies and procedures for the recommendation of the estimated long-term strength for commercial thermoplastic piping materials. The document most widely used for this is Technical Report-3, TR-3 "Policies and Procedures for Developing Hydrostatic Design Bases (HDB), Pressure Design Bases (PDB), Strength Design Bases (SDB), and Minimum Required Strengths (MRS) for Thermoplastic Piping Materials or Pipe." The material stress ratings themselves are published in TR-4, "PPI Listing of Hydrostatic Design Bases (HDB), Strength Design Bases (SDB), Pressure Design Bases (PDB) and Minimum Required Strengths (MRS) Ratings for Thermoplastic Piping Materials or Pipe." There are many other publications pertaining to various aspects of polyethylene pipe available from PPI such as: TN's - Technical Notes, TR's - Technical Reports, Model Specifications, and White Papers on specific positions addressed by the industry.

It should be noted that while the Hydrostatic Stress Board (HSB) is a division of the Plastics Pipe Institute, involved in the development and issuance of policies, procedures, and listings of stress and pressure ratings for all thermoplastic pipe materials, PPI itself is an industry association focused on the promotion and effective and proper use of pipe primarily made from polyethylene (PE), cross linked polyethylene (PEX), and polyamide (POM) materials.

1.3.2 ASTM

ASTM International is a consensus standards writing organization, and has published standards for a multitude of materials, products, practices and applications. Those pertaining to polyethylene pipe are found in Volume 8.04 "Plastic Pipe and Building Products." ASTM employees do not write these standards; rather they are written by interested parties and experts within the industry who are members of ASTM. Most anyone can be a member of ASTM and participate in the standard writing process. Other standards, pertaining to plastics in general are found in other books within Volume 8 - 8.01, 8.02, or 8.03.

ASTM Standards pertaining to PE pipe can be a Standard Specification that defines the product requirements and performance for a specific application. It can also be a Standard Practice, which defines how a particular activity is to be performed, or a Standard Test Method, which defines how a particular test on PE pipe, fittings, or materials is to be done. While ASTM standards are mainly used in North America, many are also approved by the American National Standards Institute (ANSI) for international recognition, or are equivalent to an International Standards Organization (ISO) standard. When a manufacturer prints the ASTM Standard on a product, the manufacturer is certifying that the product meets all of the requirements of that standard.

The typical sections included in an ASTM Product Standard are:

Scope - what products and applications are covered under this standard.
Referenced Documents - what other standards or specifications are referenced in this standard.

Terminology - lists definitions that are specific to this standard.

Materials - defines material requirements for products that conform to this standard.

Requirements - details the performance requirements that the product must meet. This section will also contain dimensions.

Test Methods - details how the testing is to be performed to determine conformance to the performance requirements.

Marking - details the print that must be on the product. Includes the standard number, manufacturer's name, size, date of manufacture, and possibly the application such as "water." There may be other wording added to the print as the purchaser requires.

This is only a typical example of sections that may be included. While ASTM has defined protocol for product standards, each one may contain sections unique to that standard. Each standard should be reviewed individually for its requirements.

1.3.3 ISO

The International Organization for Standardization (ISO) is a network of national standards institutes from 140 countries working in partnership with international organizations, governments, industry, business and consumer representatives.

The ISO committee having jurisdiction for development of plastics pipe standards is Technical Committee 138. The committee's stated scope is: Standardization of pipes, fittings, valves and auxiliary equipment intended for the transport of fluids and made from all types of plastic materials, including all types of reinforced plastics. Metal fittings used with plastics pipes are also included. The main committee has seven subcommittees devoted to specific issues.

TC 138 has 35 participating countries, including the United States and Canada, and 27 observer countries. For ISO matters the United States is represented by the American National Standards Institute (ANSI). Canadian representation is through the Standards Council of Canada (SCC). The United States representation has been passed through ANSI who had delegated it down to ASTM and, who in turn, had delegated it to the Plastics Pipe Institute.

1.3.4 NSF International

NSF International plays a vital role in the use of pipe and fittings for potable

water and plumbing applications. NSF is an independent, not-for-profit organization of scientists, engineers, educators and analysts. It is a trusted neutral agency, serving government, industry and consumers in achieving solutions to problems relating to public health and the environment. NSF has three essential missions, as follows:

1. To issue standards that establish the necessary public health and safety requirements for thermoplastic piping materials and for piping products intended for use in the transport of potable water and for drainage and venting systems in plumbing applications.

2. To establish the appropriate test methods by which these requirements are evaluated.

3. To offer a certification program which affirms that a particular product which carries an NSF seal is in compliance with the applicable NSF requirements

NSF standards are developed with the active participation of public health and other regulatory officials, users and industry. The standards specify the requirements for the products, and may include requirements relating to materials, design, construction, and performance.

There are two NSF Standards that are of particular importance to the polyethylene pipe and fittings industry: Standard 14, "Plastic Piping components and Related Materials" and Standard 61, "Drinking Water System Components-Health Effects." Standard 14 includes both performance requirements from product standards and provisions for health effects covered in Standard 61. NSF Standard 14 does not contain performance requirements itself, but rather NSF will certify that a product conforms to a certain ASTM, AWWA, etc... product performance standard. In order to be certified for potable water applications under Standard 14, the product must also satisfy the toxicological requirements of Standard 61.

For products intended for potable water applications, it is also an option to be certified under Standard 61 only, without certifying the performance aspects of the product. In the early 1990's NSF separated the toxicological sections of Standard 14 into a new Standard 61. This was done for several reasons, but mainly to make it easier to bring new, innovative products to market without undue expense and time, while continuing to keep the public safe. This was a great benefit to the industry. Now manufacturers have a choice of staying with Standard 14 or switching to Standard 61. Many manufacturers who have in-house quality programs and the ability to perform the necessary tests switched to this new potable water certification option.

1.3.5 AWWA

The American Water Works Association (AWWA) is a leader in the development of water resource technology. These AWWA standards describe minimum requirements and do not contain all of the engineering and administrative information normally contained in a specification that is written for a particular project. AWWA standards usually contain options that must be evaluated by the user of the standard. Until each optional feature is specified by the user, the product or service is not fully defined. The use of AWWA standards is entirely voluntary. They are intended to represent a consensus of

the water supply industry that the product described will provide satisfactory service.

There are currently two AWWA standards that pertain to polyethylene pipe: AWWA C901, "Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inch through 3 inch, for Water Service" and AWWA C906, "Polyethylene (PE) Pressure Pipe and Fittings, 4 inch through 63 inches, for Water Distribution." Standard C901 addresses PE pressure pipe and tubing for use primarily as potable water service lines in the construction of underground distribution systems. It includes dimensions for pipe and tubing made to pressure classes of 80 psi, 100 psi, 125 psi, 160 psi and 250 psi.

This standard covers PE pipe in nominal sizes from ½ inch through 3 inch that are made to controlled outside-diameters based on iron pipe sizes i.e. (OD based IPS size) and also to controlled inside-diameter based on iron pipe sizes i.e. (ID based IPS size). It also covers tubing, ranging in size from ½ inch through 2 inch that conforms to the outside-diameter dimensions of copper tubing sizes (CTS). There are also sections on materials, testing and marking requirements; inspection and testing by manufacturer; and in-plant inspection by purchaser.

AWWA Standard C906 addresses larger diameter PE pressure pipe. The pipe is primarily intended for use in transporting potable water in either buried or aboveground installations. The standard covers 10 standard dimension ratios (SDR's) for nominal pipe sizes ranging from 4 inch through 63 inch. The available pipe sizes are limited by a maximum wall thickness of 3 inch. Pipe outside diameters (OD's) conform to the outside diameter dimensions of iron pipe sizes (IPS), ductile iron pipe size (DIPS), or those established by the International Standards Organization (ISO). Pressure class ratings range from 40 to 250 psig.

AWWA has also published a manual M55, "PE Pipe-Design and Installation". This manual is a design and installation guide for the use of polyethylene pipe in potable water applications. The manual supplements C901 and C906 and provides specific design recommendations as it relates to the use of PE pipe in potable water systems.

1.2 PE Pipe Joining Procedures

.2.1 General Provisions

PE pipe or fittings are joined to each other by heat fusion or with mechanical fittings. PE pipe may be joined to other pipe materials by means of compression fittings, flanges, or other qualified types of manufactured transition fittings. There are many types and styles of fittings available from which the user may choose. Each offers its particular advantages and limitations for each joining situation the user may encounter. Contact with the various manufacturers is advisable for guidance in proper applications and styles available for joining as described in this document. The joining methods discussed in this chapter cover both large and small diameter pipe. Large diameter PE pipe is considered to be sizes 3" IPS (3.500" OD, Iron Pipe Size) and larger. All individuals involved in the joining PE pipe systems, whether it be using the typical heat fusion

methods or employing mechanical connections, should be fully trained and qualified in accordance with applicable codes and standards and/or as recommended by the pipe or fitting manufacturer. Those assigned to making joints in PE pipe for gas applications must meet the additional requirement of compliance with U.S. Department of Transportation Pipeline Safety Regulations (10). The equipment used in the process of making heat fused joints must be designed to operate for the selected pipe and fusion procedures. Additionally, the equipment should be well maintained and capable of operating to specification.

.2.2 Thermal Heat Fusion Methods

There are three types of conventional heat fusion joints currently used in the industry; Butt, Saddle, and Socket Fusion. Additionally, electrofusion (EF) joining is available with special EF couplings and saddle fittings.

The principle of heat fusion is to heat two surfaces to a designated temperature, then fuse them together by application of a sufficient force. This force causes the melted materials to flow and mix, thereby resulting in fusion. When fused according to the pipe and/or fitting manufacturers' procedures, the joint area becomes as strong as, or stronger than, the pipe itself in both tensile and pressure properties and properly fused joints are absolutely leak proof. As soon as the joint cools to near ambient temperature, it is ready for handling. The following sections of this chapter provide a general procedural guideline for each of these heat fusion methods.

.2.3 Butt Fusion

The most widely used method for joining individual lengths of PE pipe and pipe to PE fittings is by heat fusion of the pipe butt ends as illustrated in Figure 1. This technique produces a permanent, economical and flow-efficient connection. Quality butt fusion joints are produced by using trained operators and quality butt fusion machines in good condition.

The butt fusion machine should be capable of:

- Aligning the pipe ends
- Clamping the pipes
- Facing the pipe ends parallel and square to the centerline
- Heating the pipe ends
- Applying the proper fusion force

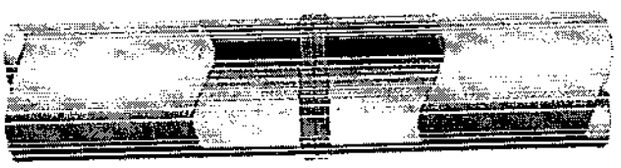


Figure 1 A Standard Butt Fusion Joint

The six steps involved in making a butt fused joint are:

1. Clean, clamp and align the pipe ends to be joined
2. Face the pipe ends to establish clean, parallel surfaces, perpendicular to the center line
3. Align the pipe ends
4. Melt the pipe interfaces
5. Join the two pipe ends together by applying the proper fusion force
6. Hold under pressure until the joint is cool

2.4 Butt Fusion of PE Pipe Products with Different Wall Thicknesses

PE pipes of the same outside diameter but having different specified wall thicknesses, that is, different DR designations, may be butt fused to each other under special conditions. Since this represents a special situation, it is subject to limitations. Therefore, the user is advised to consult with the pipe manufacturer to determine if the special procedures can be applied to the pipe components involved in the particular installation in question.

Most pipe manufacturers have detailed parameters and procedures to follow. The majority of them helped develop and have approved the PPI Technical Report TR-33 for the generic butt fusion joining procedure for PE pipe [15] and ASTM F 2620.

2.4.1 Optional Bead Removal

In some pipe systems, engineers may elect to remove the inner or outer bead of the joint. External, or both beads are removed with run-around planing tools, which are forced into the bead, then drawn around the pipe. Power planers may also be used, but care must be taken not to cut into the pipe's outside surface.

It is uncommon to remove internal beads, as they have little or no effect on flow, and removal is time-consuming. Internal beads may be removed from pipes after each fusion with a cutter fitted to a long pole. Since the fusion must be completely cooled before bead removal, assembly time is increased slightly.

.2.4.2 Saddle/Conventional Fusion

The conventional technique to join a saddle to the side of a pipe, illustrated in Figure 3, consists of simultaneously heating both the external surface of the pipe and the matching surface of the "saddle" type fitting with concave and convex shaped heating tools until both surfaces reach proper fusion temperature. This may be accomplished by using a saddle fusion machine that has been designed for this purpose.

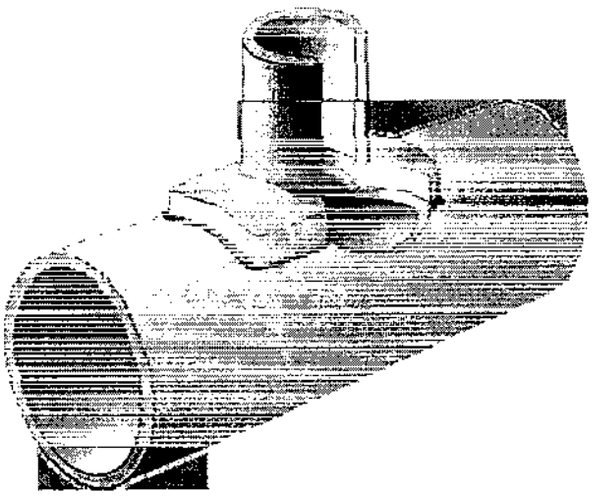


Figure 3 Standard Saddle Fusion Joint

Saddle fusion using a properly designed machine, provides the operator better alignment and force control, which is very important to fusion joint quality. The Plastics Pipe Institute recommends that saddle fusion joints be made only with a mechanical assist tool unless hand fusion is expressly allowed by the pipe and/or fitting manufacturer.[16]

There are eight basic sequential steps that are normally used to create a saddle fusion joint:

1. Clean the pipe surface area where the saddle fitting is to be located
2. Install the appropriate size heater saddle adapters
3. Install the saddle fusion machine on the pipe
4. Prepare the surfaces of the pipe and fitting in accordance with the recommended procedures
5. Align the parts
6. Heat both the pipe and the saddle fitting
7. Press and hold the parts together
8. Cool the joint and remove the fusion machine

Most pipe manufacturers have detailed parameters and procedures to follow. The majority of them helped develop and have approved the PPI Technical Report TR-41 for the generic saddle fusion joining procedure for PE pipe [16] and ASTM 2620.

2.4.3 Socket Fusion

This technique consists of simultaneously heating both the external surface of the pipe end and the internal surface of the socket fitting until the material reaches the recommended fusion temperature, inspecting the melt pattern, inserting the pipe end into the socket, and holding it in place until the joint cools. Figure 4 illustrates a typical socket fusion joint. Mechanical equipment is available to hold both the pipe and the fitting and should be used for sizes

larger than 2" CTS to help attain the increased force required and to assist in alignment. Most pipe manufacturers have detailed written procedures to follow. The majority refers to ASTM F 2620.

Figure 4 Standard Socket Fusion Joint

Follow these general steps when performing socket fusion:

1. Thoroughly clean the end of the pipe and the matching inside surface of the fitting

2. Square and prepare the pipe end

3. Heat the parts
4. Join the parts

5. Allow to cool

2.4.4 Equipment Selection

Select the proper size tool faces and heat the tools to the fusion temperature recommended for the material to be joined. For many years, socket fusion tools were manufactured without benefit of any industry standardization. As a result, variances of heater and socket depths and diameters, as well as depth gauges, do exist. More recently, ASTM F1056[7] was written, establishing standard dimensions for these tools. Therefore, mixing various manufacturers' heating tools or depth gauges is not recommended unless the tools are marked "F1056," indicating compliance with the ASTM specification and, thereby, consistency of tooling sizes.

2.4.5 Square and Prepare Pipe

Cut the end of the pipe square. Chamfer the pipe end for sizes 1¼"-inch diameter and larger. (Chamfering of smaller pipe sizes is acceptable and sometimes specified in the instructions.) Remove scraps, burrs, shavings, oil, or dirt from the surfaces to be joined. Clamp the cold ring on the pipe at the proper position, using the integral depth gauge pins or a separate (thimble type) depth gauge. The cold ring will assist in re- rounding the pipe and provide a stopping point for proper insertion of the pipe into the heating tool and coupling during the fusion process.

.2.4.6 Heating

Check the heater temperature. Periodically verify the proper surface temperature using a pyrometer or other surface temperature measuring device. If temperature indicating markers are used, do not use them on a surface that will come in contact with the pipe or fitting. Bring the hot clean tool faces into contact with the outside surface of the end of the pipe and with the inside

Ge

surface of the socket fitting, in accordance with pipe and fitting manufacturers' instructions.

2.4.7 Joining

Simultaneously remove the pipe and fitting from the tool using a quick "snap" action. Inspect the melt pattern for uniformity and immediately insert the pipe squarely and fully into the socket of the fitting until the fitting contacts the cold ring. Do not twist the pipe or fitting during or after the insertion, as is the practice with some joining methods for other pipe materials.

2.4.8 Cooling

Hold or block the pipe in place so that the pipe cannot come out of the joint while the mating surfaces are cooling. These cooling times are listed in the pipe or fitting manufacturer's instructions.

2.5 Electrofusion (EF)

This technique of heat fusion joining is somewhat different from the conventional fusion joining thus far described. The main difference between conventional heat fusion and electrofusion is the method by which the heat is applied. In conventional heat fusion joining, a heating tool is used to heat the pipe and fitting surfaces. The electrofusion joint is heated internally, either by a conductor at the interface of the joint or, as in one design, by a conductive polymer. Heat is created as an electric current is applied to the conductive material in the fitting. Figure 5 illustrates a typical electrofusion joint. PE pipe to pipe connections made using the electrofusion process require the use of electrofusion couplings.

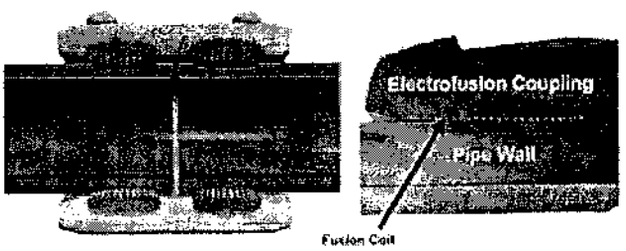


Figure 5 Typical Electrofusion Joint

General steps to be followed when performing electrofusion joining are:

1. Prepare the pipe (scrape, clean)
2. Mark the pipe
3. Align and restrain pipe and fitting per manufacturer's recommendations
4. Apply the electric current
5. Cool and remove the clamps
6. Document the fusion process

.2.5.' Prepare the Pipe (Clean and Scrape)

Assure the pipe ends are cut square when joining using electrofusion couplings. The fusion area must be clean from dirt or contaminants. This may require the use of water or 90% isopropyl alcohol (NO ADDITIVES OR NOT DENATURED). Next, the pipe surface in the fusion must be scraped, that is material must be removed to expose clean virgin material. This may be achieved by various special purpose tools available from the fitting manufacturer.

2.5.2 Mark the Pipe

Mark the pipe for stab depth of couplings or the proper fusion location of saddles. (Caution should be taken to assure that a non-petroleum marker is used.)

2.5.3 Align and Restrain Pipe or Fitting Per the Manufacturer's Recommendations

Align and restrain fitting to pipe per manufacturer's recommendations. Place the pipe(s) and fitting in the clamping fixture to prevent movement of the pipe(s) or fitting. Give special attention to proper positioning of the fitting on the prepared pipe surfaces. Large pipe diameters may need re-rounding prior to the electrofusion process.

2.5.4 Apply Electric Current

Connect the electrofusion control box to the fitting and to the power source (see Figure 6). Apply electric current to the fitting as specified in the manufacturer's instructions. Read the barcode which is supplied with the electrofusion fitting. If the control does not do so automatically, turn off the current when the proper time has elapsed to heat the joint properly.

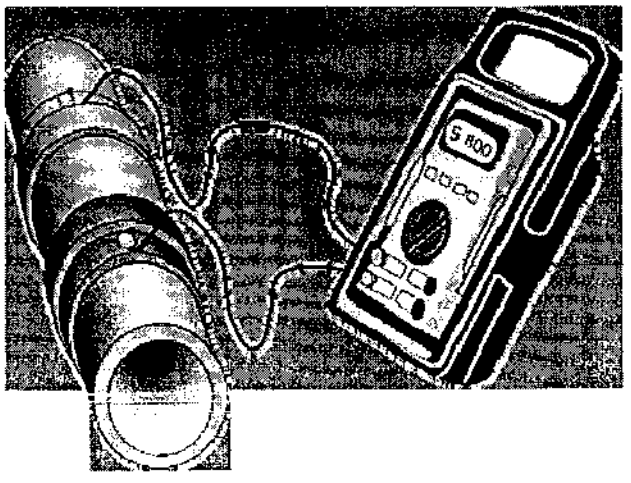


Figure 6 Typical Electrofusion Control Box and Leads with Clamps and Fittings

2.5.5 Cool Joint and Remove Clamps

Allow the joint to cool for the recommended time. If using clamps, premature removal from the clamps and any strain on a joint that has not fully cooled can be detrimental to joint performance.

Consult the fitting manufacturer for detailed parameters and procedures.

2.5.6 Documenting fusion

The Electrofusion control box that applies current to the fitting also controls

and monitors the critical parameters of fusion, (time, temperature, & pressure). The control box is a micro- processor capable of storing the specific fusion data for each joint. This information can be downloaded to a computer for documentation and inspection of the days work.

2.6 Heat Fusion Joining of Unlike PE Pipe and Fittings

Research has indicated that PE pipe and fittings made from unlike resins can be heatfused together to make satisfactory joints. Some gas companies have been heat-fusion joining unlike PEs for many years with success. Guidelines for heat fusion of unlike materials are outlined in TN 13, issued by the Plastics Pipe Institute. Refer to Plastics Pipe Institute Technical Reports TR-33 and TR-41, ASTM F 2620 and the pipe and fitting manufacturers for specific procedures.

As mentioned earlier, fusion joints, whether they involve the conventional butt, socket or saddle heat fusion assembly procedures or the electrofusion procedure, should only be made by personnel fully trained and qualified in those procedures. The equipment used shall be designed to operate for the selected pipe and fusion procedures. The equipment should be well maintained and capable of operating to specification. In addition, it is important that only the specified or recommended joining procedures be followed at all times during assembly operations.

2.7 Mechanical Connections

As in the heat fusion methods, many types of mechanical connection styles and methods are available. This section is a general description of these types of fittings.

The Plastics Pipe Institute recommends that the user be well informed about the performance attributes of the particular mechanical connector being utilized. Fitting selection is important to the performance of a piping system. Product performance and application information should be available from the fitting manufacturer to assist in the selection process as well as instructions for use and performance limits, if any. Additional information for these types of products is also contained in a variety of specifications such as ASTM F1924, F1973, and AWWA C219. PE pipe, conduit and fittings are available in outside diameter controlled Iron Pipe Sizes (IPS), Ductile Iron Pipe Sizes (DIPS), Copper Tubing Sizes (CTS) and Metric Sizes. There are also some inside diameter controlled pipe sizes (SIDR-PR). Before selecting mechanical fittings, establish which of the available piping system sizes and types are being installed to ensure proper fit and function. The pipe manufacturer can provide dimensional information, and the fitting manufacturer can advise on the correct fitting selection for the application.

.2.8 Mechanical Compression Couplings for Small Diameter Pipes

This style of fitting comes in many forms and materials. The components, as depicted in Figure 7, are generally a body; a threaded compression nut; an elastomer seal ring or O-ring; a stiffener; and, with some, a grip ring. The seal and grip rings, when compressed, grip the outside of the pipe, effecting a pressure-tight seal and, in most designs, providing pullout resistance which exceeds the yield strength of the PE pipe. It is important that the inside of the pipe wall be supported by the stiffener under the seal ring and under the gripping ring (if incorporated in the design), to avoid deflection of the pipe. A

lack of this support could result in a loss of the seal or the gripping of the pipe for pullout resistance. This fitting style is normally used in service lines for gas or water pipe 2" IPS and smaller. It is also important to consider that three categories of this type of joining device are available. One type provides a seal only, a second provides a seal and some restraint from pullout, and a third provides a seal plus full pipe restraint against pullout.

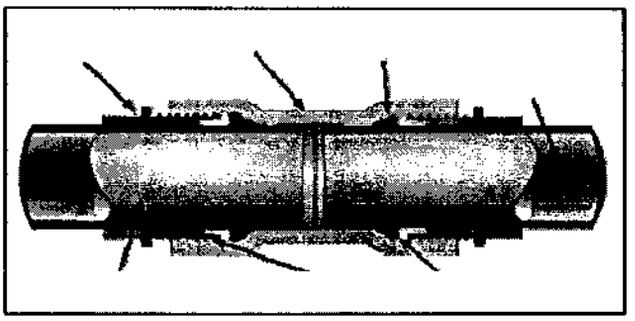


Figure 7 Typical Compression Nut Type Mechanical Coupling for Joining PE Pipe to PE Pipe

2.9 Stab Type Mechanical Fittings

Here again many styles are available. The design concept, as illustrated in Figure 8, is similar in most styles. Internally there are specially designed components including an elastomer seal, such as an "O" ring, and a gripping device to effect pressure sealing and pullout resistance capabilities. Self-contained stiffeners are included in this design. With this style fitting the operator prepares the pipe ends, marks the stab depth on the pipe, and "stabs" the pipe in to the depth prescribed for the fitting being used. These fittings are available in sizes from ½"CTS through 2" IPS and are all of ASTM D2513[2] Category I design, indicating seal and full restraint against pullout.

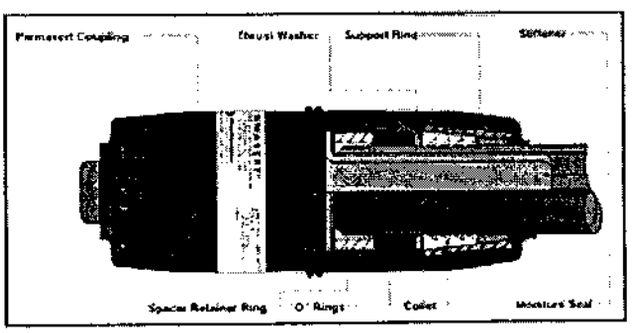
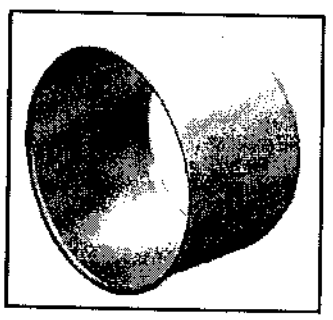


Figure 8 Stab Type Fitting

2.10 Mechanical Bolt Type Couplings

There are many styles and varieties of "Bolt Type" couplings available to join PE to PE or other types of pipe such as PVC, steel and cast iron in sizes from 1¼" IPS and larger. Components for this style of fitting are shown in Figure 9. As with the mechanical compression fittings, these couplings work on the general principle of compressing an elastomeric gasket around each pipe end to be joined, to form a seal. The gasket, when compressed against the outside of the pipe by tightening the bolts, produces a pressure seal. These

couplings may or may not incorporate a grip ring, as illustrated, that provides pullout resistance sufficient to exceed the yield strength of the PE pipe. When PE pipe is pressurized, it expands a little and shortens slightly due to Poisson's effect. In a run of PE pipe, the cumulative shortening may be enough to cause separation of unrestrained mechanical joints that are in-line with the PE pipe. This can be a particular concern where transitioning from PE pipe to Ductile Iron pipe. Joint separation can be prevented by installing external joint restraints (gripping devices or flex restraints; see Figure 16) at mechanical connections, or by installing in-line anchors or a combination of both. Additional restraint mechanisms are available to supplement the pull resistance of these types of fittings if needed. The fitting manufacturer can help guide the user with that information. Use of a stiffener is needed in this fitting style to support the pipe under the area of the seal ring and any gripping devices incorporated for pullout resistance



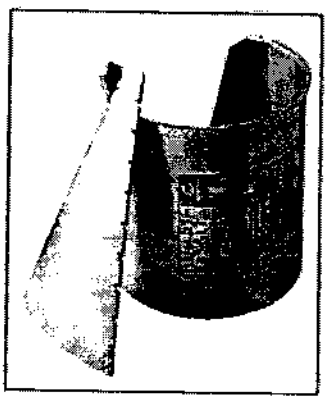


Figure 9 Mechanical Bolt Type Coupling for Joining Steel Pipe to PE or for Joining Two PE Pipes

2.11 Stiffener Installation Guidelines

When connecting PE pipe to the bell end of a ductile iron or PVC pipe, it is recommended that a stiffener be added to the ID of the pipe to insure a good connection between the seal in the bell and the pipe. Check the pipe for toe in. If it is severe, cut the pipe back to remove it. If possible, have some means to press the stiffener into place. Lubricant will minimize the insertion effort required. A detergent or silicone grease is recommended.

There are two types of stiffeners available on the market. One type is a fixed diameter stiffener that matches the ID of the pipe being repaired (see Figure 10). Caution should be used when using fixed diameter stiffeners to be sure they are sized properly to obtain the proper press fit in the PE pipe. These are mainly used with smaller diameter service lines.

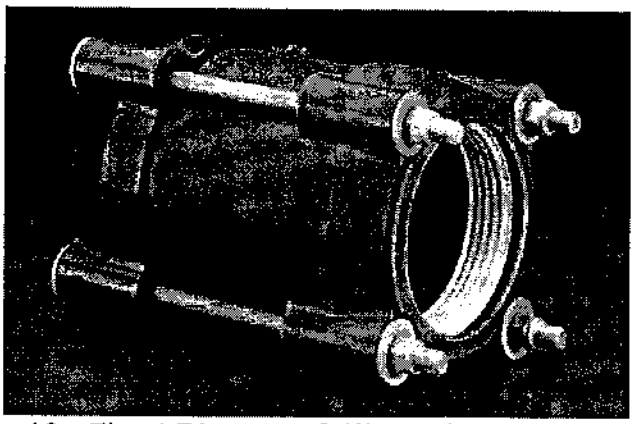


Figure 10 Fixed Diameter Stiffener for PE Pipe

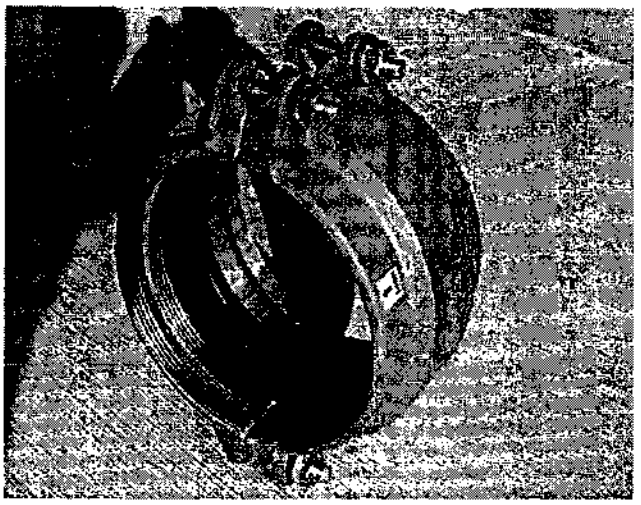
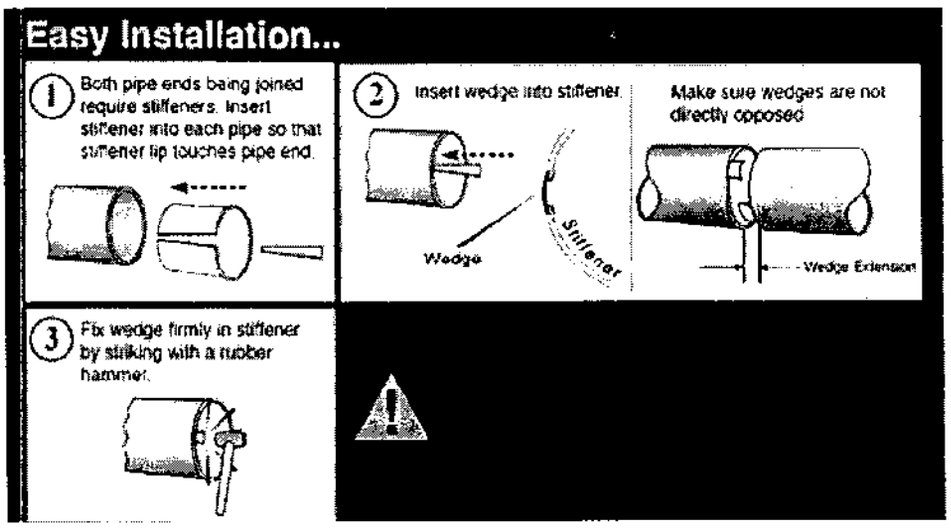


Figure 11a Split Ring Stiffener for PE Pipe

The other type of stiffener is a split ring stiffener (see Figure 11a). These are normally made of stainless steel and provide a thin yet strong pipe wall reinforcement without disturbing the flow characteristic of the pipe. The easy installation instructions are shown in Figure 11b.



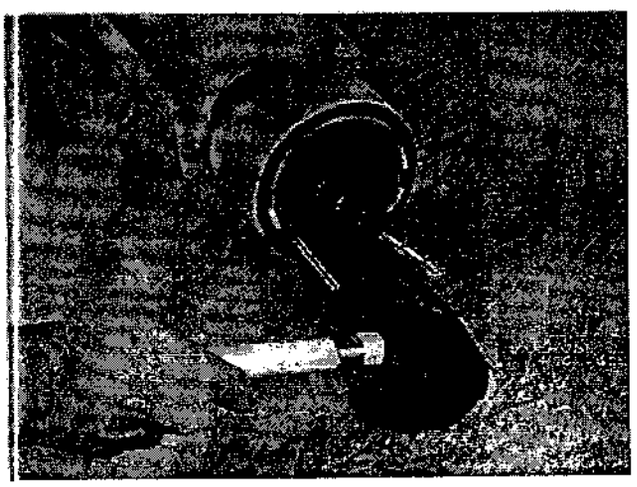


Figure 12 Install Split Ring Stiffener in PE Pipe

2.12 Flanged Connections

2.12.1 PE Flange Adapters and Stub Ends

When joining to metal or to certain other piping materials, or if a pipe section capable of disassembly is required, PE flange adapters, as depicted in Figures 13-15, are available. The "Flange Adapter" and its shorter version, the "Stub End," are designed so that one end is sized the same as the PE pipe for butt fusion to it. The other end has been especially made with a flange-type end that, provides structural support, which eliminates the need for a stiffener and, with the addition of a metal back-up ring, permits bolting to a similar flanged end connection — normally a 150-pound ANSI flange.[1]

The general procedures for joining would be:

1. Slip the metal ring onto the PE pipe section, far enough away from the end to avoid interference with operation of the butt fusion equipment.
2. If a stub end is used, first butt-fuse a short length of PE pipe to the pipe end of the stub end. If a "flange adapter" is used, the PE pipe-sized end is usually long enough that this step is unnecessary.
3. Butt fuse the flange adapter to the PE pipe segment.
4. The fusion bead may need to be removed to clear the back-up ring as it is moved against the flange.
5. Position the flanged face of the adapter at the position required so that the back-up ring previously placed on the PE pipe segment can be attached to the metal flange.
6. Install and tighten the flange bolts in a criss-cross pattern sequence (see TN 38), normally used with flange type connections, drawing the metal and PE flange faces evenly and flat. Do not use the process of tightening the flanges to draw the two sections of pipe together.

At lower pressure, typically 80 psi or less, a gasket is usually not required. At greater pressure, the serrated surface of the flange adapter helps hold the gasket in place. The flange face serration's should be individual closed concentric serration's as opposed to a continuous spiral groove which could act as a leak path. Standard Back-Up Rings are AWWA C207 Class D for 160 psi and lower pressure ratings, or Class 150 for higher pressure. Back-up ring materials are steel, primer coated steel, epoxy coated steel, or stainless steel. Ductile iron and fiberglass back-up ring materials are also available. In below ground service, coatings and cathodic protection may be appropriate to protect metal back-up rings from corrosion. One edge of the back-up ring bore must be rounded or chamfered. This edge fits against the back of the sealing surface flange.

An all-PE flange without a back-up ring is not recommended because PE flanges require uniform pressure over the entire sealing surface. Without a back-up ring, a PE flange will leak between the bolts.

Flange adapters differ from stub-ends by their overall length. A flange adapter is longer allowing it to be clamped in a fusion machine like a pipe end. The back-up ring is fitted to the flange adapter before fusion, so external fusion bead removal is not required.

A stub end is short and requires a special stub-end holder for butt fusion. Once butt fused to the pipe, the external bead must be removed so the back-up ring can be fitted behind the sealing surface flange. In the field, flange adapters are usually preferred over stub-ends.

Figure 13 Flange Adapter Assembly

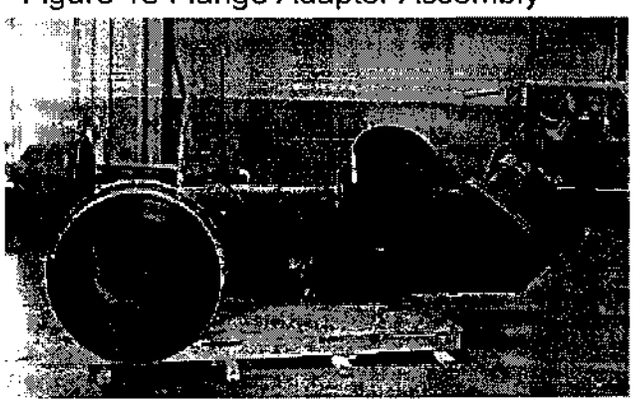


Figure 14 Fused Manifold Assembly with Flange Adapters and Back Up Rings

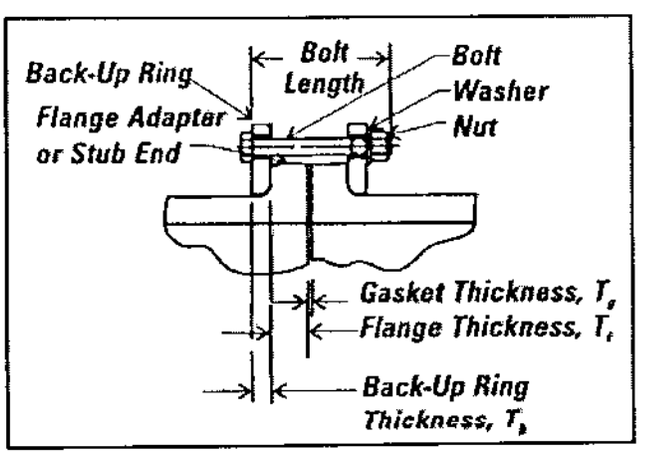


Figure 15 Flange Adapter Bolted Assembly Cross Section

2.12.2 Flange Gasket

A flange gasket may not be required between PE flanges. At lower pressures (typically 80 psi or less) the serrated flange sealing surface may be adequate. Gaskets may be needed for higher pressures and for connections between PE and non-PE flanges. If used, gasket materials should be chemically and thermally compatible with the internal fluid and the external environment, and should be of appropriate hardness, thickness and style. Elevated temperature applications may require higher temperature capability. Gasket thickness should be about 1/8"-3/16" (3-5mm) and about 60-75 Shore A hardness. Too soft or too thick gaskets may blow out under pressure. Overly hard gaskets may not seal. Common gasket styles are full-face or drop-in. Full-face style gaskets are usually applied to larger sizes, because flange bolts hold a flexible gasket in place while fitting the components together. Drop-in style gaskets are usually applied to smaller pipe sizes.

2.12.3 Flange Bolting

Mating flanges are usually joined together with hex bolts and hex nuts, or threaded studs and hex nuts. Bolting materials should have tensile strength equivalent to at least SAE Grade 3 for pressure pipe service, and to at least SAE Grade 2 for non-pressure service. Corrosion resistant materials should be considered for underground, underwater, or other corrosive environments. Flange bolts are sized 1/8" smaller than the blot hole diameter. Flat washers should be used between the nut and the back-up ring.

Flange bolts must span the entire width of the flange joint, and provide sufficient thread length to fully engage the nut.

2.12.4 Flange Assembly

Mating flanges must be aligned together before tightening. Tightening misaligned flanges can cause flange assembly failure. Surface or above grade flanges must be properly supported to avoid bending stresses. Below grade flange connections to heavy appurtenances such as valves or hydrants, or to metal pipes, require a support foundation of compacted, stable granular soil (crushed stone), or compacted cement stabilized granular backfill, or reinforced concrete. Flange connections adjacent to pipes passing through structural walls must be structurally supported to avoid shear loads.

Prior to fit-up, lubricate flange bolt threads, washers, and nuts with a non-fluid lubricant. Gasket and flange sealing surfaces must be clean and free of significant cuts or gouges. Fit the flange components together loosely. Hand-tighten bolts and re-check alignment. Adjust alignment if necessary. Flange bolts should be tightened to the same torque value by turning the nut. Tighten each bolt according to the patterns and torques recommended by the flange

manufacturer. PE and the gasket (if used) will undergo some compression set. Therefore, retightening is recommended.
about an hour or so after torquing to the final torque value the first time. In crisscross pattern sequence, retighten each bolt to the final torque value. For high pressure or environmentally sensitive or critical pipelines, a third tightening, about 4 hours after the second, is recommended.

1.3 Underground Installation of PE Piping

.3.1 Trenching

Trench collapses can occur in any soil and account for a large number of worker deaths each year. In unbraced or unsupported excavations, proper attention should be paid to sloping the trench wall to a safe angle. Consult the local codes. All trench shoring and bracing must be kept above the pipe. (If this is not possible, consult the more detailed installation recommendations.) The length of open trench required for fused pipe sections should be such that bending and lowering the pipe into the ditch does not exceed the manufacturer's minimum recommended bend radius and result in kinking. The trench width at pipe grade should be equal to the pipe outer diameter (O. D.) plus 12 inches.

.3.2 De-watering

For safe and proper construction the groundwater level in the trench should be kept below the pipe invert. This can be accomplished by deep wells, well points or sump pumps placed in the trench.

3.3 Bedding

Where the trench bottom soil can be cut and graded without difficulty, pressure pipe may be installed directly on the prepared trench bottom. For pressure pipe, the trench bottom may undulate, but must support the pipe smoothly and be free of ridges, hollows, and lumps. In other situations, bedding may be prepared from the excavated material if it is rock free and well broken up during excavation. The trench bottom should be relatively smooth and free of rock. When rocks, boulders, or large stones are encountered which may cause point loading on the pipe, they should be removed and the trench bottom padded with 4 to 6 inches of tamped bedding material. Bedding should consist of free-flowing material such as gravel, sand, silty sand, or clayey sand that is free of stones or hard particles larger than one-half inch

.3.4 Placing Pipe in Trench

PE pressure pipe up to about 8" in diameter and weighing roughly 6 lbs per ft or less can usually be placed in the trench by hand. Heavier, larger diameter pipe will require handling equipment to lift, move, and lower the pipe into the trench. Pipe must not be dumped, dropped, pushed, or rolled into the trench. Appropriate safety precautions must be observed whenever persons are in or near the trench

.3.5 Pipe Embedment

The embedment material should be a coarse grained soil, such as gravel or sand, or a coarse grained soil containing fines, such as a silty sand or clayey sand. The particle size should not exceed one-half inch for 2 to 4-inch pipe, three-quarter inch for 6 to 8-inch pipe and one inch for all other sizes. Where the embedment is angular, crushed stone may be placed around the pipe by dumping and slicing with a shovel.
Where the embedment is naturally occurring gravels, sands and mixtures with fines, the embedment should be placed in lifts, not exceeding 6 inches in thickness, and then tamped. Tamping should be accomplished by using a mechanical tamper. Compact to at least 85 percent Standard Proctor density as defined in ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort, (12 400 ft-lbf/ft^3 (600 kN-m/m^3))." Under streets and roads, increase compaction to 95 percent Standard Proctor density.

.3.6 Leak Testing

If a leak test is required, it should be conducted in accordance with the procedure in Chapter 2 after the embedment material is placed

.3.7 Trench Backfill

The final backfill may consist of the excavated material, provided it is free from unsuitable matter such as large lumps of clay, organic material, boulders or stones larger than 8 inches, or construction debris. Where the pipe is located beneath a road, place the final backfill in lifts as mentioned earlier and compact to 95 percent Standard Proctor Density.

.3.8 Engineered Installation Guidelines for PE Pipe

There will be applications where the engineer will want to prepare a specific embedment specification. These applications would most likely include gravity flow pipes that are relatively deep, shallow cover applications where the pipe is subject to vehicular or train loading, pipes placed in unstable, soft, or wet soils, high DR pipes, and pipes in deep applications such as landfills and embankments. The Simplified Installation Guidelines do not cover these applications. What all of these applications have in common is that the soil provides a relatively significant portion of the support against the overburden soil and surface loads. Or, to say this differently, the soil provides a relatively significant portion of the deflection resistance of the pipe. In these cases, detailed attention must be paid to the native (in-situ) soil, the embedment soil, and the placement of the embedment soil. The objective of installation is to minimize pipe deflection. Profile wall pipes such as pipes manufactured to ASTM F894 are normally inspected for deflection after installation. These pipes are normally limited to gravity flow applications and very low pressure systems. Conventionally-

extruded, solid wall pipes such as "DR" classified pipes that are joined by heat fusion are normally not inspected for deflection. For instance AWWA standards C901 and C906 and manual M-55 do not call for field deflection testing of "DR" classified PE pipes.

.3.9 Deflection Control

The load carrying capability of a PE pipe, particularly a pipe with a high DR, can be greatly increased by the soil in which it is embedded. When the pipe is loaded, load is transferred from the pipe to the soil by a horizontal outward movement of the pipe wall (see Figure 2). This enhances contact between pipe and soil and mobilizes
the passive resistance of the soil. This resistance aids in preventing further pipe deformation and contributes to the support for the vertical loads. The amount of resistance found in the embedment soil is a direct consequence of the installation procedure. The stiffer the embedment materials are, the less deflection occurs. Because of this, the combination of embedment and pipe is often referred to as a pipe-soil system.

The key objective of a PE pipe installation is to limit or control deflection. (In this chapter the term "deflection" will mean a change in vertical diameter of the pipe, unless otherwise stated.) The deflection of a PE pipe is the sum total of two major components: the "installation deflection," which reflects the technique and care by which the pipe is handled and installed; and the "service deflection," which reflects the accommodation of the constructed pipe-soil system to the subsequent earth loading and other loadings.

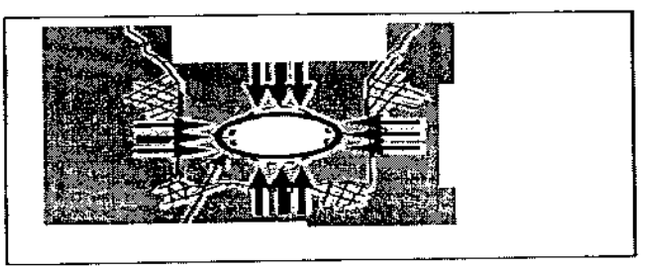


Figure 2 Mobilization of Enveloping Soil through Pipe Deformation

The "service deflection," which is usually a decrease in vertical pipe diameter, may be predicted by a number of reasonably well documented relationships, including those of Watkins and Spangler [1,2], or by use of a finite element analysis such as CANDE [1,2]. The "installation deflection" may be either an increase or decrease in vertical pipe diameter. An increase in vertical pipe diameter is referred to as "rise" and is usually a result of the forces acting on the pipe during compaction of the embedment beside it. Moderately stiff pipes such as DR17 and DR21 and stiffer pipes are usually unaffected by "rise" due to normal construction

technique. Up to a point this may be beneficial in offsetting service deflection. Installation deflection is not predictable by any mathematical formula, although there are empirical methods for accounting for it [3].

Installation deflection is subject to control by the care used in the placement and compaction of the pipe embedment material in relation to the pipe's ring stiffness. For instance, compaction forces from hand operated air or gasoline tampers normally cause little rise, even when obtaining densities of 95 percent, but driving heavy loading equipment or driven compactors on the embedment while it is being placed beside the pipe may cause severe rise even in DR17 and stiffer pipes. Commonly, deflection varies along the length of the pipeline due to variations in construction technique, soil type and loading. Field measurements illustrating this variability have been made by the U. S. Bureau of Reclamation and have been published by Howard[3]. Typically, this variation runs around ±2 percent.

3.10 *Deflection Limit*

Designing buried pipe to control deflection is discussed in Chapter 6. Field inspection of the installation procedure is generally adequate for controlling deflection of most PE fusion joined pipes. Very large diameter pipes (man entry) and gasketed jointed PE pipes are sometimes inspected for vertical deflection. Typically deflection easurements are made only after the backfill has been placed on the pipe for at least 30 days. The engineer will specify an acceptance deflection. Commonly a limit of 5 percent is used. This provides an additional safety factor as most gravity flow PE pipe can withstand higher deflection without damage.

3.11 Pipe Embedment Materials

The embedment is the material immediately surrounding the pipe. This material may be imported, such as a crushed stone, or it may be the material excavated from the trench to make room for the pipe. In this case, it is referred to as native soil.

The embedment material should provide adequate strength, stiffness, uniformity of contact and stability to minimize deformation of the pipe due to earth pressures. The earth pressure acting on the pipe varies around the pipe's circumference. The pressure on the crown or top will typically be less than the free field stress as is the pressure at the invert or bottom of the pipe. Often, the highest pressure may be acting horizontally at the spring line of the pipe, due to mobilization of passive pressure and arching. Because the earth pressure is acting around the circumference, it is important to completely envelop the pipe in embedment. (This may vary to a greater or lesser extent depending on the earth pressure, burial depth, and SDR.) To ensure that the embedment function should always be carried out under the anticipated job conditions, the design engineer will specify the permissible pipe embedment materials and their minimum acceptable density (compaction).

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The properties of the in-situ (or native) soil into which the pipe is placed need not be as demanding as those for the embedment materials (unless it is used as the embedment material). The native soil may experience additional compression and deformation due to the horizontal pressure exerted by the pipe and transferred through the embedment material. This is usually a minor effect, but in some cases it can result in additional pipe deflection. This is most likely to occur where native soils are wet and loose, soft, or where native soil sloughs into the trench during excavation and is not removed. This effect is attenuated as the trench width (or width of embedment material) increases. Therefore, consideration must be given to the in-situ soil to ensure that it has adequate strength to permanently contain the embedment system. This is also discussed in a following section.

3.12 Classification and Supporting Strength of Pipe Embedment Materials

The burial of PE pipe for gravity flow applications is covered by ASTM D2321 "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewer and Other Gravity-Flow Applications." ASTM 2774, "Standard Practice for Underground Installation of Thermoplastic Pressure Piping," covers water pipe and force mains.

3.12.1 Strength of Embedment Soil

When selecting embedment material, consideration should be given to how the grain size, shape, and distribution will affect its supporting strength. The following will help guide the designer or installer in making a choice. In general, soils with large grains such as gravel have the highest stiffness and thus provide the most supporting strengths. Rounded grains tend to roll easier than angular, or sharp grains, which tend to interlock, and resist shear better. Well graded mixtures of soils (GW, SW), which contain a good representation of grains from a wide range of sizes, tend to offer more resistance than uniform graded soils (GP, SP). Aside from the grain characteristics, the density has the greatest effect on the embedment's stiffness. For instance, in a dense soil there is considerable interlocking of grains and a high degree of grain-to-grain contact. Movement within the soil mass is restricted as the volume of the soil along the surface of sliding must expand for the grains to displace. This requires a high degree of energy. In a loose soil, movement causes the grains to roll or to slide, which requires far less energy. Thus, loose soil has a lower resistance to movement. Loose soil will permit more deflection of pipe for a given load than a dense soil.

3.12.2 Embedment Classification Per ASTM D-2321

Pipe embedment materials have been grouped by ASTM D-2321, "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity -Flow Applications" into five embedment classes according to their suitability for that use. See Appendix 1 for embedment soil descriptions, classifications, and soil group symbols referred to in the following paragraphs.

3.12.3 Class I and Class II

Class I and II soils are granular and tend to provide the maximum embedment support as illustrated by the high E' values that can be achieved with them. See Chapter 6 Table 2-7 for the relationship between soil types and E' values. Class I material is generally manufactured aggregate, such as crushed stone. Class II materials consist of clean sands and gravels and are more likely to be naturally occurring soils such as river deposits. Class I and Class II materials can be blended together to obtain materials that resist migration of finer soils into the embedment zone (as will be explained below.) In addition, Class I and II materials can be placed and compacted over a wide range of moisture content more easily than can other materials. This tends to minimize pipe deflection during installation. The high permeability of open-graded Class I and II materials aids in de-watering trenches, making these materials desirable in situations such as rock cuts where water problems may be encountered. This favorable combination of characteristics leads many designers to select these materials over others when they are readily and economically available.

Maximum aggregate size of Class I and Class II materials when used next to the pipe (i. e. , bedding, haunching and initial backfill) should not be larger than those given in Table 1 below. (Larger stones up to 1½ inches have been successfully used, but they are difficult to shovel slice and compact.) The smaller the rock size, the easier it is to place in the haunches. Maximum size for the foundation material is not restricted except that it should be graded to prevent the bedding stone from migrating into it.

TABLE 1
Maximum Particle Size vs. Pipe Size

Nominal pipe size (in)	Maximum Prticle size (in)
2 to 4	½
6 to 8	¾
10 to 15	1
16 and larger	1 ½

3.12.4 Migration

When the pipe is located beneath the ground water level, consideration must be given to the possibility of loss of side support through soil migration (the conveying by ground water of finer particle soils into void spaces of coarser soils). Generally, migration can occur where the void spaces in the embedment material are sufficiently large to allow the intrusion of eroded fines from the trench

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side walls.

For migration to occur, the in-situ soil must be erodible. Normally, erodible soils are fine sand and silts and special clays known as dispersive clays. (Most clays have good resistance to dispersion.) This situation is exacerbated where a significant gradient exists in the ground water from outside of the trench toward the inside of the trench; i. e. , the trench must act as a drain. (Seasonal fluctuations of the ground water level normally do not create this condition.)

For such anticipated conditions, it is desirable when using granular materials (Class I and II) to specify that they be angular and graded to minimize migration.

Rounded particles have a tendency to flow when a considerable amount of water exists and material with a high void content provides "room" for migrating particles. The Army Corps of Engineers developed the following particle size requirements for properly grading adjacent materials to minimize migration:

Where the D_{15}, D_{50} and D_{85} are the particle sizes from a particle size distribution plot at 15%, 50% and 85%, respectively, finer by weight and where D^E is the embedment soil and D^A is the adjacent in-situ soil.

Another approach to preventing migration is to use geotextile separation fabrics. The fabric is sized to allow water to flow but to hold embedment materials around the pipe.

3.12.5 Cement Stabilized Sand

One special case of Class II material is Cement Stabilized Sand. Cement Stabilized Sand, once cured, is generally considered to give the same or better supporting strength as compacted Class I material. Cement Stabilized Sand consists of sand mixed with 3 to 5 percent cement. To achieve proper density, the material is placed with compaction rather than poured as with concrete. The material must be placed moist (at or near optimum moisture content) and then compacted in lifts as a Class II material. (The optimum moisture content is that moisture content at which a material can achieve its highest density for a given level of compaction.) If desired, deflection can be reduced if the cement sand embedment material is allowed to cure overnight before placement of backfill to grade. If the trench is backfilled immediately, cement sand will give the same support as a Class II material, but the lag factor will be reduced. Cement sand is usually placed in both the primary initial and secondary initial backfill zones

3.12.6 Class III and Class IVA

Class III and Class IVA materials provide less supporting stiffness than Class I or II materials for a given density or compaction level, in part because of the increased clay content. In addition, they require greater compactive effort to

attain specified densities and their moisture content must be closely controlled within the optimum limit. Placement and compaction of Class IVA materials are especially sensitive to moisture content. If the Class IVA material is too wet, compaction equipment may sink into the material; if the soil is too dry, compaction may appear normal, but subsequent saturation with ground water may cause a collapse of the structure and lead to a loss of support. Typically, Class IVA material is limited to applications with pressure pipe at shallow cover.

3.12.7 Class IVB and Class V

Class IVB and Class V materials offer hardly any support for a buried pipe and are often difficult to properly place and compact. These materials are normally not recommended for use as pipe embedment unless the pipe has a low SDR (or high ring stiffness), there are no traffic loads, and the depth of cover is only a few feet. In many cases the pipe will float in this type of soil if the material becomes saturated.

3.12.8 Compaction of Embedment Materials

Compaction criteria for embedment materials are a normal requirement in flexible pipe construction. Compaction reduces the void space between individual grains and increases the embedment density, thereby greatly improving pipe load carrying ability while reducing deflection, settlement, and water infiltration problems. Compaction of the embedment often will increase the stiffness of the in-situ soil and provide a sort of pre-stressing for the embedment and in-situ soils. Because of these benefits compaction should be considered on all projects.

3.12.9 Density Requirements

The required degree of compaction for an installation will be set by the designer in consideration of height of cover, extent of live loading, water table elevation and soil properties. Generally, the "moderate" compaction requirements listed in Table 2-7 of chaper 6 are quite satisfactory. When compacting to tis "moderate" level, it is suggested that the minimum target values for field measured densities be set as 90 percent Standard Proctor Density. This field density requirement will ensure that the actual densities will always be within the "moderate" range presented in Table 2-7.

The Standard Proctor density of embedment materials is normally measured using ASTM D-698, "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft^3 (600 kN-m/m^3)) while the Modified Proctor density is measured using ASTM D-1557, "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3))." See Appendix 2 for a discussion of the difference between density and compaction and a discussion of the various test methods.

3.12.10 Compaction Techniques

Compaction of the embedment material should be performed by the most economical method available, consistent with providing uniform compaction and attaining the minimum specified density. Typical equipment used for compaction are hand held tamping bars (see Figure 4), gasoline driven

impact tampers ("whackers"), vibratory plates, and air driven impact tampers ("pogo sticks"). With crushed stone, some degree of densification can be achieved by the technique of shovel slicing, which consists of cutting the soil with a shovel.

Compaction of the haunching material can best be accomplished by hand with tampers or suitable power compactors, taking particular care in the latter case not to disturb the pipe from its line and grade. In 36" and larger pipe, hand tampers are often used to reach under the haunches; they are then followed up with power compaction alongside the pipe When compacting the embedment near the pipe with impact-type tampers, caution should be taken to not allow direct contact of the equipment with the pipe. Avoid use of impact tampers directly above the pipe until sufficient backfill (usually 12") has been placed to ensure no local deformation of the pipe. Compaction of the embedment material alongside the pipe should not cause pipe to lift off of grade, but if upward movement occurs, reduce the compaction level below the spring line or move the compactor away from the pipe toward the side of the trench.

Compaction of primary initial backfill should be conducted at, or near, the material's optimum moisture content. The backfill should be placed in layers, or lifts, that are brought up evenly on both sides of the pipe, otherwise the pipe could be moved off alignment. Each lift should be thoroughly compacted prior to placement of the next layer. The maximum lift height that will allow development of uniform density will vary depending on the material, its moisture content, and compactive effort. In general, maximum lifts of approximately 12 inches for Class I, 8 inches for Class II, and 6 inches for all others are adequate.

3.12.11 Compaction of Class I and II Materials

Compaction by vibration is most effective with granular (Class I and II) materials. Compaction of stone does not deform the stone but it does move it into a more compact or dense arrangement. In cases where the engineer specifies a minimum soil density of 90 percent of Standard Proctor or higher, as for installations under deep cover, mechanical compaction of Class I materials will be required. Impact tampers will also increase the density of Class I and II materials, primarily due to vibration. Impact tamping also acts to drive the embedment into the in-situ soil, which stiffens the trench wall interface. For this reason, impact compaction of Class I material should be considered for any application where the pipe will be below the ground water table or where the stability of the in-situ soil is in question.

An alternate method of achieving compaction with Class I materials is shovel slicing. Materials having been shovel sliced thoroughly will generally yield a modulus of around 1000 psi. The effectiveness of this method depends on the frequency of slicing along the length of the pipe. This technique should be limited to dry or firm (or better) in-situ soils. Where Class I materials are dumped around the pipe without any compactive effort (or shovel slicing), E's may be considerably lower than those given in the Chapter 6, Table 2-7. This is especially the case in wet or loose ground. A few passes with a vibratory compactor will increase the density and modulus of soil reaction.

Mechanical compaction of Class II materials can be aided by slight wetting.

When so doing, care must be taken not to saturate the material or flood the trench, particularly when the native trench material does not drain freely. Flooding can result in flotation of the pipe.

Compaction by saturation, also called flooding or water tamping, is sometimes used to compact Class II materials. This method of compaction rarely yields Proctor densities greater than 75 percent, and therefore it will generally not give an E' of 750 psi or higher. Flooding is only suited for those applications where the pipe has sufficient internal supporting strength for the design load and does not depend on the soil for side support. (When considering this method for embedment that must provide side support, a geotechnical engineer should be consulted.) Compaction by saturation is limited to applications where both the embedment soil and in-situ soil are free draining. Compaction should be done in lifts not exceeding the radius of the pipe or 24 inches, whichever is smaller. Only enough water should be placed to saturate the material. It should be determined through proper monitoring that the desired level of compaction is being attained in each lift. Compaction by saturation should not be used in freezing weather. Water jetting, or the introduction of water under pressure to the embedment material, should not be used with plastic pipe.

3.12.12 Compaction of Class III and IV Materials

Compaction by impact is usually most effective with Class III and Class IVa materials. The use of mechanical impact tampers is most practical and effective. Depending on the embedment material, its moisture content, and lift height, several compaction passes may be required. A maximum lift height of 6 inches should be used when compacting by impact. Embedment density should be suitably monitored to ensure that specification requirements are met.

3.12.13 Density Checks

It is prudent to routinely check density of the embedment material. Typically, several checks are made during start-up of the project to ensure that the compaction procedure is achieving the desired density. Random checks are subsequently made to verify that the materials or procedures have not changed. Checks should be made at different elevations of the embedment material to assure that the desired compaction is being achieved throughout the embedment zone.

16.3.12.14 Trench Construction

Trenches should be excavated to line and grade as indicated by contract documents and in accordance with applicable safety standards. Excavation should proceed upgrade. Excessive runs of open trench should be avoided to minimize such problems as trench flooding, caving of trench walls and the freezing of trench bottom and backfill material, and to minimize hazards to workmen and traffic. This can be accomplished by closely coordinating excavation with pipe installation and backfilling.

Principal considerations in trench construction are trench width, stability of the native soil supporting and containing the pipe and its embedment soil, stability of trench walls, and water accumulation in the trench. When encountering unstable soils or wet conditions, they should be controlled by

providing an alternate foundation, sloping or bracing the trench walls, de-watering the trench bottom, or some other such measure.

.3.12.15 Trench Width

Since flexible pipe has to support, at most, only the weight of the "prism" or vertical column of soil directly over the pipe, the precaution of keeping the trench as narrow as possible is not the concern that it is for a rigid pipe, which can be subjected to the weight of the soil beside the prism as well as the prism itself. With PE pipe, widening the trench will generally not cause a loading greater than the prism load on the pipe. Trench width in firm, stable ground is determined by the practical consideration of allowing sufficient room for the proper preparation of the trench bottom and placement and compaction of the pipe embedment materials, and the economic

consideration of the costs of excavation and of imported embedment materials. Trench width in firm, stable ground will generally be determined by the pipe size and the compacting equipment used. Table 2 below gives minimum trench width values.

The trench width may need to be increased over the values in Table 2 to allow for sufficient clearance between the trench sidewalls and the pipe for compaction equipment. Typically for large diameter pipe (18" and larger), this required clearance will vary from 12 to 18 inches. If two or more pipes are laid in the same trench, sufficient space must be provided between the pipes so that embedment material can be compacted.

TABLE 2

Minimum Trench Width in Stable Ground vs. Pipe Size

Nominal Pipe Size (in.)	MinimumTrench Width (in.)
< 3	12
3 - 24	Pipe O. D. + 12
> 24 - 63	Pipe O. D. + 24

Note to Table 2: Minimum trench widths do not apply to trenching techniques that use chain or wheel trenchers or plows to lay PE pipe. Chain and wheel trenching techniques feed PE pipe over the earth-cutting machine and lay the pipe immediately into the earth-cut. These techniques use round-bottom chain or wheel trenching machines that match pipe radius and do not require extra trench width to place embedment in the pipe haunches below the pipe springline. Plowing techniques feed smaller diameter PE pipe or tubing through a chute that is integrated into an earth plow. Plowing may not require backfilling

3.12.16 Trench Length

Table 3 lists the recommended lengths of trench openings for each placement of continuous lengths of fused pipe, assembled above the trench. When the trench sidewalls are significantly sloped, somewhat shorter trench openings may be used. When space or ground conditions do not permit these uggested trench openings, the pipe lengths may be joined within the trench, using a joining machine or flanged couplings. When bell-and-spigot jointed pipe or

flange-end pipe is used, the trench opening needs to be only long enough to accommodate placement and assembly of a single pipe length.

TABLE 3
Suggested Length of Minimum Trench Opening (Feet) for Installation of Joined Lengths of PE Pipe

Nominal Pipe Size (in.)	Depth of Trench (Feet					
	3	5	7	9	11	13
½ to 3	15	20	25	30	35	40
4 to 8	25	30	35	40	45	50
10 to 14	35	40	45	50	55	60
16 to 22	45	50	55	60	65	70
24 to 42	-	60	65	70	75	80
48	-	-	80	90	100	110

3.12.17 Stability of the Trench

Although the native soil in which PE pipe is installed need not be as strong and stiff as the pipe embedment materials, it should provide adequate support and stable containment of the embedment material so that the density of the embedment material does not diminish. If the trenching conditions present construction problems such as trench sidewalls that readily slough off or a soft trench floor that will not support workers or compaction, it is termed unstable. The instability is usually a condition of the trench and not the soil. Most often the primary cause of the instability is high groundwater, not the soil. Even soft or loose soils can provide good support for the pipe if they are confined. The problem with unstable conditions generally occurs during the installation. When the trench is opened where groundwater is present, most soils, except firm, cohesive soils (firm clays) or cemented soils, tend to slough off the trench wall. This results in a trench that keeps widening, with loose material falling into the trench floor.

Soil formations that commonly lead to unstable trenching conditions include materials with fine grain soils (silts or clays) saturated with water and uncemented sands saturated with water. In some cases, where the soil has an extremely high water content, such as with peat or with clay (or silt) having a water content beyond the liquid limit, the soil behaves "hydraulically", that is, the water in the soil controls the soil's behavior. Here, the backfill must be designed to sustain all the pressure from the pipe without support from the in-situ soil. These conditions may occur in saturated fine grained soils where the unconfined compressive strength of the soil is less than 500 psf, or in saturated, sandy soils where the standard penetration value, N, is less than 6 blows per ft. In this case, an engineering evaluation should be made to determine the necessity for special procedures such as a "wide" trench or permanent trench sheeting of the trench width.

As mentioned above, most trench stability problems occur in trenches that are excavated below the groundwater level. (However, the designer and the contractor should keep in mind that all trenches pose the risk of collapse and therefore workers should not be in trenches that are not adequately braced or sloped.) Stability can be improved by lowering the water table through deep wells, well-points, or other such means. In some ground the permeability is such that the only option is to remove the water after it has seeped out of the trench walls. Here the contractor will use underdrains or sumps on the trench floor. De-watering should continue throughout the pipe laying operation until sufficient cover is placed over the pipe so that it will not float.

3.12.18 Stability of Trench Floor

Trench floor stability is influenced by the soils beneath the trench. The floor must be stable in order to support the bedding material. A stable bedding minimizes bending of the pipe along its horizontal axis and supports the embedment enveloping the pipe. Generally, if the trench floor can be walked on without showing foot prints it is considered stable.

In many cases the floor can be stabilized by simply dewatering. Where dewatering is not possible or where it is not effective, stabilization of the trench floor may be accomplished by various cost-effective methods which can be suited to overcome all but the most difficult soil conditions. Included among these are the use of alternate trench foundations such as wood pile or sheathing capped by a concrete mat, or wood sheathing with keyed-in plank foundation; stabilization of the soil by the use of special grout or chemicals; geofabric migration barriers; or ballasting (undercutting). A cushion of bedding material must be provided between any special foundation and the pipe. Permanently buried timber should be suitably treated.

Stabilization by ballasting (undercutting) is the removal of a sufficient quantity of undesirable material. This technique is frequently employed to stabilize randomly encountered short sections of unstable soil. The extent of required over-excavation and details of accompanying construction requirements will be determined by the engineer in consideration of the qualities of the unstable soil and the specific design requirements. The following are general guidelines:

The trench bottom should be over-excavated over the full trench width from 18 to 36 inches below the pipe grade (depending on the soil strength and pipe diameter) and then brought back to grade with a foundation of ballast material topped with Class I material. An appropriate bedding should then be placed on the foundation. The grading of the foundation material should be selected so that it acts as an impervious mat into which neither the bedding, other embedment material, nor the surrounding native soil will migrate.

These guidelines are suitable for most situations except for extremely weak soils (such as quicksands, organic silts, and peats) which may call for further overexcavation, or other special treatment.

3.12.19 Stability of Trench Walls

In order to control deflection, the embedment material must be placed from undisturbed trench sidewall to undisturbed trench sidewall. Where trench walls are unstable, it may be necessary to use trench shields, bracing, or permanent

sheeting to achieve a stable sidewall while installing the pipe. Where material sloughs into the trench it should be removed. This technique often leads to widening the trench.

Walls of trenches below the elevation of the crown of the pipe should be maintained as vertical as possible. The shape of the trench above the pipe will be determined by the stability of the trench walls, excavation depth, surface loadings near the trench, proximity of existing underground structures, presence of groundwater or runoff water, safety and practical considerations. These will determine if the trench walls may be vertical, excavated with slope or benched sides, or shored. When trench walls are shored or otherwise stabilized, the construction scheme must allow for the proper placement and compaction of pipe embedment materials. Some suggested trench construction schemes follow. The final procedure must be in compliance with all applicable safety regulations.

Sloping of trench walls in granular and cohesionless soils should be provided whenever the walls are more than about four feet in depth or otherwise required by state, local or federal regulations. For safety, if the walls are not sloped, they should be stabilized by alternate means such as shoring or bracing. The slope should be no greater than the angle of repose of the materials being excavated and should be approved by the engineer.

Shoring or bracing will frequently be required in wet fine grained cohesive type soils and clays. Bracing or sheathing that is constructed of treated timber, steel or other acceptable material may be used to stabilize trench walls either permanently or temporarily. Wherever possible, sheathing and bracing should be installed so that its bottom extends no lower than about one-quarter of the pipe diameter below the pipe crown. When so installed, pulling the sheathing will minimally disturb the embedment material and the side support it provides. Sheathing that is installed to project below the pipe spring line should be left in place unless, as with some thinner sheathing, it is designed to be pulled and removed without disturbing the embedment next to the pipe. In this case, the trench width should be increased by 12 to 24 inches depending on the pipe diameter to allow for minor disturbance to the embedment near the sheathing. Vibratory placement or extraction of sheeting is not advised. This method can cause severe disturbance to the bedding and liquefaction of the surrounding soils. Where steel sheet piling is used as sheathing and is to be removed or pulled, to minimize disturbance to the pipe embedment, it should be installed so that it is not closer than one pipe diameter or 18 inches, whichever is larger, from either side of the pipe. The void left by removal of the sheathing should be filled with embedment material.

3.12.20 Portable Trench Shield

Portable trench shields or boxes which provide a moveable safe working area for installing pipe can be used with flexible pipe. However, the installation technique of flexible pipe with the shield is not the same as it is for rigid pipe. In order to use the shield with PE pipe, all excavation of the trench below the pipe crown elevation should be done from inside of the shield. That is, the backhoe operator should dig inside of the shield and force the shield down as soil is removed. (The technique of digging out a large hole to pipe invert grade then sliding the shield into it will result in excess deflection of PE pipe and

therefore, should not be used.) After placing the pipe in the trench, embedment material should be placed in lifts and the shield vertically raised after each lift is placed so that workers can shovel embedment material under the shield to fill the void created by the shield wall.

If trench soil quality and applicable safety regulations permit, it is best to use shields that are placed with no portion of their sides extending lower than one-quarter of a pipe diameter below the pipe crown. This minimizes the amount of lifting required and precludes the possibility for disturbing embedment materials. If the sides of the trench box or shield do project below this point, then the box should be lifted vertically as described above, before moving along the trench.

The minimum inside clear width of the box, or shield, should allow for the minimum trench width requirements for the pipe to be satisfied plus an additional 12 to 24 inches depending on the pipe diameter.

3.13 Installation Procedure Guidelines

The installation procedure discussed in this section consists of trench floor preparation, providing a sufficiently stable working platform, and meeting the design grade requirements. Following pipe placement, backfill material which has been selected with regards to potential material migration, required density, depth of cover, weight of soil and surcharge loads is installed as follows:

1. Bedding material is placed and leveled
2. Haunching is placed and, if required, compacted so as not to disturb the pipe from its line and grade.
3. The remainder of the primary initial backfill is placed and, if required, compacted in lifts.
4. Secondary backfill is used to protect the pipe during the final backfilling operation and also to provide support for the top portion of the pipe.
5. The final backfill may consist of any qualifying material that satisfies road construction or other requirements and, when required, must be compacted.

3.13.1 Trench Floor Preparation

The trench floor must have sufficient stability and load-bearing capacity to present a firm working platform during construction to maintain the pipe at its required alignment and grade and sustain the weight of the fill materials placed around and over the pipe. The trench bottom should be smooth and free from sloughed sidewall material, large stones, large dirt clods, frozen material, hard or soft spots due to rocks or low-bearing-strength soils, and any other condition that could lead to non-uniform or unstable support of the pipe. The trench bottom must be kept dry during installation of the pipe and the embedment materials. All foundation and bedding materials must be placed and compacted according to the design requirements. Such materials should be selected to provide the necessary migration control when required. Over-excavation of the trench floor by more than 6 inches beyond grade requires that the over-excavation be filled with acceptable embedment material that is compacted to a density equal to that of the embedment material. If the over excavation exceeds 12 inches, it should be brought to proper grade with a

suitably graded Class I or II material that is compacted to the same density as that of the native soil but not less than the density requirements for the embedment materials.

In stable soils the trench floor should be undercut by machine and then brought up to proper grade by use of a well-leveled bedding consisting of a 4 to 6-inch layer of embedment material. This material should be compacted by mechanical means to at least 90 percent Standard Proctor Density. Class I material may be shovel sliced where the depth of cover permits.

In unstable soils that may be too soft, of low load-bearing capacity or otherwise inadequate, the trench bottom must first be stabilized by soil modification, by providing an alternate foundation, or by the removal of the undesirable material and replacement with stable foundation material. A cushion of at least 4 inches of compacted bedding should be provided between any special foundation and the pipe. Adequacy of trench bottom stability is difficult to evaluate by visual observation and is therefore best determined by soil tests or at the site during installation. However, a warning of a potentially unstable soil condition is given by a trench bottom that cannot support the weight of workmen.

Uneven soil support conditions, where the grade line traverses both soft and hard spots, requires special consideration. Ballasting is the most frequently employed technique to deal with randomly encountered short sections of soft soils.

When differential conditions of pipe support might occur, such as in transitions from manholes to trench or from hard to soft soils, a transition support region should be provided to ensure uniform pipe support and preclude the development of shear, or other concentrated loading on the pipe. The following procedure may be used:

The soil next to the more rigid support is over-excavated to a depth of not less than 12 inches over a distance of 2 pipe diameters along the pipe line; over the next 2 diameters away from the rigid support, the depth of over-excavation is gradually decreased until it meets the normal trench depth. See Figures 6 and 7. Pipe grade is then restored by the addition of granular material that is compacted. In the case of connections to manholes and buildings, the distance of over-excavation along the pipe length should be no less than required to reach undisturbed soil.

3.13.2 Backfilling and Compaction

Backfilling should follow pipe placement and assembly as closely as possible. Such practice prevents the pipe from being shifted out of line by cave-ins, protects the pipe from external damage, eliminates pipe lifting due to flooding of open trench and in very cold weather lessens the possibility of backfill material becoming frozen. The quality of the backfill materials and their placement and compaction will largely determine the pipe's ultimate deformation and alignment. Backfill material should be selected with consideration of potential material migration to, or from, the trench wall and other layers of embedment material. Under most circumstances, compaction will be required for all material placed in the trench from 6 inches beneath the pipe to at least 6 inches above the pipe.

The required density of the bedding, haunching and the primary and secondary initial backfill material will depend on several considerations such

as depth of cover, weight of soil, and surcharge loads. The minimum density for these materials should be equal to 85 percent Standard Proctor Density for Class I and II materials or 90 percent Standard Proctor Density for Class III or IVa materials. For Class II,III, and IVa materials, compaction will always be required to obtain these densities. Class I material placed by shovel slicing will generally have a minimum density of 85 percent Standard Proctor; however, its E' may not be greater than 750 psi. Just dumping Class I material into the trench may produce densities near 85 percent. However, except in shallow cover without live loads, this method will normally not provide adequate support to the pipe as voids may exist under the pipe haunches or elsewhere in the material.

3.13.3 Backfill Placement

Bedding performs a most important function in that it levels out any irregularities in the trench bottom, assuring uniform support and load distribution along the barrel of each pipe section and supports the haunching material. A mat of at least 6 inches of compacted embedment material will provide satisfactory bedding.

Haunching material must be carefully placed and compacted so as not to disturb the pipe from its line and grade while ensuring that it is in firm and intimate contact with the entire bottom surface of the pipe. Usually a vibratory compactor has less tendency to disturb the pipe than an impact tamper.

Primary initial backfill should be placed and compacted in lifts evenly placed on each side of the pipe. The lifts should not be greater than 12 inches for Class 1, 8 inches for Class II, and 6 inches for Class III and IVa materials. The primary initial backfill should extend up to at least three-quarters of the pipe diameter to perform its function of pipe side support as shown in Figure 1. If the construction does not call for the use of a secondary initial backfill, then the primary layer should extend to not less than 6 inches above the pipe crown. In any location where the pipe may be covered by existing or future groundwater, the primary initial backfill should extend up to at least 6 inches over the pipe crown for pipe up to 27-inch diameter and to at least 12 inches over the pipe for larger pipe.

Secondary initial backfill serves to protect the pipe during the final backfilling operation and to provide support to the top portion of the pipe. Secondary initial backfill should extend to 6 inches above pipe for pipe up to 24 inches and to 12 inches for larger pipe. These depths can be modified slightly depending on the depth of burial, groundwater level, and type of native soil. Compaction of this layer should be to the same extent as that specified for the primary initial backfill. If the final backfill material contains large rock (boulder or cobble size) or clumps, then 18 inches of cushion material should be provided in the secondary initial backfill. Secondary initial backfill may consist of a different material than the primary initial backfill; however, in most cases, it should be a material that will produce an E' of at least 750 psi. The final backfill may consist of any material that satisfies road construction or other requirements. The material must be free of large stones or other dense hard objects which could damage the pipe when dropped into the trench or create concentrated pipe loading. The final backfill may be placed in the trench by machines.

There should be at least one foot of cover over the pipe before compaction of

the final backfill by the use of self-powered compactors. Construction vehicles should not be driven over the pipe until a three foot cover of properly compacted material is placed over the pipe.

When backfilling on slopes, the final backfill should be well compacted if there is any risk of the newly backfilled trench becoming a "french drain." Greater compaction may be achieved by tamping the final backfill in 4 inch layers all the way from the top of the initial backfill to the ground or surface line of the trench. To prevent water from undercutting the underside of the pipe, concrete collars keyed into the trench sides and foundation may be poured around the pipe or a PE waterstop can be fabricated onto the pipe.

3.14 Sunlight Exposure

Placing pipe that has been in direct sunlight in a cooler trench will result in thermal contraction of the pipe's length. This contraction can generate force which could result in pull-out at mechanical couplings or other buried structures. Allow pipe to cool before making connections to an anchored joint, flange, or a fitting that requires protection against excessive pull-out forces. Covering the pipe with embedment will facilitate cooling.

3.15 Cold (Field) Bending

Coiled lengths and long strings of PE fused pipe may be cold bent in the field. The allowable bend ratio is determined by the pipe diameter and the dimension ratio. See Figure 8 and Table 4. Because fittings and flange connections are rigid compared to the pipe, the minimum bend radius is 100 times the pipe's outside diameter (OD), when a fitting or flange connection is present in the bend. The bend radius should be limited to 100 x OD for a distance of about 5 times the pipe diameter on either side of the fitting location.

TABLE 4
Minimum Bend Radius for PE Pipe Installed in Open Cut Trench

Dimension ration, DR	Minimum Cold Bend Radius
7, 7.3, 9	20 x Pipe OD
11, 13.5	25 x Pipe OD
17, 21	27 x Pipe OD
26	34 x Pipe OD
32.5	42 x Pipe OD
41	52 x Pipe OD
Fitting or flange present in bend	100 x Pipe OD

3.16 Installation of Pipe in Curves

Field bending involves excavating the trench to the desired bend radius, then sweeping or pulling the pipe string into the required bend and placing it in the trench. Temporary restraints may be required to bend the pipe, and to maintain the bend while placing the pipe in the trench and placing initial backfill.

Temporary blocks or restraints must be removed before installing final backfill, and any voids must be filled with compacted initial backfill material. Considerable force may be required to field bend the pipe, and the pipe may spring back forcibly if the restraints slip or are inadvertently released while bending. Observe appropriate safety precautions during field bending.

.3.17 Transition from PE Pressure Pipe to Gasket Jointed Pipe

The heat fusion joint used for PE pipe creates an essentially continuous length of pipe. When the pipe is pressurized two significant internal forces are present in the pipe. End thrust from bends or end caps is transmitted through the pipe as a longitudinal force. Hoop stress (hoop thrust) occurs due to the internal pressure. The longitudinal force tends to grow the pipe length while the hoop thrust expands the diameter (ever so slightly) and tends to contract the pipe's length in proportion to Poisson's Ratio. In an all PE pipe system the length effects from these two forces tend to cancel each other out. As a result, buried PE pipes are self-restrained and require no thrust blocking. A different situation occurs when PE pipe transitions to a type of pipe material that is joined by non-restrained gasket joints. The longitudinal force may be no longer present. The result is that hoop expansion is unbalanced and will cause contraction of the PE pipe. This contraction can result in pulling apart of gasket joints in line with the PE pipe.

Generally, it is necessary to anchor the ends of a PE pipeline that transitions into an unrestrained gasket jointed pipe system. If the gasket joints are restrained anchoring is unnecessary. See Appendix 3, "Pull-out of Mechanical Joints due to the Poisson Effect" for a complete discussion of the pull-out effect.

The transition of PE pipe to DI and PVC pipe is discussed in TN-36, "General Guidelines for Connecting PE Potable Water Pressure Pipes to DI and PVC Piping Systems.

3.18 Proper Burial of Fabricated PE Fittings

A common question is "Does the installation of heat fused PE solid wall pipe and fittings need thrust blocks?" The simple answer to this question is that heat fused PE pipe and fittings are a monolithic structure which does not require thrust blocks to restrain the longitudinal loads resulting from pipe pressurization.

Since fittings are part of the monolithic structure no thrust blocks are needed to keep the fittings from separating from the PE pipe. Bell and spigot piping systems must have thrust blocks or restrained joints to prevent separation of pipe from fittings when there is a change of direction.

Pipe movement due to elastic deformation, thermal expansion/contraction, etc. is not detrimental to PE pipe, but pipe movement or the attachment of valves or other appurtenances used with PE pipe systems can cause excessive loads. Proper backfill prevents excessive loads in most situations.

Common fittings, elbows and equal tees normally require the same backfill as specified for the pipe. When service connections are made from PE water mains, no special compaction is required. When service connections are made under an active roadway, 95% Standard Proctor density is normally required around the pipe and the service connection.

In water systems and fire protection piping systems, reducing tees are frequently used to connect from the main to valves and hydrants. Figure 9 shows the use of concrete support pads, thrust blocks on hydrants, self restrained PE MJ adapters and sand stabilized with cement around the reducing tee. While no true thrust blocks are on the PE pipe or fittings in this arrangement, the sand stabilized with cement provides proper support for the reducing tee. Compaction of the soil around these fittings is difficult and the use of sand stabilized with cement or flowable fill is usually easy.

As with all piping systems, proper compaction of the soil around pipe and fittings is important. In water and/or fire protection systems, when in-situ embedment materials can be compacted to a Standard Proctor density of 85% for installation outside of roadways or 95% Standard Proctor density in roadways, these materials should be used. When in-situ materials do not provide proper support, then sand stabilized with cement or flowable fill should be used.

3.19 Inspection

The engineer should provide inspection commensurate with the application. Good inspection would include some or all of the following:

- Verification that all embedment materials meet the specification and verification of pipe grade and alignment,
- Verification that the correct pipe is installed (see numerical code printed on pipe),
- Observation of pipe installation, placement of embedment and backfill materials, and trench excavation methods,
- Verification that proper pipe storage and handling procedures are followed, that pipe placement in the trench, attachment of mechanical joints, fittings and appurtenances, and transitions to other pipes were done in accordance with recommended methods, that scratches or gouges do not exceed the permitted depth, and that the minimum bend radius was not exceeded,
- In the case of large diameter gravity pipes (gasket joined) inspection for deflection by either pulling a mandrel through the pipe or taking physical measurements of the pipe vertical diameter.
- In the case of pressure pipes record results of leak testing.

.4.1 Measurement and Payment

.4.2 General

The Contractor's bid amount against each Bill of Quantities item as given below shall include providing, laying, jointing, testing and commissioning and completion for all work specified herein and/or as shown on the Tender Drawing related to the item.

4.3 Polyethylene Pipe (HDPE)

4.4 Measurement:

Measurement shall be made for total running feet for each size and type of P.E Pipe acceptably supplied and laid by the Contractor.

4.5 Payment

Payment shall be made for the total running feet of each size of P.E Pipe measured, as provided above, at the Contract unit price each and shall constitute full compensation for providing, laying, testing and commissioning of the P.E Pipe including all accessories such as Pipe joints, Bends, Tees, Flanges, etc. complete.

4.6 Construction of Valve Chamber

4.7 Measurement:

Measurement shall be made for item as each no for Valve chamber including with brick work, excavation, plaster, CI cover etc acceptably supplied and laid by the Contractor.

.4.8 Payment

Payment shall be made for the No of each of valve chamber measured, as provided above, at the Contract unit price each and shall constitute full compensation for Construction of Valve chamber inside with Brick work, excavation, plaster, CI manhole cover etc. complete job.

SPECIAL NOTES

SPECIAL NOTES

1. The bill of quantities (BOQ) forming part of this contract is only approximate. Contractor to verify quantity of each item from construction drawings or through on site measurement before ordering material for that item. Any short fall or excess procurement made based only on BOQ items will be contractor's own responsibility.
2. Payment shall be made against the quantities actually executed at site according to measurement.
3. Quoted rates shall remain valid for actual value of contract varying within ± 30% of bid value and contractor has no right to claim any extra on this account. It's difficult work in under construction area, contractor to make sure that no services/ utilities are disturbed in case any utility / service are disturbed contractor to make the damage good at his own cost. Contractor to arrange access for traffic and residents through temporary bridges or detours all cost involved for such works are to be covered in the unit rates of items of works in the BOQ.
4. The contractor will place the order for all the material to be used at site and in his scope of works well in time so that delivery of these materials should not affect the schedule of completion of works. No excuse for the late delivery of the materials by other manufacturers shall be accepted in this regard.
5. The contractor shall include in his rates the cost of the cable accessories such as copper lugs, glands, cable end box etc, wherever required. Increase in rate(s), will not be possible after approval of the rate(s) and during execution of works.
6. Contractor to submit all warranty and guarantee cards for equipments and appliances installed. The test certificates of Cables to be submitted before installation.
7. Contractor to submit samples for approval and maintain at site a sample room.
8. For extra works carried out according to instructions of the Client and/or Consultants, or their representatives, the rates claimed for these works will be approved by the Client/Consultants after mutual discussion with contractor.
9. Quoted Tender documents, Tender Drawings and Addendum (if any) etc, shall be submitted on the date Tender opening.
10. Contractors/Bidders are advised to visit and understand the quantum of works unvalued in existing areas before filling the BOQ
11. Contractors/Bidders may contact Consultants for clarification of each and every query before filling the BOQ. No alteration in the rates will be entertained after submission / approval of the Tender documents.
12. For all works contractor to employ qualified Engineer with knowledge of surveying. The Engineer to be present during works on full time basis.
13. Only Government of Sindh notified escalations after the date of opening this tender (new escalation) on any item shall be only payable to contractor.

LIST OF APPROVED MANUFACTURERS

LIST OF APPROVED MANUFACTURES/BRANDS

(Samples subject to physical approval by consultants)

Note: This project may not require some of following materials

S/No	Description	Company
1.	Reinforcement Steel	AFCO, Mughal, Amreli, Prime, Razzaq, Metropoliton, Nawab & Itehad
2.	Ceramic Tiles	EMCO, Shabir, Master
3.	Plastic/Vinyle enyle emulsion/Enamel (Matt or Gloss)	ICI Dulux , Burger Paint
4.	G.I Pipes	IIL, Jamal, KPM, Pioneer Steel
5.	Hardware stays, Handles (Bras)	Moosa, Pistol, Alfa, Yale, Babar
6.	Glass	Khawaja Glass, Nowshera Glass, Prince & Usmania Glass
7.	Stainless Steel Sink	Altas, Super Asia & Master
8.	Cost Iron *Spun) pipe, fitting & Fixtures	Alpine, Teepu
9.	Asbestos Pipe	Dadex
10.	UPVC Pipe & Fittings	Dadex, Beta & Galco
11.	ASTM RCC Pipes	Hume Pipe, Razia & Balochistan Pipe
12.	Sanitary Fixtures	Master, ICL-Bosch, Ceramika
13.	Flushing Tank	Golden, Rehber & Master
14.	Hot and Cold PVC Pipe	Dadex
15.	Anti Termite Water Proofing agents and concrete admixture	Termite, Biflex, Dursbin, Dyna Bond, Vanex, feb, Sika & Foscroc
16.	Acid proof Tiles	National Tiles
17.	Terrazzo Tiles	Capital Tiles, Noor Tiles
18.	Aluminum Section	Alcop, Japan Metal
19.	Wooden Door Shutter	Sterling & Interwood
20.	Light Fixtures	Phillips, ohms lighting, Britlite Engineering Company
21.	Distribution Boards	Siemens, Hussain & Co, PEL
22.	Cable & Wirers	Pakistan Cables, Newage cable, Allied cables
23.	PVC Conduit & Accessories	Beta, Galco, Dadex
24.	Steel conduits & Associates	Hilal Industries and International Industries

25.	Switches, socket etc	MK (UK) Clipsal (Aus)
26.	Fans	Pak Fan, Millat & Royal
27.	MCCB, MCB	Merlen Gerin, Siemens, Terasaki
28.	Sluice Valve	KSB Company
29.	Pumps	KSB Company, Grundfos
30.	Deep Well Turbine	KSB Company, Grundfos
31.	M.S Pipe all 6.4mm spirally welded	Indus Steel, Data Steel, Crescent Steel
32.	Non Return Valve	KSB Company
33.	Safety Valve	KSB Company
34.	PVC Pipe/Valves	Dadex
35.	Motors	Siemens
36.	Transformers	Siemens, J&P
37.	Generator	Siemens, FG Wilson
38.	Poles GI	IIL Material
39.	VCB	Alstom, PEL
40.	Cement (OPC/SR)	Dg Cement, Thatta Cement, Falcon cement
41.	External Epoxy Coating	SIKA, MBT, ICI, Burger
42.	Porcelain Tiles	Master, China
43	P.E Pipe	Dadex, Hi-Tech
44.	Kerb Stone, Hard Pavers	Envicrete, (Banu Mukhtar) Bincrete, Megnacrete
45.	Switches	Clipsal/MK(or equivalent to be approved by tendering authority/Engineer In-charge)
46.	Switches-socket outlet	Clipsal/MK(or equivalent to be approved by tendering authority/Engineer In-charge)
47.	Circuit Breakers	Make Terrasaki (Japan/Malaysia/Koria)
48.	Light Fittings / Fixtures	Philips/Sunlight (Models as per BOQ of work)
49.	Sweep ceiling Fan 56"	Millat/Asia/Pak Fans (Gujrat)
50.	Fans (wall Bracket)18"-24"	Pak Fan (Gujrat) /wahid Fan
51.	Sweep Exhaust Fan 8",12"	Millat/Asia/Pak Fans (Gujrat)
52.	Light Distribution Board of 14 SWG Steel sheets	Best Electric HYD/ Elmatec/ Baber Brothers/ Husain's & Co.
53.	Light Distribution Board as per BOQ	Best Electric HYD/ Elmatec/ Baber Brothers/ Hussain & Co.

BILL OF QUANTITIES

RCC CONSULTANTS

Drinking Water Rapid / Slow Sand Filtration Plants, Waste Water Treatment,
Solid Waste Management Water Supply, Sewerage System, Civil, Electrical, Mechanical
& Architectural Works, City Master Plans, GIS, Environmental Consultants
Phone No 022-2652957 Fax No 022-2655833
E-mail: rcc.consultants@rccgoc.com
www.rccgoc.com

Providing, Laying, Jointing & Testing Sewerage cum Storm Water Lines including RCC Manholes (Phase-I) For Z.A Bhutto Campus, Mehran University of Engineering and Technology Khairpur Mir's.

Summary Sheet

S.No	Description	Amount
1	Providing, Laying, Jointing & Testing Sewerage cum Storm Water Lines including RCC Manholes (Phase-I) (Amount Carried from Page:122)	
	Total Amount in Rs.	

In words: ----------

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Note:

Cartage shall not be payable separately and that the bid offered, is inclusive of cost of cartage.

Any difference on steel, cement, Bitumen, wood and bricks if notified by Government of If any extra item is required during execution preference will be given to Govt. of Sindh Schedule of rates.

SIGNATURE OF BIDDER SEAL OF BIDDER

RCC CONSULTANTS

Drinking Water Rapid / Slow Sand Filtration Plants, Waste Water Treatment,
Solid Waste Management Water Supply, Sewerage System, Civil, Electrical, Mechanical
& Architectural Works, City Master Plans, GIS, Environmental Consultants
Phone No 022-2652957 Fax No 022-2655833
E-mail: rcc.consultants@rccgoc.com
www.rccgoc.com

Providing, Laying, Jointing & Testing Sewerage cum Storm Water Lines including RCC Manholes (Phase-I).

Schedule-B

S.No	Description	Qty	Unit	Rate	Amount
Schedule Items					
1	Excavation for pipe lines in trenches and pits in soft 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 within a one chain as directed by Engineer Incharge. providing fence guards, lights flags and temporary crossings for non vehicular traffic where ever required lift upto 5 ft (1.52m) and lead upto one chain (30.50m). (PHS# 1, P# 60)	104069.47	%oCft	3,600.00	374,650.09
2	Excavation for pipe line in trenches, pits in wet soil clay or mud 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 within a one chain as directed by Engineering Incharge. providing fence guards. lights flags and temporary crossings for non vehicular traffic where ever required lift upto 5 ft (1.52m) and lead upto one chain (30.50m) (PHS. P# 66. Item# -14)	23690.00	%oCft	5,400.00	127,926.00

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S.No	Description	Qty	Unit	Rate	Amount
3	Excavation for pipe line in trenches, pits in slushy daldaly soil 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 within a one chain as directed by Engineering Incharge. providing fence guards. lights flags and temporary crossings for non vehicular traffic where ever required lift upto 5 ft (1.52m) and lead upto one chain (30.50m) (PHS. P# 67. Item# -15)	35789.06	%oCft	10,800.00	386,521.85
4	Add for additional lift of every three ft or part there of in item No 1 to 15 (A&B) for excavation for pipelines & storage tanks trenches and pits. (G.S.I. #16) P-74	35789.06	%0Cft	550.00	19,683.98
5	Bailing out sub soil water during excavation, concreting cast in situ concrete or masonry work in foundation work etc. (PHSI # 18 P-75)	85921.80	%Cft	543.00	466,555.37
6	Cement concrete plain including placing compacting finishing and curing complete l/c washing of aggregates without shuttering (i) Ratio 1:4:8 (GSI 5 P-15)	2331.00	% Cft	11,288.75	263,140.76
7	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). R.C.C work in roof slab, beams columns rafts, lintels and other structural member laid in situ or precast laid in position complete in all respects. Ratio 1:2:4. GSI# #6 ii P-16)	12151.50	P-Cft	337.00	4,095,055.50
8	Fabrication of Tor bars reinforcement for cement concrete including cutting, bencing, lifting, laying in position, making joints and fastenings including cost of binding wire (Also includes removal of rust from bars).b) Using Tor bars. (GSI# 8b, Page No16)	542.48	P-Cwt	5,001.70	2,713,322.22

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S.No	Description	Qty	Unit	Rate	Amount
9	Cement concrete plain including placing compacting finishing and curing complete l/c washing of aggregates without shuttering (f) Ratio 1:2:4 (GSI 5 P-17)	1320.00	%Cft	14,429.25	190,466.10
10	Erection and removal of centering for R.C.C or plain cement concrete works of Horizontal partal wood (b) (i), GSI# 19b, P# 17)	2136.00	%Sft	3,588.48	76,649.93
11	Bitumen Coating to plastered or cement concrete surface (GSI# 9, P# 70)	89562.12	% Sft	778.09	696,873.90
12	Provicing, Laying, RCC Pipes of ASTM C-76-62 T/C-76-70 of Class II wall B and fixing in trench l/c , cutting , fitting and jointing with rubber ring i/c testing with water to specified pressure. (PHESI# B 1, P# 17)				
	(d) 18" dia RCC ASTM Pipe	2150.00	P-Rft	618.00	1,328,700.00
	(f) 24" dia RCC ASTM Pipe	950.00	P-Rft	869.00	825,550.00
	(i) 36' dia RCC ASTM Pipe	1200.00	P-Rft	1,568.00	1,881,600.00
13	Providing, Laying & Fixing in trench including fitting, jointing & testing etc complete in all respect the high Density Polyethylene PE pipes (HDPE-100) for W/S confirming ISO 4427/DIN8074/8075 B.S 3580 & PSI 3051. PN-8 (PHSI# F 1, P# 25)				
	(q) 315mm Pipe	1160.00	P-Rft	1,635.00	1,896,600.00
14	Refilling the excavated stuff in trenches 6" thick layer l/c water ramming to full compaction etc complete (PHSI# 24, P# 77)	126343.24	%oCft	2,760.00	348,707.34
				Amount of Schedule Items	**15,692,003.05**
	Non Schedule Items				
15	Providing, Laying, Jointing following diameter uPVC "B-Class" Sanitary pipe etc complete for Road Crossings Casing pipe / Rain Water pipes including cost of cartage loading unloading etc complete as per directions of engineer incharge.				
	(a) 4" dia Pipe	200.00	P-Rft	150.00	30,000.00
	(b) 6" dia Pipe	300.00	P-Rft	222.00	66,600.00
	(c) 8" dia Pipe	200.00	P-Rft	438.00	87,600.00
	(d) 12" dia Pipe	200.00	P-Rft	1,344.00	268,800.00

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S.No	Description	Qty	Unit	Rate	Amount
16	Provicing and fixing 30" x 30" & 3" thick RCC Pre-Cast concrete covers Ratio 1:1.5:3 (S.R Cement) with 3"x 3" x 2/8" M.S angle iron including MS Angle Iron frame made out 3" x 3" x 2/8"" to be fixed RCC manhole slab, colouring, lifting hooks *(Steel reinforcement to be paid separately)* etc complete in all respects as per directions of engineering incharge detail shown in drawings.	122	Each	7,039.20	858,782.40
17	Provicling and Fixing 1" Dia MS Plain Bar Foot steps including cost of 3 coats ICI Paint etc complete as per drawing and as per directions of engineer incharge.	270	Each	1,083.84	292,636.80
				Amount of Non Schedule Items	**1,604,419.20**

A **Total Amount of Schedule items in Rs.** **15,692,003.05**

I the Contractor M/s ----------

B

Here by quote ----------**% premium above / below the schedule items.** ----------

C **Total Amount of Non Schedule items in Rs.** **1,604,419.20**

Total Tender Amount of A+B+C in Rs. ----------

In words: ----------

Note:

Cartage shall not be payable separately and that the bid offered, is inclusive of cost of cartage.

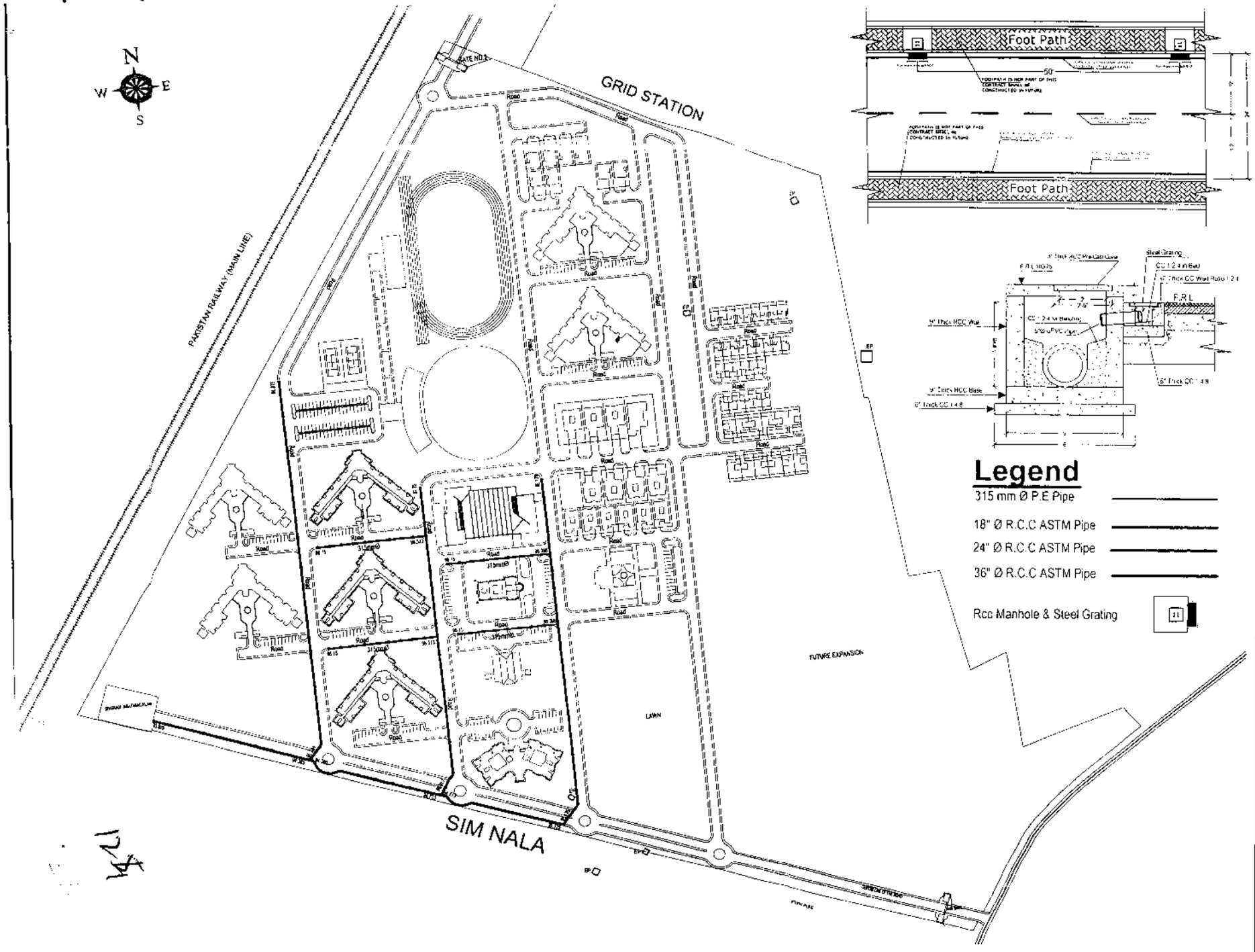
Any difference on steel, cement, Bitumen, wood and bricks if notified by Government of sindh after opening of this bid shall be payable based on executed quantities.

If any extra item is required during execution preference will be given to Govt. of Sindh Schedule of rates.

SIGNATURE OF BIDDER **SEAL OF BIDDER**

122

TENDER DRAWINGS
(NOT VALID FOR CONSTRUCTION)



Legend

315 mm Ø P.E Pipe

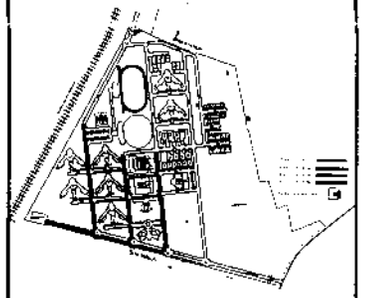
18" Ø R.C.C ASTM Pipe

24" Ø R.C.C ASTM Pipe

36" Ø R.C.C ASTM Pipe

Rcc Manhole & Steel Grating

MASTER PLAN OF UNIVERSITY



KEY PLAN

Note :-

Project:-

Z.A Bhutto Campus, Mehran University of Engineering and Technology Khairpur Mir's.

Client:-

Z.A BHUTTO CAMPUS, MEHRAN UNIVERSITY COLLEGE OF ENGINEERING AND TECHNOLOGY KHAIRPUR MIR'S

Consultans:-

RCC CONSULTANTS

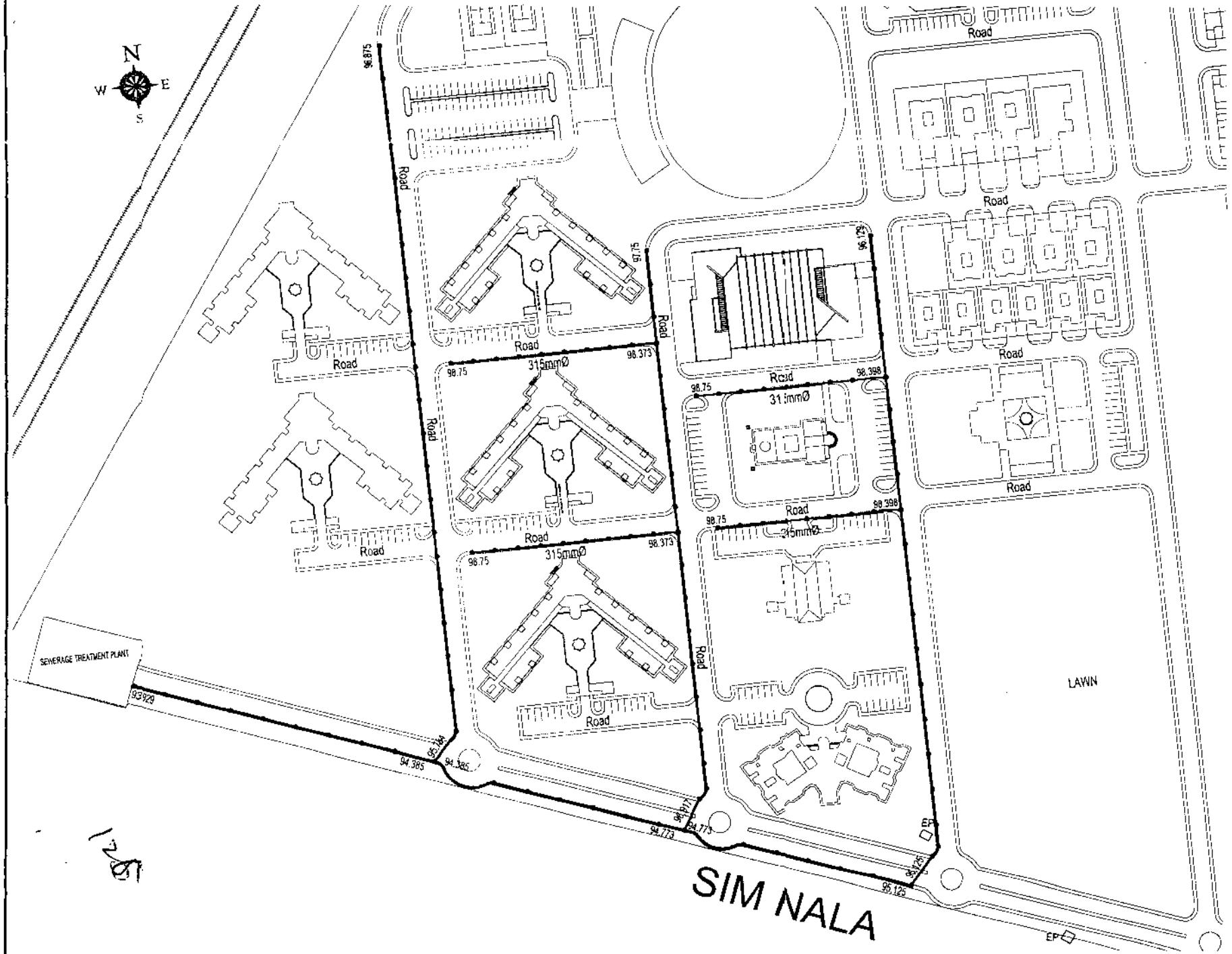
GROUND FLOOR RCC COMPLEX MAIN CASJMABAD ROAD KHAIRPUR

Drawing Name:-

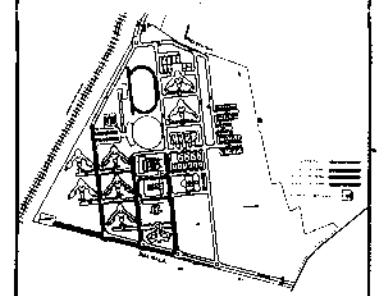
Plan of Phase-I Sewerage Cum Storm Water Sewer lines

Design By:-	Check By:-	Drawn By:-
SML	NAVEED LAKHO	TANVEER

Drawing No:-	Dated:-	Revision No:-
RCC/MUET/01	11-02-2015	00



MASTER PLAN OF UNIVERSITY



KEY PLAN

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Project:-

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Client:-

Z.A BHUTTO CAMPUS, MEHRAN UNIVERSITY COLLEGE OF ENGINEERING AND TECHNOLOGY KHAIRPUR MIR'S

Consultants:-

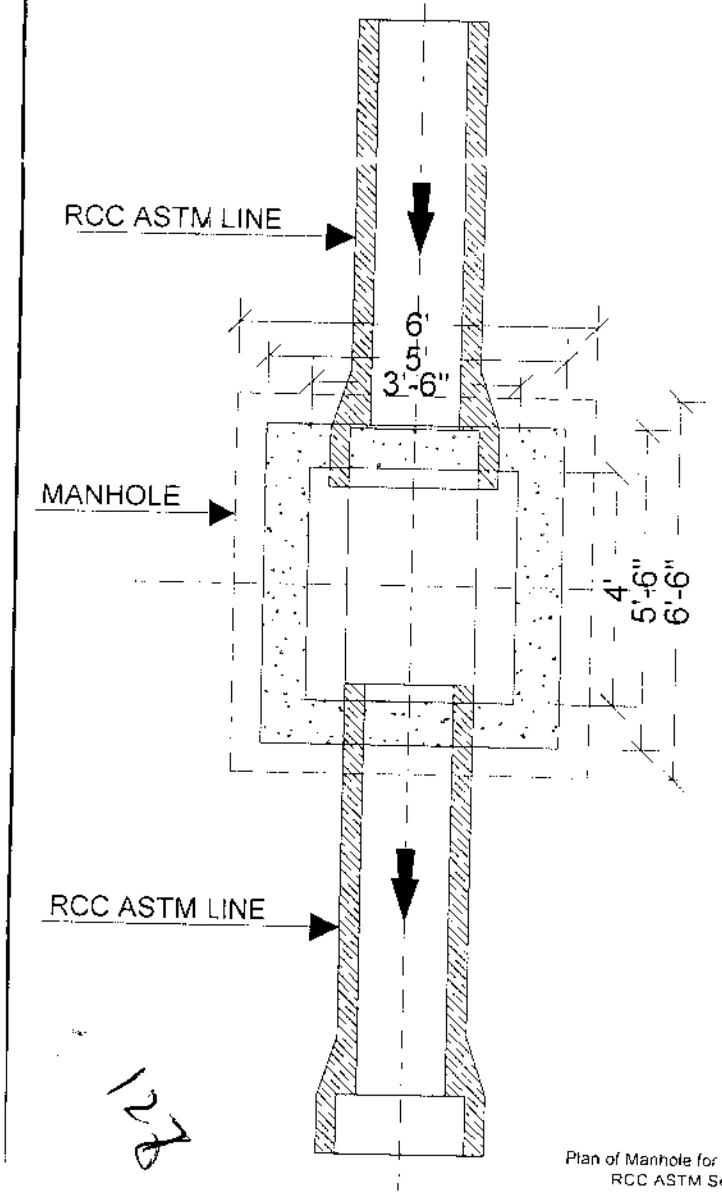
RCC CONSULTANTS

Drawing Name:-

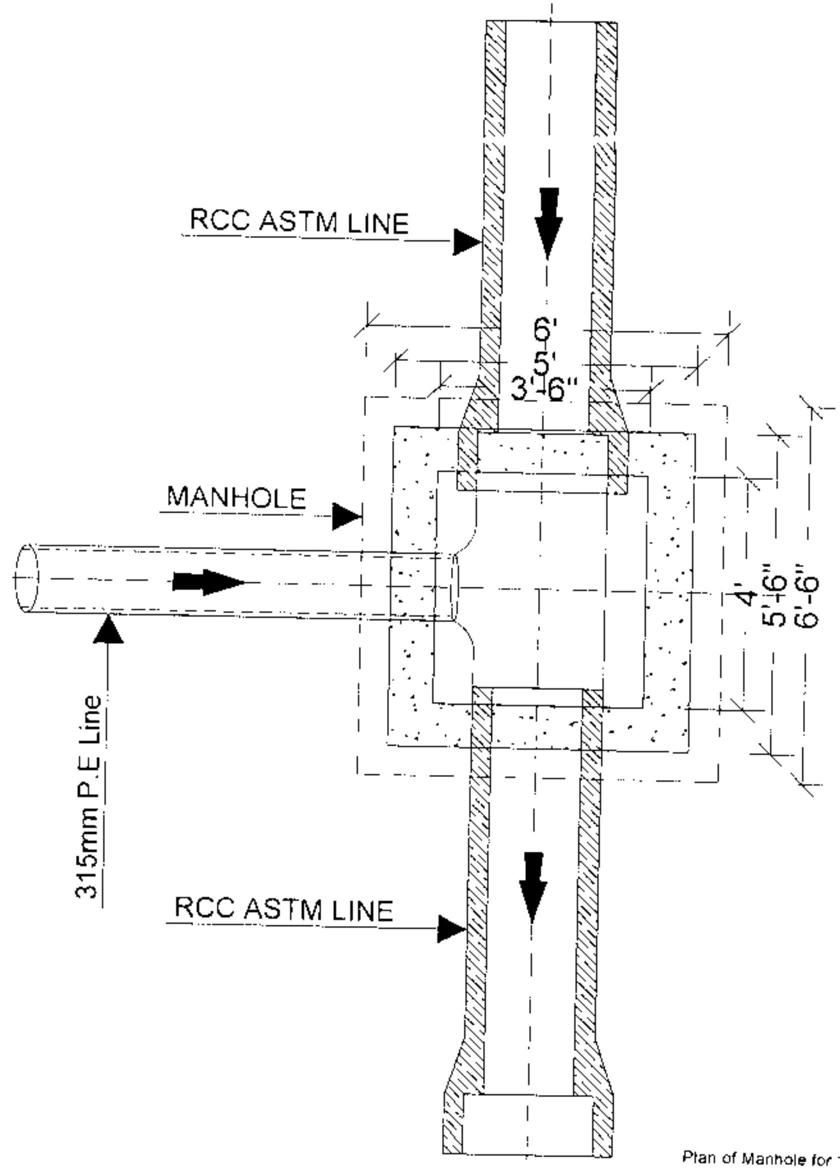
Plan of Phase-I Sewerage Cum Storm Water Sewer lines

Design by:	Check by:	Drawn by:
SML	NAVEED LAKHO	TANVEER

Drawing No:	Dated:	Revision No:
RCC/MUET/02	11-02-2015	00



Plan of Manhole for 18", 24" & 36" Ø
RCC ASTM Sewer lines.



Plan of Manhole for 18", 24"& 36" Ø
RCC ASTM Sewer lines.

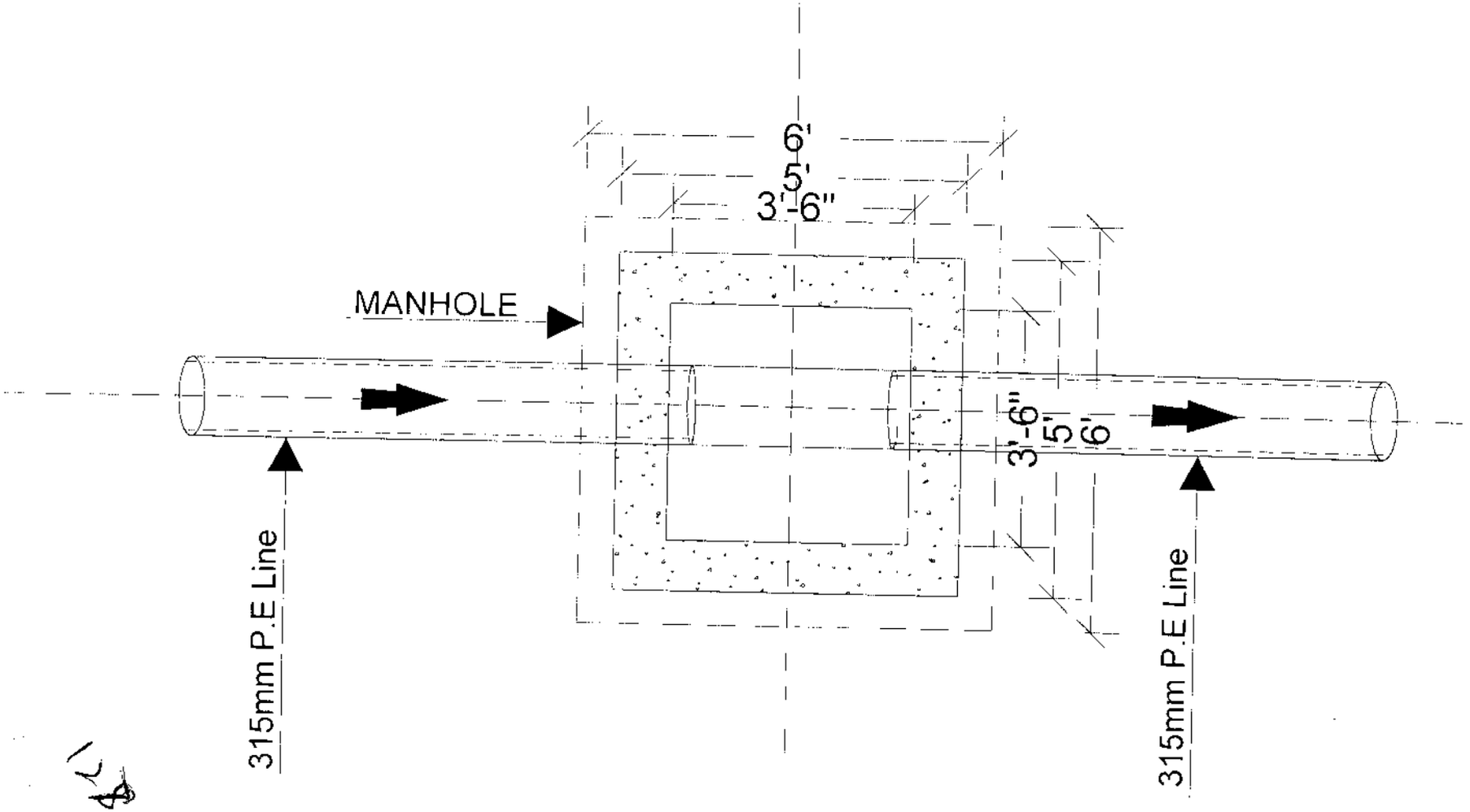
DWG# RCC/Sewer/03
DATE: 01-11-2014
REV# 00

Plan of Sewer Cum Storm Water Sewer lines and RCC Manholes

Sewerage / Storm Water & Utilities Services Lines System

Z.A Bhutto Campus, Mehran University College of Engineering and Technology Khairpur Mir's.

RCC Consultants



DWG# RCC/Sewer/04
DATE: 01-11-2014
REV# 00

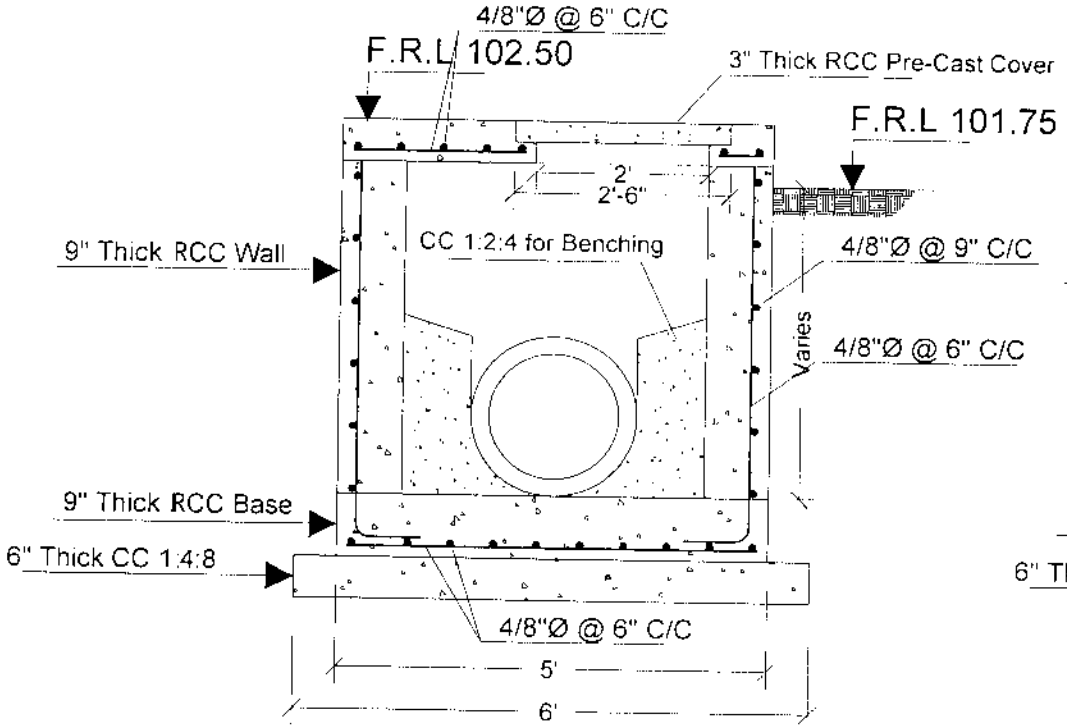
Plan of 315mm Ø P.E Sewer lines and RCC Manholes

Sewerage / Storm Water & Utilities Services Lines System

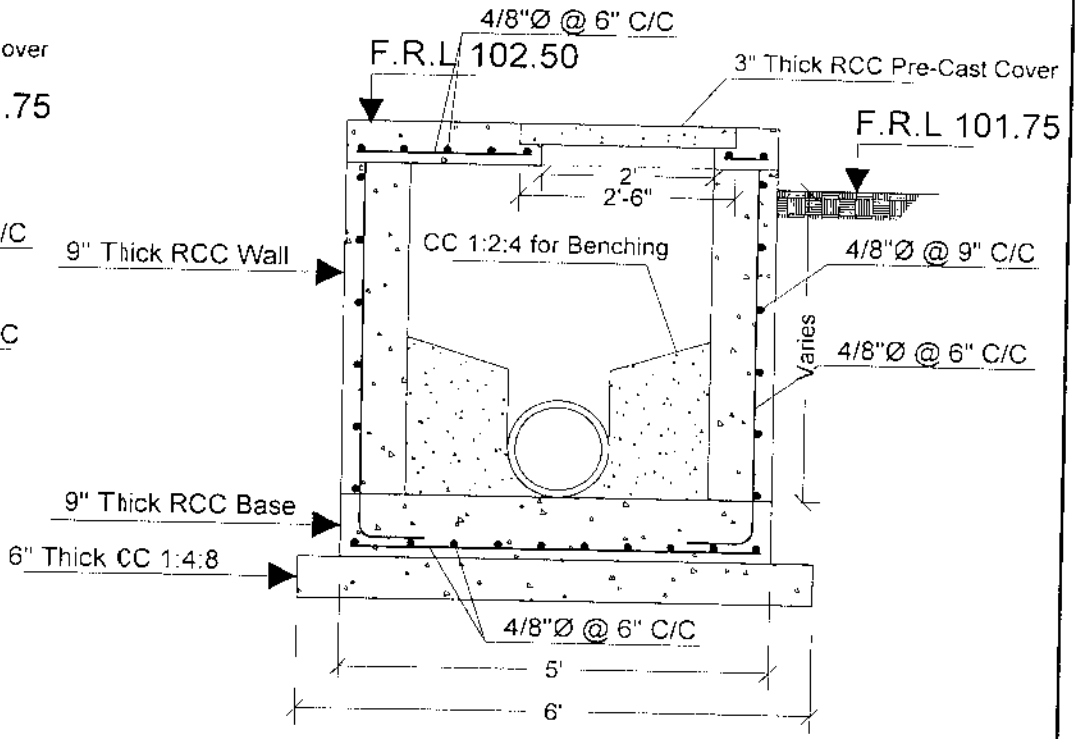
Z.A Bhutto Campus, Mehran University College of Engineering and Technology Khairpur Mir's.

RCC Consultants
Architects, Planning,Design & Management Consultants
A-6 Green Homes Phase-1 Gulshan-e-Iqbal Hyderabad.
Tel:-022-2650709-2652957 Fax-022-2655833

NAVEED/D/RCC CONSULTANTS/KHAIRPUR/COLLEGE /NEW Utilities

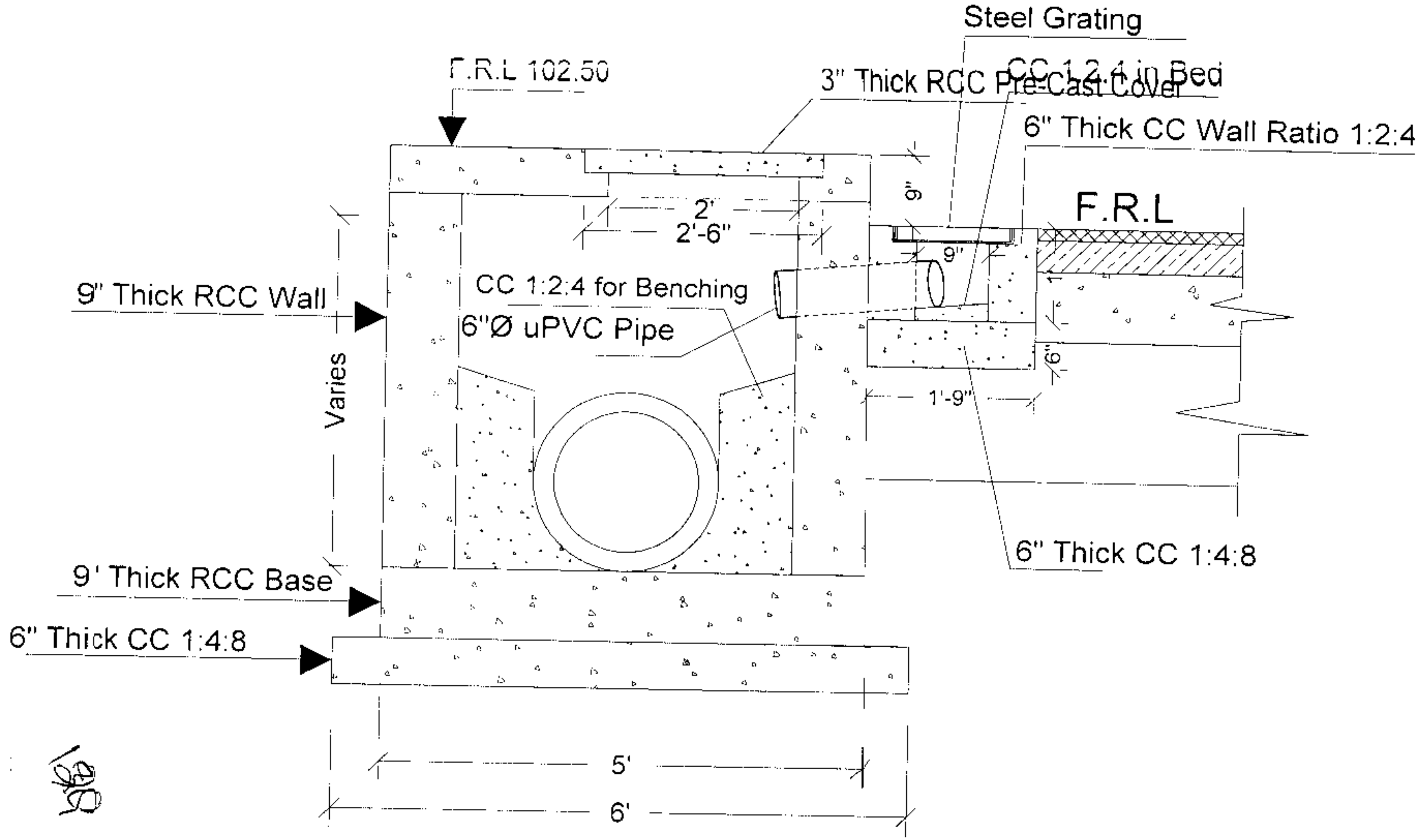


Typical Section of Manhole for 18", 24" & 36" Ø RCC ASTM Sewer lines.



Typical Section of Manhole for 315mmØ P.E Sewer lines.

DWG# RCC/Sewer/05 DATE: 01-11-2014 REV# 00	Detail Reinforcement Section of RCC Manholes. Sewerage / Storm Water & Utilities Services Lines System Z.A Bhutto Campus, Mehran University College of Engineering and Technology Khairpur Mir's.	RCC Consultants Architects, Planning, Design & Management Consultants A-6 Green Homes Phase-1 Deshmukh Hyderabad. Tel:022-2650709-2652957 Fax:022-2655833



DWG# RCC/Sewer/OE
DATE: 01-11-2014
REV# 00

Typical Detail Section of Manholes & Storm Water Sewer Lines Catch Pit.

Sewerage / Storm Water & Utilities Services Lines System

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