

**OFFICE OF THE EXECUTIVE ENGINEER DAD DIVISION  
SHAHEED BENAZIR ABAD**

Phone No. 0244-9370223 - Fax No. 0244-9370222

No. TC/G-55/ <sup>196</sup> of 2016,  
S. B. A, Dated:- 01/02/2016.

**NOTICE INVITING TENDERS.**

Scaled Tenders are invited from the interested persons / Suppliers / Contractors/ Firms as per SPPRA Rules - 2010, on Standard Bidding Documents (SBDs) for following works. -

**CONDITIONS.**

11. The blank tender forms will be issued on receipt of applications on schedule as given below. In case of holiday or Authority is out of head Quarter the submission shall be on next working day up to 01:00 P.M and will be opened at 2:00 P.M
12. All the interested Persons' Suppliers Companies / Firms are required to submit the earnest money for amount shown against each work in the shape of Call Deposit / Pay Order from the Schedule Bank in the name of undersigned at the time of submitting the tenders.
13. All the interested Persons' Supplier Companies / Firms shall not be allowed to withdraw his / their bid bids or ask for return of bid security during the bid validity period, otherwise bid security shall be forfeited.
14. Tender forms' documents can be has from this office situated at Nawabshah on payment of the cost of tender fee shown against each work in cash ( Non-refundable ) or can be downloaded from authority website and tender fee will be paid in office through hand cash.
15. The Competent Authority may reject all or any tender at any time prior to the acceptance of tender/bid subject to the relevant provision of SPPRA Rules.
16. Conditional Tenders will not be entertained.
17. Contractor must be registered with " Federal Board of Revenue " as well as with " Sindh Board of Revenue " in (i) Income Tax & (ii) Sales Tax and must provide valid copy of Certificate & taxes will be deducted from their bills if applicable.
18. Undertaking on stamp paper that Firm is not involved in any kind of litigation, departmental rift, abandoned or un-necessary delay in completion of any work in the Government and as well as in private organizations".
19. Pakistan Engineering Counsel Certificate is required for the works above Rs. 4.00 Million only.
20. Turn over at least three years and relevant experiences.

Sr. #	Place, Date & Time of Issuing Blank Tender Forms.	Place, Date & Time of Opening Sealed Tenders.
1	Blank tender forms will be issued on receipt of applications from office of the Executive Engineer Dad Division Shaheed Benazir abad situated at Nawabshah from the date of floating tenders in newspapers upto <u>4-2-2016</u> (upto 12:00 Noon) and will be received back on same day at 02:00 P.M.	Sealed Tenders will be Opened in the presence of Procurement Committee. Bidders or their authorized agents who may intend to present at office of the Executive Engineer Dad Division Shaheed Benazir Abad, situated at Nawabshah on <u>4-2-2016</u> @ 3:00 P.M.

**NOTE :-** In case of un-responded works the next date of issue , received back and opening of tenders shall be 8-2-2016 and 8-2-2016 respectively.

Other Terms & Conditions will be remain same.

**EXECUTIVE ENGINEER  
DAD DIVISION  
SHAHEED BENAZIR ABAD.**

**Copy forwarded with compliments to the:-**

9. Secretary to Government of Sindh Irrigation Department Karachi.
10. Private Secretary to Honourable Minister Irrigation Department Karachi.
11. Chief Engineer, Sukkur Barrage, Left Bank Region Sukkur, for favour of kind information.
12. Superintending Engineer Rohri Canal Circle, Hyderabad, for favour of kind information.
13. Director SPPRA Karachi. He is requested to hoist the N.I.T on authorities Website.
14. Director of Information ( Advertisement ) Publication Block No.96, Sindh Secretariat Karachi, with (Seven) 7-Copies for one insertion in three leading daily National Newspapers that is Sindhi, Urdu & English.
15. Copy forwarded to the Executive Engineers ( All ) of Rohri Canal Circle, Hyderabad, for wide publicity.
16. Copy to Drawing Branch.

COPY TO NOTICE BOARD.

**EXECUTIVE ENGINEER  
DAD DIVISION  
SHAHEED BENAZIR ABAD.**

# LIST OF WORKS

Sr. #	Name of Work	Estimated Cost (in Millions)	Earnest Money	Tender Fee	Time of completion
01	Restoration of Duro Fall Regulator @ RD. 523 Down Stream of Rohri Main Canal.	152.054	2%	4000/=	07 days

  
EXECUTIVE ENGINEER  
DAD DIVISION  
SHAHEED BENAZIR ABAD

INSTRUCTIONS  
TO  
BIDDERS

postal addresses at which notices may be legally served on them and to which all correspondence in connection with their bids and the contract is to be sent.

18.8 Bidders should retain a copy of the bidding documents as their file copy.

#### D. SUBMISSION OF BIDS

##### IB.19 Sealing and Marking of Bids

19.1 Each bidder shall submit his bid as under:

- (a) ORIGINAL and \_\_\_\_\_ COPIES of the bid shall be separately sealed and put in separate envelopes and marked as such.
- (b) The envelopes containing the ORIGINAL and COPIES shall be put in one sealed envelope and addressed as given in sub – clause IB 19.2 hereof.

19.2 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 data; and
- (c) provide a warning not to open before the time and date for bid opening, as specified in the bidding data.

19.3 In addition to the identification required in sub- clause IB 19.2 hereof, the inner envelope shall indicate the name and postal address of the bidder to enable the bid to be returned unopened in case it is declared "late" pursuant to Clause IB.21

19.4 If the outer envelope is not sealed and marked as above, the procuring agency will assume no responsibility for the misplacement or premature opening of the Bid.

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

- 20.1 (a) Bids must be received by the 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.

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. (SPP Rule 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 the procurement process.

**IB.25 Clarification of Bid (SPP Rule 43)**

25.1 To assist in the examination, evaluation and comparison of bids, the procuring agency may, at its discretion, ask any bidder for clarification of the 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 fulfill 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 bids 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 one envelope, single stage-two envelopes, two stage or two 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 the bidding documents, without material deviation or reservation. A material deviation or reservation is one (i) which affect in any substantial way the scope, quality or performance of the works; (ii) which limits in any substantial way, inconsistent with the bidding documents, the 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 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.

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 before Financial Evaluation.**

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 Financial 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's 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 Rule 2(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.

#### 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 (SPP Rule 49)

29.1 Subject to clauses IB 30 and IB 34 and provision of the rule: The procuring agency 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 contractor 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 Rule 25)**

Notwithstanding clause IB 29 and provision of the rule: (1) A procuring agency reserves 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 to 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) Form 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 reasons for such non acceptance, either in writing or by holding a debriefing meeting with such a bidder.
- (b) The requesting bidder shall bear all the costs 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 award part of the award and forfeiture of the bid security.
- 32.3 Validity of performance security shall extend at least ninety days 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 signatures of both the procuring agency and the successful bidder are affixed to the written contract. Such affixing of signatures 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 ---% 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, in 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 Provincial/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

## CONTACT / BIDDING DATA

### Instructions to Bidders Clause Reference

1.1 Name of and Address of the procuring agency:  
Executive Engineer,  
Dad Division situated near Gym Khana Restaurant  
District Shaheed Benazir Abad

1.2 Name of the Project and Summary of the works.

#### Name of Work

Restoration of Duro Fall Regulator @ RD. 523 Down Stream of Rohri Main Canal.

#### The work:

1. Earth Work Excavation
2. Borrow Pit
3. Carriage of Earth
4. Earth Work compaction ASSHTO
5. Earth Work compaction 6" layer
6. Cement Plaster
7. Cement Concrete
8. Filling Expansion joints
9. Constructing Temporary Outlets
10. Constructing Permanent Outlets
11. Rehandling of Earth work

The works will involve following major activities.

1.2 The successful bidder will be expected to complete the work within the time specified in Special Stipulations (Appendix-A)

2.1 Name of the Funding Source:

Funds provided by the Government of Sindh (ADP No. )

2.1 Amount and Type of Financing / Scheme Cost and Allocated Funds.

Allocation for 2015-16 Pak Rs. 10.0 Million

3.1c Bidders are:

Delete IB Clause 3.1c (i) and replace following  
National of Islamic Republic of Pakistan

8.1 Time Limit for clarification

The written clarification should reach the address of the NIT on any working day but not later than 7 working days prior to last date of bid submission.

  
Executive Engineer  
Dad Division  
Shaheed Benazir Abad

10.1 Bid Language.

**Bid Language in English.**

11.1 The bid shall comprise single envelop submitted, called Prize Bid containing the documents listed in clause 11.1a,

11.1a The price Bid shall comprise the following:

- i. Form of Price Bid;
- ii. Complete Price Bill of Quantities (Appendix D), in accordance with clause 11.1b and Clause 12:

11.1b The Form of Price Bid, and all documents listed under Clause 11.1a, shall be prepared using the relevant forms furnished in Appendix D to M. The forms must be completed without any alterations to the text, and no substitutes shall be accepted. All blank spaces shall be filled in with information requested.

13.1 Bidders to quote entirely in Pak. Rupees

**The currency of Bid is Pakistan Rupee (PKR). All payment will be made in PKR only.**

14.1 Period of Bid validity:

**Period of Bid validity shall be 90 days**

15.1 Amount of Bid Security:

**The amount of the bid security shall be 2% (Two Percent) of Bid price in PKR**

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

**At the office of Executive Engineer Dad Division mentioned in 1.1 above**

**Date: As per invitation for Bid**

18.1 The Bidder shall prepare one original of the Price Bid comprising the Bid as described in 1A Clause and clearly mark it and "ORIGINAL-PRICE BID".

18.2 The original and all copies of, the Bid shall be typed or written in indelible ink and shall be signed by a person duly authorized to sign on behalf of the Bidder. This authorization shall consist of a written confirmation as specified below and shall be attached to the bid. The name and position held by each person signing the authorization must be typed or printed below the signature. All pages of the Bid, except for un-amended printed literature, shall be signed or initialed by the person signing the bid.

  
Signature of \_\_\_\_\_  
Shahid Hussain Khan

The written confirmation of authorization to sign on behalf of the Bidder shall consist of:

- (a) Power of Attorney on Judicial Paper duly attested by Notary Public.
- (b) Bids submitted by an existing or initiated JV shall include an undertaking signed by all parties (i) stating that all parties shall be jointly and severally liable and (ii) nominating a Representative who shall have the authority to conduct all business for and on behalf of any and all the parties of the JV during the bidding process and, in the event the JV is awarded the Contract, during contract execution.

18.4 Number of copies of the bid to be completed and returned:

**Original + One Copy**

Delete Sub Clause 19.1 and replace with following:

19.2 (a) Procuring Agency's address for the purpose of bid submission:

**Executive Engineer  
Dad Division Shaheed Benazir Abad  
Situating near Gym Khana Restaurant Shaheed Benazir Abad  
Phone # 0244-9370222**

(b) Name and Identification Number of the Contract:

**Restoration of Duro Fall Regulator @ RD. 523 Down Stream of Rohri Main Canal.**

20.1 (a) Deadline for submission of bids:

**Date: As per invitation for Bid.  
Time: As per invitation for Bid**

(b) Venue, time, and date of bid opening.

**Venue: Office of the Executive Engineer Dad Division Shaheed Benazir Abad.**

**Date: As per invitation for Bid.  
Time: As per invitation for Bid**



- 23.4 The date, time, and location of the opening of Price Bids will be advised in writing by the Procuring Agency. Bidders shall be given reasonable notice for the opening of Price Bids.
- 23.5 The Procuring Agency shall conduct the opening of Price Bids of all Bidders who submitted substantially responsive Bids, in the presence of Bidders' representatives who choose to attend at the address, date and time specified by the Procuring Agency. The Bidder's representatives who are present shall be requested to sign a register evidencing their attendance.
- 23.7 All envelopes containing Price Bids shall be opened one at a time and the following read out and recorded:
- (a) the name of the Bidder;
  - (b) whether there is a modification or substitution;
  - (c) the Bid Prices, including any discounts and alternative offers if permitted; and
  - (d) any other details as the Procuring Agency may consider appropriate.
- Only Price Bids, discounts, and alternative offers read out and recorded during the opening of Price Bids shall be considered for evaluation. No Bid shall be rejected at the opening of Price Bids.
- 23.8 The Procuring Agency shall prepare a record of the opening of Price Bids that shall include, as a minimum: the name of the Bidder, the Bid Price, any discounts, and alternative offers. The 'Bidders' representatives who are present shall be requested to sign the record.

## 26.2 Single Stage Single Envelope Bidding Procedure

Add following paragraph at the end of Sub Clause 26.3

The Procuring Agency's determination of a Bid's responsiveness is to be based on the contents of the bid itself, as defined in IB 11.

The Procuring Agency shall examine the technical aspects of the Bid submitted in accordance with IB 11, Technical Proposal, in particular, to confirm that all requirements of Works and Bidding Documents have been met without any material deviation.

Provided that a bid is substantially responsive, the Procuring Agency may waive any non-conformity in the Bid that does not constitute a material deviation, reservation or objection.

  
Procuring Agency  
Bidding Documents

The determination shall be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, pursuant to Sub Clause 3.2.

An affirmative determination shall be a prerequisite for the opening and evaluation of a Bidder's Price Bid. A negative determination shall result into the disqualification of the Bid, in which event the Procuring Agency shall return the unopened Price Bid to the Bidder.

28.4 If the successful bidder failed to submit Performance Security of increased amount within fourteen (14) days of demand by the PA, his bid shall be cancelled and his bid security shall be forfeited.

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

The performance security will be in the form of a "unconditional, irrevocable and acceptable bank guarantee" in the amount of 5% (five percent) of the Accepted Contract Amount acceptable to the Procuring Agency in the attached format

32.3 Validity of performance security

The Performance Security shall be valid for a period 90 days after the date of issue of defects liability certificate

33.4 Stamp duty

The Contract will be executed on a non-judicial stamp paper of the value @ 0.30% of the contract value. The cost of the stamp duty shall be borne by the successful bidder.

[0.3% may vary depending upon the rates applicable at the time of signing the Contract]

EVALUATION/  
QUALIFICATION CRITERIA

Evaluation/Qualification Criteria

1. Evaluation/Qualification Criteria: Based on Pass/Fail system.

1.1 Mandatory Provisions/Eligibility

(i) Registration with PEC:

Bidders must possess valid registration certificate of PEC in the category CA and in discipline (CE-10, CE-01, ME) for at least 01 years. (Attach PEC registration certificate)

Single Entity: Must Meet

(ii) Registration with Income Tax Department:

Bidders must possess valid registration certificate from Income tax authority (NTN). (Attach NTN certificate)

Single Entity: Must Meet

Joint Venture: Lead Member must meet, other members must meet

(iii) Conflict of Interest:

As per SPPRA Rule 2 (1)(i), Bidder shall not have the Conflict of Interest. The "Conflict of Interest means:

- (a) where a contractor, supplier or consultant provides, or could provide, or could be perceived as providing biased professional advice to a procuring agency to obtain an undue benefit for himself or those affiliated with him;
- (b) receiving or giving any remuneration directly or indirectly in connection with the assignment, except as provided in the contract;
- (c) any engagement in consulting or other procurement activities of a contractor, consultant or service provider that conflicts with his role or relationship with the procuring agency under the contract;
- (d) where an official of the procuring agency engaged in the procurement process has a financial or economic interest in the outcome of the process of procurement, in a direct or an indirect manner;

(Attach Affidavit)

Single Entity: Must Meet

Joint Ventures: Lead Member must meet, other members must meet

(iv) **Government Owned Enterprises:**

In accordance with SPPRA Rule 29(2) "Government owned enterprises or institutions may participate only if they can establish that they are;

- (a) legally and financially autonomous; and
- (b) operate under commercial law;

Provided that where government owned universities or research centers in the country are of a unique and exceptional nature, and their participation is critical to project implementation, they may be allowed to participate."

Single Entity: Must Meet

Joint Venture: Lead Member must meet, other members must meet

(v) **Blacklisting:**

Bidder is not black listed pursuant to Instructions to Bidders and SPPRA Rule 2 (1) (i). In accordance with SPPRA Rule 2 (1) (i), Blacklisting means:

"Barring a bidder, contractor, consultant or supplier from participating in any future procurement proceedings by the procuring agency" (Article 17(1)(b))

Single Entity: Must Meet

Joint Venture: Lead Member must meet, other members must meet

(vi) **Litigation History:**

All pending litigation shall in total not represent more than fifty (50) % of the Bidder's net worth and shall be treated as resolved against the Bidder. (Provide details or attach Affidavit in case of not applicable)

Single Entity: Must Meet

Joint Venture: Lead Member must meet, other members must meet

(vii) **History of Non-Performing Contracts:**

All Non-performance of a contract did not occur within the last 5 years prior to the deadline for bid submission based on all information on fully settled disputes or litigation. A fully settled dispute or litigation is one that has been resolved in accordance with the Dispute Resolution Mechanism under the respective contract and where all appeal instances available to the applicant have been exhausted. (Provide details or attach Affidavit in case of not applicable)

The past performance of the applicant on all completed and ongoing projects may also be checked, in coordination with other government departments.

Single Entity: Must Meet

Joint Venture: Lead Member must, other members must meet

(viii) **Failure to Sign Contracts:**

Not being under execution of a Bid Securing Declaration for last 5 years.  
(Provide details or attach Affidavit in case of not applicable)

Single Entity: Must Meet

Joint Venture: Lead Member must, other members must meet

1.2

1.3 **Financial Situation**

(i) **Historical Financial Performance**

a. **Average Net Worth: PKR 50 million**

(Submit Audited Balance Sheet and Income tax submitted by the Bidder for last 03 years)

Single Entity: Must Meet

Joint Venture: Lead Member must, 60% of total requirement (Minimum); each other members must meet 40% of the total Requirement (Minimum)

(ii) **Average Annual Turnover: Minimum: PKR 600 million**

(Minimum average annual construction turnover as mentioned above, calculated as total certified payments received for contracts in progress or completed, within the last three (03) years, Submit Audit Balance Sheet of the Bidder)

Single Entity: Must Meet

Joint Venture: Lead Member must, 60% of total requirement (Minimum); each other members must meet 40% of the total Requirement (Minimum)



### 1.3 General Construction Experience

Bidder shall be in business of construction at least for last 03 years.

Experience under construction contracts in the role of contractor, subcontractor, or management contractor for at least the last three [03] years prior to the bid submission deadline, and with activity in at least nine (9) months in each year. (Attach Articles of Incorporation or Documents of Constitution, and documents of registration of the legal entity. In case of JV, letter of intent to form JV or JV agreement.)

Single Entity: Must Meet

Joint Venture: Lead member must meet, other members must meet.

### 1.4 Specific Construction Experience

Participation as contractor or subcontractor having execution experience in Drainage and Road works management projects in Arid zone/ rural zone, in last ten [10] years. The Project shall be based on the physical size, complexity, methods / technology or other characteristics.

Value of the largest similar work executed in last 3 years:

(Submit verified completion certificates and maintenance certificates)

Single Entity: Must meet

Joint Venture: - Lead Member must meet, all other combine must meet,  
Each Partner N/A

The Bidder must demonstrate that it has the personnel for the key positions that meet the following requirements

- (i) **Project Manager.** Qualification Msc (Civil) to BE (Civil) with 7 years experience (3 years relevant experience) or BE (Civil) with 15 years experience (8 years relevant experience).
- (ii) **Planning Engineer:** BE (Civil) with 10 years experience.
- (iii) **Contracts Engineer:** BE (Civil) with 15 years experience.
- (iv) **Material Engineer:** BE (Civil) or Msc (Geology) with 15 years experience
- (v) **Site Engineers:** Qualification: EE (Civil), Number: (4).  
Experience: 3 similar assignments, 10 years experience.
- (vi) **Sr. Surveyors:** Qualification: Diploma in Civil, Number: 01. Experience: 3 similar assignment, 10 years experience.
- (vii) **Surveyors:** Qualification: Diploma in Civil, Number: (4). Experience: One (1) similar assignment, 5 years experience.

(viii) Quantity Surveyor: Qualification: Diploma in Civil, Number: 01  
Experience: 3 similar assignment, 10 years experience.

(For all Engineer's submit PEC registration certificate and Brief CVs of persons to be attached as per form provided in Appendix M).

Single Entity: Must Meet

Joint Venture: Must meet collectively

### 1.5 Plant & Equipment

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

Sr. No.	Description of Equipment	Capacity & Horse Power	Minimum Requirement (Qty. in No.)
1	Bulldozer	200 HP	4
2	Vibratory Roller	10 - 12 Ton	4
3	Wheel Loader	2.5 Cum	4
4	Plate Compactor	1 <sup>1</sup> HP (230 KG)	4
5	Dump Truck	18 Ton	20
6	Dump Truck	10 Ton	10
7	Excavator (Chain)	105 HP	6
8	Water Tanker	10,000 Ltr	8
9	Concrete Vibrator	5 HP	4
10	Concrete Mixer	3 Cum	3
11	Air Compressor	300 CFM	2
12	Pneumatic Jack Hammer	-	2
13	Crane	25 Ton	4

Note: Total equipment available with the bidder is to be listed along with its current mobilization on on-going projects. The Bidder should provide further details of proposed items of on-going projects the relevant Form in Appendix M.

Single Entity: Must Meet

Joint Venture: Must meet collectively

FORM OF BID  
AND  
APPENDICES TO BID

## SCHEDULE OF PRICE

HEAD OF ACCOUNT: 04-ECONOMIC AFFAIRS-042-IRRIGATION-0422-IRRIGATION-042203- CANAL IRRIGATION .

NAME OF WORK: RESTORATION OF DURO FALL REGULATOR RD 523  
DOWN STREAM OF ROHRI MAIN CANAL.

QUANTITY	No	ITEM OF WORKS	RATE	UNIT	AMOUNT
72,000.0	1	Supplying and filling new jute bags 4 to 5 cft capacity with sand or earth sewing and lying in position under water (P-79-I-3(b)).	202.46	Each	14577120
2,275.0	2	Dismantling cement concrete plain 1:2:4 ( P-no 10 / I - no 19 © )	3327.5	% Cft	75701
32,400.0	3	Excavation in foundation of Buildings, bridges and other structures i/c dagbelling, dressing, refilling around structure with excavated earth watering and ramming lead up to one chain and lift upto 5.0' (the rate i/c the dressing of all excavated earth. B) in ordinary soil. (P-4/I-18(b))	3176.25	%0 Cft	102911
565,749	4	Earth work excavation in Irrigation channel, drains etc. dressed to desing section grade & profiless excavated material disposed off and dressed within 50 feet lead. (a) In ordinary soil. (P-I/I-5(a)).	2420	%0 Cft	1369112
598,149	5	Rehandeling of earth work (b) upto a lead of 50 ft. (P-2/I-9(b))	1058.75	%0 Cft	633290
9,125.5	6	4. RCC work including all labour & material except the cost of steel reinforcement and its labour for bending & binding which will be paid separatly. This rate also includes all kind of forms moulds, lifting, shuttering, curing, rendering and & finishing the exposed surface (including screening and washing of shingle). (a) R. C work in roof slab beams columns rafts, lintels & other structural members laid in situ or precast laid in position complete in all respects. (I) Ratio 1:2:4 (P-16-I-6(a-II)).	337	P.Cft	3075294
570.3	7	Fabrication of Mild Steel reinforcement for cement concrete i/c cutting bending lying in position making joints and fastening i/c cost of binding wire (also i/c removal of rust from bars) (P-17, I-8(a))	4820.2	P.Cwt	2749171
88,261.1	8	Supplying of clean screened (River or Pit) sand within 5 chains i/c removal of top crust of earth or over burden and royalty to the government or cost to the private owner (Page 6, item 36).	420	%0cft	37069.67

QUANTITY	No	ITEM OF WORKS	RATE	UNIT	AMOUNT
548,925	9	Borrow Pit excavation undressed lead upto 100 ft (a) ordinary soil. (P-1/i-3).	2117.5	%0 Cft	1162348.69
	10	Carriage of 100 cft/5 tons of all material like stone aggregate spawl. Coal. Lime, surkhi etc. B.G Rail fastening points and crossing bridge, grids, pipes sheets, Rails, M.S Bars etc of 1000 Nos. Brick 10"x5"x3" or 1000 Nos. tiles 12"x6"x2" or 150 cft of timber or 100 mounds of fuel wood by trucks or any other means owned by the contractor (P-1/1).			
548,925	a	Earth (2 miles) Lead	502.52	%cft	2758457.91
88,261.1	b	Sand (1 miles) Lead	447	%cft	394527.16
548,925	11	Earth Work compaction (soft ordinary or hard soil) laying earth in 6" layers leveling dressing and watering for compaction etc complete. (P-3/l-13(b)).	354.0	%0 Cft	194319.45
375,000.0	12	Stone filling dry hand packed as filling behind retaining walls or in pitching and aprons. [P-31-l-16]	2684.00	%cft	10065000.00
981,365	13	Supply Stone boulders 9"and above. (Page 4, item 25 Sch; Material).	1400.0	%cft	13739103.00
981,364.5	14	Dumping shingle , spawls and boulders including carriage material within 3-chains. [P-81-l-17]	529.38	%cft	5195147.39
	11	Full hire charges of the pumping set per day including of wages of driver and assistant fuel or electric energy plate form required for placing pumps etc at lower depths with suction and delivery pipes for pumping out water found at various depths form trenches including the cost of erection and dismantling after the completion of the job. (i) Hire charges of pumping set of up to 10 HP pumping out water from 20' ft deep trench P. day (PHED-Sch (P-76/l-23)			
280	Days	(a) 3" dia	1500	P. Day	420000
280	Days	(b) 6" dia	2000	P. Day	560000
		NOTE: For working the pump beyond 8 Hrs. the following payment shall be made, the hire of the pumping set itself being for 24 hours. i) for pumping set of above 10 HP. P-77/l-23(iv)			
4480	Hours	(a) 3" dia	188	P. Hour	842240
4480	Hours	(b) 6" dia + 8" dia	250	P. Hour	1120000
Total Rs.					<b>59070811</b>
(-) Non Schedule Items No. 10(a&b)					<b>3,152,985</b>
Schedule Item				Rs.	<b>55,917,826</b>
Percentage quoted above below on the price of item based on composite schedule of rates.					

CONTRACTOR

EXECUTIVE ENGINEER  
DAD DIVISION  
SHAHEED BENAZIR ABAD

## FORM OF BID

Bid Reference No. TC / G – 55 / Dated \_\_\_\_\_  
 Name of Work: Restoration of Duro Fall Regulator @ RD. 523  
Down Stream of Rohri Main Canal.

To:

The Executive Engineer  
Dad Division  
Shaheed Benazir Abad

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 / I, the undersigned, offer to execute and complete the work and remedy and defect therein in conformity with the Conditions of Contract, Specification, Drawing, Bill of Quantities and Addenda for the sum of Rs \_\_\_\_\_ (Rupees \_\_\_\_\_) or such other sum as may be ascertained in accordance with the said Documents.
2. We/I 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/I submit herewith a Bid Security in the amount of Rupees \_\_\_\_\_ (Rs. \_\_\_\_\_) drawn in your favour or made payable to procuring agency 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 work comprised in the Contract within the time(s) 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.

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 \_\_\_\_\_  
(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: \_\_\_\_\_



## SPECIAL STIPULATIONS

## Clause

## Conditions of Contract

1.	Engineer representing Consulting Firm hired by the procuring agency to issue variation in case of emergency.	3.1	Up to 2% of the contract price stated in the Letter of Acceptance.
2.	Amount of Performance Security	4.2	Up to 10% of contract price. Total amount including performance security and retention money deducted from bills should not exceed 10% of contract price stated in the Letter of Acceptance.
3.	Time for Furnishing Programme	8.3	Within 42 days from the date of receipt of Letter of Acceptance.
4.	Minimum amount of Third Party Insurance	18.3	Rs. _____ 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 (works & sections)	8.2 & 10.2	_____ days from the date of receipt of Engineer's Notice to Commence.
7.	Amount of Liquidity Damages/Delay Damages/Penalties	8.7	-----Damages per day (are to be mentioned) but total amount will not be more than 10% of contract Price.
8.	Defects Liability Period	11.1	_____ 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	Rs. _____
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 currency or 42 days in case of foreign funded projects.
13.	Mobilization Advance.	14.3	10% of Contract Price stated in the Letter of Acceptance.

### FOREIGN CURRENCY DISCOUNTS

1. The bidder may indicate how it will discount foreign currency payments with reference to various currencies to the works.
2. Foreign Currency Requirements as per the Bill of Materials shall be in the following Sums \_\_\_\_\_%.
3. Table of Exchange Rates

Unit of Currency	Exchange Rate to Pak. Rupee
Australian Dollar	_____
Euro	_____
Japanese Yen	_____
U.K. Pound	_____
U.S. Dollars	_____
_____	_____
_____	_____



PRICE ADJUSTMENT UNDER CLAUSE 70/13.8  
OF CONDITIONS OF CONTRACT

A. Weight 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 Labor		Government of Pakistan (GoP) Federal Bureau of Statistics (FBS) Monthly Statistical Bulletin.
(iii)	Cement – in bags		“ “ “
(iv)	Reinforcing Steel		“ “ “
(v)	High Speed Diesel (HSD)		“ “ “
(vi)	Bricks		“ “ “
(vii)	Bitumen		“ “ “
(viii)			
	Total	1.000	

Notes:

- 1) Indices for “(ii)” to “(vii)” are taken from the Government of Pakistan Federal Bureau of Statistics, Monthly Statistical Bulletin. The base cost indices or prices shall be those applying 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 materials only.  
 Price adjustment on following items shall be allowed:

Cost Element	Description	Base price	Applicable Index
1	2	3	4
(i)	Cement - in bags		Government of Pakistan (Govt) Federal Bureau of Statistics (FBS) Monthly Consumer Price Index
(ii)	Reinforcing Steel		" " "
(iii)	Bricks		" " "
(iv)	Bitumen		" " "
(v)	Wood (Composite item)		" " "
	Total five items.		

## BILL OF QUANTITIES

### A. Preamble

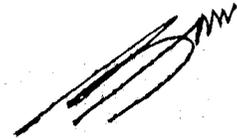
1. The Bill of Quantities shall be read in conjunction with the Conditions of Contract, Specifications and Drawings.
2. The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities 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.

## GENERAL ABSTRACT

S.No.	Name of Scheme	Cost
-------	----------------	------

- |    |  |  |
|----|--|--|
| 1. | Restoration of Duro Fall Regulator @ RD. 523<br>Down Stream of Rohri Main Canal. |  |
|----|--|--|

G.TOTAL:-
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(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: \_\_\_\_\_

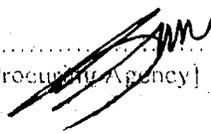
..... [name of Contractor] hereby declares that it has not obtained or induced the procurement of any contract, right, interest, privilege or other obligation or benefit from Government of Sindh (GoS) or any administrative subdivision or agency thereof or any other entity owned or controlled by it (GoS) 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 times the sum of any commission, gratification, bribe, finder's fee or kickback given by [name of Contractor] as aforesaid for the purpose of obtaining or inducing the procurement of any contract, right, interest, privilege or other obligation or benefit in whatsoever form from PA.

  
[Procuring Agency]

[Contractor]

FORMS

BID SECURITY  
PERFORMANCE SECURITY  
CONTRACT AGREEMENT  
MOBILIZATION ADVANCE GUARANTEE  
INDENTURE BOND FOR SECURED ADVANCE

BS-1

**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 therefore, 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 as to whether the Principal (Bidder) has duly performed his obligations to sign the Agreement and to furnish the requisite Performance Security and whether the Principal has defaulted in fulfilling said requirements and the Surety shall pay the said sum upon demand from the procuring agency to the Principal or any other person.

IN WITNESS WHEREOF, the above bound Surety, of its own free will and accord, has hereunto set its hand and seal on the date indicated above, the name and seal of the Surety being hereunto attested by these presents duly signed by its undersigned representative and attested by the governing body.

SURETY (Bank)

WITNESS:

1. \_\_\_\_\_  
\_\_\_\_\_

Corporate Secretary (Seal)

2. \_\_\_\_\_  
\_\_\_\_\_  
Name, Title & Address

Signature \_\_\_\_\_

Name \_\_\_\_\_

Title \_\_\_\_\_

Corporate Governor (Seal)

**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 9, 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 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 by bank

civil 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 of 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.

Witness:

1. \_\_\_\_\_

\_\_\_\_\_  
Corporate Secretary (Seal)

2. \_\_\_\_\_

\_\_\_\_\_  
Name, Title & Address

\_\_\_\_\_  
Guarantor (Bank)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Corporate Guarantor (Seal)



01-1

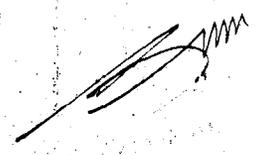
FORM OF CONTRACT AGREEMENT

THIS CONTRACT AGREEMENT (hereinafter called the "Agreement") made on the \_\_\_\_\_ day of \_\_\_\_\_ (month) 20\_\_\_\_ between \_\_\_\_\_ (hereafter called the "Procuring Agency") of the \_\_\_\_\_ 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 signed and sealed the day, month and year first before written in accordance with their respective laws.

Signature of the Contactor

Signature of 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

Bank 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)  
(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.



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 .....  
..... 20..... 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).

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 (B), 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 materia's brought by the Contractor to the site of the said works.

NOW THIS INDENTURE WITNESSETH 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 ..... Rs. .... ) so advanced by the Government to the Contractor as aforesaid and all or any further sum or sums which may be advanced as 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 offered to and accepted by the Government as security for the said amount are

absolutely by the Contractor's 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

(3) That the said materials detailed in the said Running Account Bill (B) and all other 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 the 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 greater degree than is due to reasonable use and wear thereof Contractor will forthwith replace the same with other materials of like quality 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) That 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 Contractor's Bill for such payment by deducting therefrom in the value of the said materials (then 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 the 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 of repayment and with all costs, charges, expenses and expenses incurred by the Government or for the recovery

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 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 there with 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.

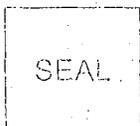
(b) Remove and sell by public auction the seized materials or any part thereof and out of the moneys arising from the sale retain all the sums aforesaid repayable to the Government under these presents and pay over the surplus (if any) to the Contractor.

(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 said 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/Executive District Officer/Officer one grade higher to officer signed the agreement Circle whose ..... decision shall be final and the provisions of the Arbitration Act 1940 for the time being in force so far as they are applicable shall apply to any such reference.

Singed, sealed and delivered by\*  
In the presence of



1<sup>st</sup> witness  
2<sup>nd</sup> witness

Signed, sealed and delivered by\*  
In the presence of

SEAL

1<sup>st</sup> witness  
2<sup>nd</sup> witness



## 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 4th revised 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:

To request such permission please contact:

FIDIC CASE POSTALE, CH-1215 Switzerland;

Tel. +41 22 799 49 00;

Fax; +41 22 799 49 01

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



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PART B - 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".
1.1.1.8	"The word 'Tender' is synonymous with 'Bid', and the words 'Bidding' with 'Tendering' and the words 'Appendix to Tender' with 'Appendix to Bid' and words 'Tender Documents' with 'Bid Documents'".
1.1.1.11	Insert this Sub Clause "Programme" means the programme to be submitted by the contractor in accordance with Sub-Clause 8.3 and any approved revisions thereto.
1.1.2.2	"Employer" is synonymous with "Procuring Agency". The Employer is: Executive Engineer Highway Division Situatied near Kazi Ahmed road Phone: 02449370133 Fax: 0244366648 Employer's Representative, Executive Engineer
1.1.2.4	The Engineer is: EA Consulting (Pvt) Limited A-9, 15 <sup>th</sup> Lane, Khayaban-e-Hilal, Phase VII, DHA Karachi.
1.1.2.9	"DB" is synonymous with "Committee"
1.1.3.1	"Replace 28 days with 7 days"
1.1.3.7	"Defects Notification Period is synonymous with Defects Liability Period"
Sub-Clause 1.5 Priority of Documents	Replace sequence of priority of documents with the following: (a) the Contract Agreement (if completed), (b) the Letter of Acceptance, (c) the Tender including Letter of Bid, Appendix to Bid, Annexure, and tables excluding Appendix D Bill of Quantities", (d) the Particular Conditions – Part A, (Appendix A) (e) the Particular Conditions – Part B

	<p>(f) the General Conditions</p> <p>(g) the Drawings,</p> <p>(h) the Addenda to Specification, Special Provisions and Specification,</p> <p>(i) the Appendix D, Bill of Quantities and</p> <p>(j) The Schedules and any other documents forming part of the Contract.</p>
Sub-Clause 1.6 Contract Agreement	<i>Replace the word 'Employer' with 'Contractor' in last line</i>
Sub-Clause 1.15 Inspections and Audit by the Bank	This Sub-Clause is deleted entirely.
Sub-Clause 2.4 Employer's Financial Arrangements	This Sub-Clause is deleted entirely.
Sub-Clause 3.1 Engineer's Duties and Authority	<p><i>The following paragraph is added after duties:</i></p> <p>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 1975)</p> <p><i>Replace part of Clause after the sentence "The following provisions shall apply" with following:</i></p> <p>The Engineer shall obtain the specific approval of the Employer before taking action under the following Sub Clauses of these conditions:</p> <p>a) Sub-Clauses 1.9, 2.1, 4.7, 4.12, 4.24, 7.4, 8.4, 8.5, 8.9, 10.3, 13.7, and 19.4: Agreeing or determining an extension of time and/or additional cost.</p> <p>b) Approving subletting of any part of the Works under Clause 4.4.</p> <p>c) Sub-Clause 8.8: Instructing suspension of Works;</p> <p>d) Sub-Clause 10.1: Issuing Taking Over Certificate</p> <p>e) Sub-Clause 10.2: Issuing Taking Over Certificates</p> <p>f) Sub-Clause 11.9: Issuing Performance Certificate(s)</p> <p>g) Sub Clause 13.1: Instructing a Variation, except:</p> <p>i) in an emergency situation as determined by the Engineer, or</p> <p>ii) if such Variation would increase the Accepted Contract Amount not more than 1% cumulatively of such Amount.</p> <p>h) Sub-Clause 13.3: Approving a proposal for Variation submitted by the Contractor in accordance with Sub Clause 13.1 or 13.2.</p>

	<p>j) Sub-Clause 13.4: Specifying the amount payable in each of the applicable currencies.</p> <p>k) Sub-Clause 13.7: Before Adjustment for Changes in Legislation</p> <p>l) Sub-Clause 13.8: Before Adjustment for Changes in Cost</p> <p>m) Sub-Clause 20.1: Approving Claims of the Contractor (Time / Financial) under Clause 20.1 and accepting principles of the Claims</p> <p>Notwithstanding the obligation, as set out above, to obtain approval, if, in the opinion of the Engineer, an emergency occurs affecting the safety of life or of Works or adjoining property, he may, without relieving the Contractor of any of his duties and responsibility under the Contract, instruct the Contractor to execute all such work or to do all such things as may, in the opinion of the Engineer, be necessary to abate or reduce the risk. The Contractor shall forthwith comply, despite the absence of approval of the Employer, with any such instruction of the Engineer. The Engineer shall determine an addition to the Contract Price, in respect of such instruction, in accordance with Clause 13 and shall notify the Contractor accordingly, with a copy to the Employer.</p>
<p>Sub-Clause 3.6 Management Meetings</p>	<p><i>Insert this Sub Clause at the end of Clause 3</i></p> <p>"The Engineer or the Contractor's Representative may require the other to attend a management meeting in order to review the progress with reference to the agreed program and arrangements for future works. The Engineer shall record the business of management meetings and supply copies of the record to those attending the meeting and to the Employer. In the record, responsibilities for any actions to be taken shall be in accordance with the Contract".</p>
<p>Sub-Clause 4.1. Contractor's General Obligation</p>	<p><i>Add following at the end of Sub-Clause 4.1:</i></p> <p>The Contractor shall prepare and submit one complete set of "As-Built" Documents on one master CD and two complete sets of print copies of "As-Built" Documents together with the back-up of the quantity calculation to the Engineer within 28 days after the date of taking over by Employer. These "As-Built" Documents shall indicate all approved changes made during construction, as imposed on the original plans / "As-Stacked Documents".</p> <p>The fact measured quantities for all pay items shall be included on all "As-Built" Documents. These "As-Built" Documents shall be prepared continuously as execution of the Works progresses and shall be submitted to the Engineer for review as sections or parts of the Project are</p>

the foregoing requirements.

The Contractor shall submit five (5) copies of Shop Drawings plus the number that the Contractor wishes to return for his own and his Subcontractor's use.

For all Equipment, Shop Drawings shall be completed in all respects and shall show clear compliance with the Specifications. Where applicable, performance figures of equipment, finishes and reference to other relevant drawings must be noted on the Shop Drawings. Details of ancillary items being supplied with the particular equipment must be submitted. Piecemeal submissions will not be considered.

Descriptive brochures that are applicable shall be included for information. Any notation on the Shop Drawings which is on the prints and not on the original from which the prints were made shall be in GREEN INK.

The Engineer will review submitted Shop Drawings within a reasonable time and will return them stamped with "NO COMMENT", "SEE COMMENTS" or "RESUBMIT".

The Engineer may, at his discretion, require an immediate re-submission of Shop Drawings noted "SEE COMMENTS" so that he can make a further review or amendments. Drawings requiring re-submission shall be either amended and re-submitted or shall be superseded by another Shop Drawings. Comments on Shop Drawings are not orders for Extra Work.

Shop Drawings re-submitted for further review will be reviewed for response to previous notations only and the Contractor, by such re-submission shall be held to have represented that such Shop Drawings contain no other alterations, additions or deletions, unless the Contractor (in writing) directs the Engineer specific attention to the same.

Should the Contractor question, or dissent, from such notations or comments, he shall direct the Engineer's attention to the same for further clarification before re-submitting.

*By reviewing Shop Drawings, the Engineer does not assume responsibility for errors or omissions and non-compliance with the Contract requirements. Such errors and omissions must be made good by the Contractor, irrespective, of the receipt, checking, or review of the Shop Drawings by the Engineer and even though the Work is done in accordance with such Shop Drawings.*

As-Staked Drawings; "As-Staked" Drawings shall be

completed. No Taking-Over Certificate for a Sector or the whole of Works shall be issued to the Contractor by the Engineer without the approved "As-Built" Documents. The preparation of the "As-Built" Documents shall be at the expense of the Contractor, payment for which is subsidiary to the pay items of the Contract.

The review and approval by the Engineer or by the Employer of the "As-Built" Documents does not relieve the Contractor of any responsibility for and/or liabilities arising out of inaccurate, false or otherwise incorrect "As-Built" Documents prepared and submitted by the Contractor. The approved "As-Built Documents" shall be reproduced by the Contractor in four (4) hard copies and one (1) soft copies and return the same to the Employer.

**Shop Drawings.** The Contractor shall furnish to the Engineer all Contractor's, and Subcontractor's Shop Drawings. Shop Drawings shall be deemed to include design drawings, fabrication drawings, catalogue cuts, brochures, illustrations, material lists, design calculations, reference standards and performance data which may be required by the specification necessary for the proper execution of the Work, or as otherwise required by the Engineer for assurance that there is intent to meet the requirements of the specifications. All Shop Drawings shall be in English.

The Contractor shall submit all Shop Drawings to the Engineer in the manner hereinafter described, in sufficient time to prevent delays in the delivery of materials or in the progress or completion of the work. Regardless of the source of Shop Drawings, all submissions shall be deemed to be submissions by the Contractor under the Contract.

All Subcontractors' Shop Drawings shall first be sent directly to the Contractor. The Contractor shall thoroughly check all such Shop Drawings for measurements, sizes of members, materials and all other details, to assure him that the Shop Drawings conform to the intent of the Drawings and Specifications.

The Contractor shall return to the Subcontractors for correction, such Shop Drawings that are found inaccurate or otherwise in error. After the Contractor has checked and approved such Shop Drawings he shall place thereon the date of such approval and the legible signature of the checker, and shall then submit them to the Engineer for review. The Engineer may refuse to check or review any Shop Drawings that are not submitted in compliance with

<p>Sub-Clause 4.3 Contractor's Representative</p>	<p><i>Insert additional paragraph at the end of Sub-Clause 4.3</i></p> <p>The Contractor's authorized representative and his other professional engineers working at site shall register themselves with the Pakistan Engineering Council.</p>
<p>Sub-Clause 4.4 Subcontractors</p>	<p><i>Replace first line with the following</i></p> <p>The Contractor may subcontract the Works for the maximum value equal to 25% of the Accepted Contract Amount.</p>
<p>Sub-Clause 4.8 Safety Procedures</p>	<p><i>Insert additional paragraph at the end of Sub-Clause 4.8</i></p> <p>In the event of work being carried out at night, the Contractor shall at his own cost, provide and maintain such good and sufficient light as will enable the work to proceed satisfactorily and without danger. The approaches to the Site and the Works where the night-work is being carried out shall be sufficiently lighted. All arrangement adopted for such lighting shall be to the satisfaction of the Engineer.</p>
<p>Sub-Clause 4.18 Protection of the Environment</p>	<p><i>Final paragraph to be added to after second paragraph</i></p> <p>The Contractor shall exercise care to protect the natural landscape and shall conduct his construction operation so as to prevent any unnecessary destruction, scarring or defacing of the natural surroundings in the vicinity of the Works, except where clearing is required for permanent works, approved temporary works and for excavation operations. All trees and native vegetation shall be preserved and shall be protected from damage, which may be caused, by the Contractor's construction operations and equipment. On completion of the Works, all work areas shall be smoothed and graded in a manner to scarring damage or defacing may occur as a result of the Contractor's operations, it shall be repaired, replanted or otherwise corrected as directed by the Engineer at Contractor's expense.</p> <p>Borrow areas shall be located and operated so as not to detract from the future usefulness or value of the sites. Upon completion of operations, borrow areas shall be left in a safe and sightly conditions. No borrow areas shall be located within 500 meter from the right of way.</p> <p>During the performance of the work required under the Contract, the Contractor shall carryout proper and efficient measures as often as necessary to reduce the dust nuisance, and to prevent dust originating from his operations. For waste water disposal, the provision of septic tank alone for worker's camp etc. will not be sufficient and may have to be supplemented with</p>

prepared for the entire project. These drawings shall be submitted to the Employer for review and approval regardless of the nature of the changes in the original design, if there is increase/decrease of more than five percent (5%) in quantities of major items of work and more than ten percent (10%) for minor items of work. Variation Order shall be prepared in accordance with Sub-Clause 13.1.

The preparation of the "As-Staked" drawings, and the corresponding back-up calculations must be completed within a reasonable period from the commencement of the project. The plans shall indicate major modifications (i.e. change in road alignment, change in type or main components of structures, introduction of new work items), superimposed on the original plans.

The approved "As-Staked" drawings shall be reproduced (white print) by the Contractor in five (5) copies. The preparation of the "As-Staked" drawings and reproduction cost shall be at the expense of the Contractor, payment for which is subsidiary to the pay items of the contract.

All data pertaining to As-Staked survey shall be jointly signed by the Contractor's and Engineer's representatives.

**Quality of Plans ("As-Built", "As Staked" and other Drawings for Variation).** All sheets of the "As-Built", "As-Staked" and other drawings for Variations should be of uniform size and one (1) standard size (A1) using Mylar or other quality tracing paper. The sheets must be neat and clean and without any crossed-out or voided portion. The title block should be made an integral part of the sheet plans and not merely patched-up.

**Supplementary Drawings and Instructions.** The Engineer shall have the authority to issue to the Contractor from time to time such supplementary drawings and instructions to the proper and adequate execution of the Works and the remedying of any defects therein. The Contractor shall carry out and be bound by the same.

The Contractor shall designate an additional set of drawings as "Record Drawings" and keep them to the site.

The Contractor shall clearly and neatly mark the Record Drawing in ink to indicate all authorized changes in the work, and also as actually constructed. These additional plans will not change the work of the Contract but will elucidate or explain it.

	<p>way.</p> <p>Notwithstanding the Approval by the Engineer of the Contractor's methods of dealing with water, the Contractor shall be responsible for and accept all the risks and liabilities of dealing with water from whatever source and of all effects thereof.</p> <p>The Contractor shall throughout the execution and completion of the Works and the remedying of any defects therein, comply with all applicable Environment Protection Laws and Regulations of the Country.</p>
<p><b>Sub-Clause 4.21</b> <b>Progress Reports</b></p>	<p><i>Add following paragraphs after paragraph (h)</i></p> <ul style="list-style-type: none"> <li>(i) An updated construction schedule indicating the progress in percentage; and</li> <li>(j) Description of all works carried out since the last report; and</li> <li>(k) An updated Progress Curve/Projected Cash flow indicating the planned and actual progress; and</li> <li>(l) An updated Critical Resource Usage Chart showing comparison of planned and actual values; and</li> <li>(m) An updated material procurement plan showing comparison of planned and actual values; and</li> <li>(n) An updated schedule of shop drawings comparison of planned and actual values; and</li> <li>(o) Description of the Works planned for the next 28 days sufficiently detailed to enable the Engineer to determine his programme of inspection and testing; and</li> <li>(p) Summary of all submission; and</li> <li>(q) Information about problems and areas of concern and proposal to overcome the same.</li> </ul>
<p><b>Sub-Clause 6.5</b> <b>Working Hours</b></p>	<p><i>Add the following paragraph at the end of Sub-Clause 6.5:</i></p> <p>The Contractor shall pay overtime payment to the Engineer's Support Staff/Personnel who were required by the Contractor to perform their respective work assignment beyond the normal working hours stated in Part A - Particular Conditions (Appendix A).</p>
<p><b>Sub-Clause 6.10</b> <b>Records of Contractor's Personnel and Equipment</b></p>	<p><i>The following paragraphs added:</i></p> <p>The Contractor shall, upon request by the Engineer at any time in relation to any time 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.</p>

secondary treatment in form of gravel drains / constructed welland depending on the laboratory results of effluent from the septic tank.

The Contractor shall take all necessary measures to prevent water from the Site causing a nuisance on or, in any neighbouring land or property either by causing flooding or by depositing sediment on the surface of the ground or in drains or watercourses. Wherever necessary to prevent this, the Contractor shall construct temporary drainage channels, layer sumps and traps (in addition to those shown on the Contract) discharging into existing drain, ditches or watercourses. The Contractor shall remove over all sediment, which may accumulate on any land or in any drains, ditches or watercourses or in any other property as a result of his operations.

All works including those below sub-soil standing water level shall be carried out in the dry unless specified otherwise. The Contractor's arrangements for controlling the inflow of water into the parts of the excavation being worked and during the placing of concrete and other works therein and for the collection and disposal of water shall be to the Engineer's Approval. Such arrangements may include inter alia temporary cofferdams, well-point systems, pumps, drains trenches, flumes and other recognized means. All Costs and charges in dealing with water in any way whatsoever and the effects thereof will be deemed to be included in the Contract Price and in the unit rates or prices of the Contractor for excavations.

Water flowing into excavations shall be carried by trenches, drainage layers or open jointed drains to sumps from which it shall be pumped. Such trenches drains or sumps shall generally be clear of the Permanent Works unless approved otherwise by the Engineer. If, with the said Approval of the Engineer trenches drains or sumps are excavated under or immediately adjacent the Permanent Works, these shall comprise open-jointed pipes with gravel mounds. When no longer required and when approved by the Engineer they shall be filled with a cement /sand grout injected under pressure so as to fill the pipe and all voids completely.

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

<p><b>Sub-Clause 6.23</b> <b>Epidemics</b></p>	<p><i>Insert sub-clauses after Sub-Clause 6.22:</i> In the event of any outbreak of illness of an epidemic nature, the Contractor shall comply with and carry out such regulations, orders and requirements as may be made by the Government or the local medical or sanitary authorities, for the purpose of dealing with and overcoming the same.</p>
<p><b>Sub-Clause 6.24</b> <b>Workers' Organizations</b></p>	<p><i>Insert additional sub-clauses after Sub-Clause 6.23:</i> In countries where national law recognizes workers' rights to form and to join workers' organizations of their choosing without interference and to bargain collectively, the Contractor shall comply with national law. The Contractor shall not discriminate or retaliate against Contractor's Personnel who participate, or seek to participate, in such organizations. Where national law restricts workers' organizations, the Contractor shall ensure that Contractor's Personnel have alternative means to express their grievances and defend their rights regarding working conditions and terms of employment, such as worker committees or forums to facilitate dialogue between workers' representatives and the employer. Where national law is silent on this issue, the Contractor shall not discriminate or retaliate against Contractor's Personnel who participate, or seek to participate, in organizations and forums designed to promote good working conditions and favourable terms of employment, consistent with the Contract.</p>
<p><b>Sub-Clause 6.25</b> <b>Non-Discrimination and Equal Opportunity</b></p>	<p><i>Insert additional sub-clauses after Sub-Clause 6.24:</i> The Contractor shall not make employment decisions on the basis of personal characteristics unrelated to inherent job requirements. The Contractor shall base the employment relationship on the principle of equal opportunity and fair treatment, and will not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline. In countries where national law provides for non-discrimination in employment, the Contractor shall comply with national law. When national laws are silent on non-discrimination in employment, the Contractor shall meet this Sub-Clause's requirements. Special measures of protection or assistance to remedy past discrimination or selection for a particular job based on inherent requirements of the job will not be deemed discrimination.</p>
<p><b>Sub-Clause 7.9</b> <b>Use of Pakistani</b></p>	<p><i>Insert additional sub-clauses after Sub-Clause 7.8:</i> The contractor shall, so far as may be consistent with the</p>

Materials and Services	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.
Sub-Clause 8.1 Commencement of Works	Delete paragraph (b) entirely 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
Sub-Clause 8.3 Programme	Insert following additional paragraphs at the end of Sub Clause 8.3; The program shall be submitted in the form of CPM charts. The Contractor will also have a licensed copy of the software from a reputed firm which shall be accessible to the Engineer as well as his assistants. Contractor shall organize a training program for his and Engineer's staff so that the program can be updated regularly as required. The revised programme, in accordance with the Contract, shall be submitted within fourteen (14) days of the request received from the Engineer. The Contractor shall pay a penalty of Rs. 100,000/- (Rupees Hundred Thousands only) for each day of delay in the submission of said revised programme. The Employer shall recover such amount from any payment due to the Contractor under the Contract, on the Engineer's recommendations. Notwithstanding General Conditions of the Contract Sub Clause 8.3, the program to be submitted for the execution of the works shall, in addition to the program of pure construction activities, include an alleviation program for site staff and labour and their families (if allowed to stay at camp) in respect of Sexually Transmitted Infections (STI), Sexually Transmitted Diseases (STD) including HIV/AIDS. The STI and HIV/AIDS alleviation program shall indicate when, how and at what cost the Contractor plans to satisfy the requirements of Sub Clause 6.7 herein and the related Specifications. The Contractor shall submit the Programme of Works on Primavera Project Planner P-5 or the latest (both hard and soft copy) for the consent of the Engineer. All items of works and activities including mobilization should be included in the Programme of Works. The programme shall identify and highlight those activities, which are on the Critical Path. The programme shall be revised monthly and

should include a chart of principal activities of the work forecast for monthly execution and an updated schedule of the payment to be made by the Employer to the Contractor. This programme of works as scheduled shall form basis of Delay Damages pursuant to Sub-Clauses 6.7.

In addition, cash flow estimates shall be supported with inputs of over drafts organized with financial institutions at various stages of the projects to meet the funding requirements of the project. The Contractor shall supply and maintain at his site office for his and Engineer's use a licensed copy of the project management computer software package namely Primavera for programming and to monitor the progress. It shall be supplied complete with manuals and technical training and support for the duration of the Contract as per requirements assessed by the Engineer.

In order to assist the Engineer's Project Management Team, the Contractor shall be required to submit at 2 weeks intervals data to the Engineer on the cost and quantities and other data relevant to the monitoring of progress according to a particular format suitable for computer processing.

The programme should be computerized and drawn up on the CPM with all details as illustrated in this Clause, identifying all items of work including temporary work. Progress reporting by the Contractor should be supported on a monthly basis with an up-to-date analysis of the progress including a statement on items, which are or are about to become critical to the progress of the work along with the proposals on how the Contractor intends to alleviate the situation.

**General Requirements:**

- a. Programme should be submitted (both hard and soft copy) strictly following the guidelines and format specified in this Clause.
- b. The Engineer at any time during the execution of the Works; direct the Contractor to change/modify the Programme / Schedule based on the Priority of Works.
- c. No payment shall be released to the Contractor prior to approval of the Base Line Prog by the Engineer.
- d. Submittal of Programme consists of:
  1. Construction Schedule (CPM)
  2. Progress Curve/Project Cash
  3. Critical Resources Usage Chart

4. Detailed Method Statement;
5. Material Procurement Plan;
6. Schedule of Submittals and Shop-Drawings;
7. Any other details as required by the Engineer;

#### Construction Schedule:F

- a. Construction Schedule shall be developed on the basis of Work Breakdown Structure provided or approved by the Engineer.
- b. Construction Schedule shall be detailed up to level 4 or as required by the Engineer.
- c. Durations of construction activity should be calculated practically in relation to quantity of work done and allocated resources. Any activity that demands duration greater than seven (07) calendar days should be split into number of activities to monitor the same accordingly.
- d. Construction activities of the schedule should be logically linked with preceding and succeeding activities and shown in submitted construction schedule.
- e. Critical Activities and Critical Path of the project should be highlighted with red colour in bar chart and precedence diagram. Total Float for non-critical activities should also be shown in the schedule.
- f. Appropriate quantity of direct resources (material, labour, equipment and non-consumable material) should be allocated to all activities and showed in submitted construction schedule. Labour resource should be divided according to related trades (e.g. Mason, Operator, helper etc.) Contractor should make sure that no resource is being over allocated. Indirect resources should be allocated to supervision / supervisory activity.
- g. BOQ amount should be loaded to reach construction activity. Accrual basis should be indicated to construction activity.
- h. Construction Schedule should show Activity ID, Activity Description, BOQ Quantity, Duration, Start Date, Finish Date, Total Float, Predecessors, Resource names with quantity, BOQ Amount and timescale where the bars show start and finish dates.

#### Progress Curve / Projected Cash Flow:

- a. Progress Curve / Projected Cash Flow should be developed and presented on Project Management Software -- Primavera Project Planner.

- b. S-Curve should be plotted between time (in weeks) and progress of work done (in % of work). The progress should be shown in cumulative percent of work done. Percent of work done should be calculated with the BOQ and unit and payment terms.

**Critical Resources Usage Chart:**

- a. Critical Usage Chart should be developed.  
b. List of Critical Resources included Labourers, equipments, consumable/non-consumable materials and/or identified by the Engineer.  
c. Resource usage chart should show Resource Name and weekly utilization (numbers) of resources on each activity.

**Detailed Method Statement:**

- a. Detailed method statement should be presented in descriptive format explaining the method of carrying out works, logistics, site layout, flow of work, quality and safety measures for each activity and any other details as required by the Engineer.

**Material Procurement Plan:**

- a. Material Procurement Plan for major items of purchase should be presented in a Tabular Format to be submitted to the Engineer for pre-approval. The Plan must as a minimum show the list of local & imported materials to be used, their specification reference, and planned dates for submittal to Consultant, approval process, placing of order, vendor contact, required delivery on site, status of Line of Credit (LOC) if applicable, and usage of material.

**Schedule of Shop Drawings and Submittals:**

Schedule of Shop Drawings and other Submittals should be presented in a Tabular Format to be submitted to the Engineer for pre-approval. Plan must as a minimum show the list of shop drawings required and their specification reference, planned dates for submittal to consultant, approval process, and usage of shop drawing.

**Cash Flow Estimates:**

The Contractor shall, within 28 days from the receipt of the Letter of Acceptance, provide to the Engineer for his information a detailed cash flow estimate in quarterly periods, of all payments to which the Contractor will be entitled under the Contract and the Contractor shall subsequently supply revised cash flow estimates at quarterly intervals. Revised by the Engineer.

**Revised Programme:**



	<p>If at any time it should appear to the Engineer that the actual progress of the Works does not conform to the programme to which consent has been given under Sub-Clause 8.3, the Contractor shall produce, at the request of the Engineer, a revised programme showing the modifications to such programme necessary to ensure completion of the Works within the Time for Completion.</p>
<p><b>Sub-Clause 8.7 Delay Damages</b></p>	<p><i>Insert following additional paragraphs at the end of Sub-Clause 8.7:</i></p> <p>Notwithstanding the provision of above stated conditions following shall prevail:</p> <p>The rate of Delay Damages shall be 0.1% per day of the Contract Price for every day of delay in which whole or part of the work(s) remained unfurnished subject to a maximum of 10% of the Final Contract Price.</p> <p>In addition to the Delay Damages, the Contractor shall borne all the cost/expenses related to the supervision of the works by the Engineer and his staff covering salaries of the Engineer and all of his Site Supervision staff including all the benefits, providing, running and maintenance of all the Engineer's Facilities up to the issuance of the Taking Over Certificate by the Employer. All the above cost/expenses will not be reimbursed / paid to the Contractor beyond the approved completion period of the works.</p> <p>If before the Time for Completion of the whole of the Works or, if applicable, any Section, a Taking-Over Certificate has been issued for any part of the Works or of a Section, the delay damages for delay in completion of the remainder of the Works or of that Section shall, for any period of delay after the date stated in such Taking-Over Certificate, and in the absence of alternative provisions in the Contract, be reduced in the proportion which the value of the part so certified bears to the value of the whole of the Works or Section, as applicable. The provisions of this Sub-Clause shall only apply to the rate of delay damages and shall not affect the limit thereof.</p> <p><b>Interim Delay Damages</b></p> <p>Contractor's works programme submitted under Sub-Clause 8.3 of the Conditions of Contract shall be considered part of the Contract Agreement. If the Contractor's progress is not as per approved programme of works, the Contractor shall be liable for Interim Delay Damages at the rate of 0.05% of the Contract Price for each day of delay, which shall be refunded if the progress again matches the approved programme of works during the currency of works.</p> <p>The amount of interim delay damages deducted by the</p>

	<p>Employer from the payment of the Contractor and refunded shall be taken into consideration while determining the delay damages for the whole of the Works.</p> <p>If the progress of works is observed to be behind approved programme of works against three consecutive months then the Employer may invoke Sub-Clause 15.2 of the Conditions of Contract.</p>
Sub-Clause 8.11 Prolonged Suspension	Replace 84 days by 120 days.
Sub-Clause 10.1 Taking Over of the Works and Sections	<p><i>Insert following as 3rd paragraph after 2nd paragraph:</i></p> <p>Within 14 days of the date of receipt of Contractor's notice for issuance of Taking Over Certificate the Employer shall on the written request of the Engineer constitute a committee comprising of Engineer/Engineer's Representative, Employer's and Contractor's Representatives. The Committee shall conduct a detailed inspection of the works completed by the Contractor to ascertain the completion or the extent of completion to decide about the issuance of Taking Over Certificate.</p> <p>The Engineer shall take further action on the Contractor's application in pursuance to the recommendations of the committee.</p>
Sub-Clause 11.9 Performance Certificate	<p><i>Insert following as 2nd paragraph after 1st paragraph:</i></p> <p>At the completion of the Defects Notification Period the Employer shall constitute a committee comprising of Engineer / Engineer's Representative, Employer's and Contractor's Representatives. The Committee shall conduct a detailed inspection of the works to ascertain the issuance of Performance Certificate or otherwise.</p>
Sub-Clause 13.1 Right to Vary	In the last line of Para, after the word "Variation", the word "in writing" is added.
Sub-Clause 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"
Sub-Clause 13.8 Adjustment for Changes in cost	<p><i>The following provision is added:</i></p> <p>The amounts payable to the Contractor, pursuant to Sub-Clause 14.6, shall be adjusted in respect of the rise or fall in the cost of materials only, and will be paid to the contractor on those items mentioned in the Appendix -C (B). Similarly reduction in the cost of these materials will also be recovered from the contractor accordingly.</p>
Sub-Clause 14.1	<i>Renumber subparagraphs (c) and (d) as (f) and (g) and</i>

The Contract Price

~~delete subparagraph (e)~~

*Insert following paragraphs (c), (d) and (e):*

(c) The Contract Price shall include all taxes, duties and other charges imposed outside the Country on the production, manufacture, sale and transport of the Contractor's Equipment, Plant, Materials and supplies to be used on or furnished under the Contract, and on the services to be performed under the Contract.

(d) The Contractor's staff and labour will be liable to pay personal income taxes in the Country in respect of such of their salaries and wages as are chargeable under the Laws for the time being in force, and the Contractor shall perform such duties in regard to such deductions thereof as may be imposed on him by such laws.

(e) Notwithstanding the provisions of subparagraph (b), Contractor's Equipment, including essential spare parts therefore, imported by the Contractor for the sole purpose of executing the Contract shall be temporarily exempt from the payment of import duties and taxes upon importation, provided the Contractor shall post with the customs authorities at the port of entry an approved export bond or bank guarantee, valid until the Time for Completion plus six months, in an amount equal to the full import duties and taxes which would be payable on the assessed imported value of such Contractor's Equipment and spare parts, and callable in full if the Contractor's Equipment is not exported from the Country on completion of the Contract. A copy of the bond or bank guarantee endorsed by the customs authorities shall be provided by the Contractor to the Employer upon the importation of individual items of Contractor's Equipment and spare parts. Upon export of individual items of Contractor's Equipment or spare parts, or upon the completion of the Contract, the Contractor shall prepare, for approval by the customs authorities, an assessment of the residual value of the Contractor's Equipment and spare part to be exported, based on the depreciation scale(s) and other criteria used by the customs authorities for such purposes under the provisions of the applicable Laws. Import duties and taxes shall be due and payable to the customs authorities by the Contractor on (a) the difference between the initial imported value and the residual value of the Contractor's Equipment and spare parts to be exported; and (b) on the initial imported value of Contractor's Equipment and spare parts remaining in the Country after completion of the Contract. Upon payment of such dues within 28 days of being invoiced, the bond or bank guarantee shall be reduced or released accordingly; otherwise the security shall be called in the full amount remaining.

Sub-Clause 14.2  
Advance Payment

*Delete the Clause in entirety and replace with following*

The Employer if requested by the Contractor shall make an advance payment for mobilisation and cash flow support when the Contractor submits a guarantee in accordance with this Sub-Clause. The total advance payment, the number and timing of instalments (if more than one) shall be as stated in the Appendix A.

The Advance Payment (if required) shall be paid in two equal instalments after the following conditions have been fulfilled.

Installment-1: 50% of the total amount of the Advance Payment

- That the Contract Agreement has been signed by the Parties.
- The Contractor has submitted bank guarantee for the full amount of the advance payment in the form of irrevocable without recourse bank guarantee.
- The Contractor has submitted the Performance Security in the form as prescribed in Sub-Clause 4.2.

Installment-2: Remaining 50% of the total amount of the Advance Payment shall be paid on mobilization of Plant, Equipment and other resources at site by the Contractor to the satisfaction of the Engineer

Unless and until the Employer receives this guarantee, or if the total advance payment is not stated in the Appendix A, this Sub-Clause shall not apply.

The Contractor shall pay interest on the mobilization advance at the rate of 10% per annum on the advance.

The Engineer shall deliver to the Employer and to the Contractor an Interim Payment Certificate for the advance payment or its first instalment after receiving a Statement (under Sub-Clause 14.3 [Application for Interim Payment Certificates]) and after the Employer receives (i) the Performance Security in accordance with Sub-Clause 4.2 [Performance Security] and (ii) a guarantee in amount equal to the advance payment. This guarantee shall be issued by an entity and from within a country (or other jurisdiction) approved by the Employer, and shall be in the form annexed to the Particular Conditions or in another form approved by the Employer.

The Contractor shall ensure that the guarantee is valid and enforceable until the advance payment has been repaid, but its amount shall be progressively reduced by the amount repaid by the Contractor as indicated in the Payment Certificates. If the terms of the guarantee specify its expiry date, and the advance payment has not been repaid by the date 28 days prior to the expiry date, the

	<p>The Contractor shall extend the validity of the guarantee until the advance payment has been repaid.</p> <p>At any time, the bank guarantee shall be valid for an amount not less than the amount of the original Advance Payment less any partial repayment of that Advance Payment which may have been affected. The Contractor shall inform the guaranteeing bank, by letter, counter signed by the Employer, of the required amount of the guarantee from time to time. Reduction of the amount shall not be made without such authorizing letter.</p> <p>Unless stated otherwise in the Appendix A, the advance payment including interest shall be recovered in 5 equal payments starting from third running bills (IPCs) and in case the number of bills is less than 5 then 1/5 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.</p> <p>If the advance payment has not been repaid prior to the issue of the Taking-Over Certificate for the Works or prior to termination under Clause 15 [Termination by Employer], Clause 16 [Suspension and Termination by Contractor] or Clause 19 [Force Majeurs] (as the case may be), the whole of the balance then outstanding shall immediately become due and in case of termination under Clause 15 [Termination by Employer] and Sub-Clause 19.6 [Optional Termination, Payment and Release], payable by the Contractor to the Employer.</p> <p>It is agreed that the amount of money certified and due to the Contractor under the contract at any time is less than the total of due repayments of Advance Payment, the balance of the due repayments shall be paid to the Employer by the Contractor within seven days of demand by the Employer. If the balance is not so paid, the Employer shall be empowered to call in sufficient of the Advance payment bank guarantee to cover the said balance.</p> <p>The Employer shall be empowered to call in the guarantee in whole or in part(s) if the Contractor defaults in the repayment(s) for any reason(s).</p>
<p>Sub-Clause 14.5 Plant and Materials intended for the Works</p>	<p>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 :-</p> <p>1. 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</p>

	in the rules not more than three months (even if unutilized);
Sub-Clause 14.8 Delayed Payment	<i>Second Para is replaced with following text:</i> In the event of the failure of the Procuring Agency to make the payment within the time stated, the procuring agency shall pay to the contractor in case of ICB contracts only, the compensation at rate of KIBOR+2% per annum in local currency and Libor+1% for foreign currency, upon all sums to be paid from the date of which the same would have been paid (i.e. for NCB, no compensation is admissible).
Sub-Clause 14.15 Currencies of Payment	Currency of Payment is Pakistan Rupee (PKR).
Sub-Clause 15.2 Termination by Employer	<i>Insert following as paragraph (g) after paragraph (f):</i> (g) If the progress of works with respect to the Programme of Works is observed to be behind the approved program of works pursuant to Sub-Clause 8.7 for three consecutive months.  <i>The following Para. is added at the end of the sub-clause:</i> Provided further, that in addition to the action taken by the procuring agency against the Contractor under this Clause, the procuring agency may also refer the case of default of the Contractor to Pakistan Engineering Council for punitive action under the Construction and Operation of Engineering Works Bye-Laws 1987, as amended from time to time.
Sub-Clause 15.6 Corrupt and Fraudulent Practices	<i>The following text is to be added as 3rd paragraph:</i> <i>Successful Contractor has to provide Integrity Pact (for contracts worth Rs.10.0 million and above) if the Contractor or any of his Subcontractors, agents or servants is found to have violated or involved in violation of the Integrity Pact signed by the Contractor as Appendix-I to his Bid, then the procuring agency shall be entitled to:</i>  a. recover from the Contractor an amount equivalent to ten times the sum of any commission, gratification, bribe, finder's fee or kickback given by the Contractor or any of his Subcontractors, agents or servants;  b. terminate the Contract; and  c. recover from the Contractor any loss or damage to the procuring agency as a result of such termination or of any other corrupt business practices of the Contractor or any of his Subcontractors, agents or servants.  <i>The termination under sub-para (b) of this Sub-Clause shall</i>

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, receipt 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 statements the estimated value of the materials on site together with such documents as may be required by the Engineer for the purpose of valuation of materials and providing evidence of ownership and payment therefor;
  - 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 the written permission of the procuring agency;
  - vi. The amount 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 similar other materials;
  - vii. Secured Advance shall not be allowed unless and until the previous advance, if any, is fully recovered;
  - viii. Detailed account of advances must be kept in part II of running account bill or a separate statement; 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 in no case for full quantities of materials for the entire work/contract.
- ii. Recovery of Secured Advance:
- Secured Advance paid on non-perishable materials to the Contractor under the above provisions shall be deducted from the monthly payments on actual consumption basis, but not later than period specified

period stated in sub-clause 20.5, shall be finally settled, under the provisions of the Arbitration Act, 1940 as amended or any statutory modification/Rules of Conciliation And Arbitration PEC Islamabad or its enactment thereof for the time being in force.

The place of arbitration shall be Karachi, in Sindh Province.

The arbitrators shall have full power to open up, review and revise any certificate, determination, instruction, opinion or valuation of the Engineer, and any decision of the DB, relevant to the dispute. Nothing shall disqualify representatives of the Parties and the Engineer from being called as a witness and giving evidence before the arbitrators on any matter whatsoever relevant to the dispute.

Neither Party shall be limited in the proceedings before the arbitrators to the evidence or arguments previously put before the DB to obtain its decision, or to the reasons for dissatisfaction given in its notice of dissatisfaction. Any decision of the DB shall be admissible in evidence in the arbitration.

Arbitration shall be commenced after completion of the Works. The obligations of the Parties, the Engineer and the DB shall not be altered by reason of any arbitration.

	<p>provided in the manner prescribed under sub-clauses 15.2 &amp; 15.3 and the payment under Sub-Clause 15.4 shall be made after having deducted the amounts due to the financing agency under Sub-Para (a) and (c) of this Sub-Clause.</p>
Sub-Clause 16.1 Contractor's Entitlement to Suspend Work	<p>Delete words "... Sub-Clause 2.4 [Employer's Financial Arrangements] or ..." from first paragraph</p> <p>Delete paragraph 2 in entirety (i.e. from words "Notwithstanding" to "notification from the bank".</p>
Sub-Clause 16.2 Termination by Contractor	Delete paragraph (a) in entirety.
Sub-Clause 17.3 Employer's Risks	Delete paragraph (a) in entirety.
Sub-Clause 18.1 General Requirements for Insurance	<p>Add following text</p> <p>The contractor shall be obliged to place all insurances relating to the contract (including, but not limited to, the insurances referred to in Clauses 18.1, 18.2, 18.3, 18.4) with Insurance Company having at least AA rating from PACRA/JCR in favour of the Employer valid for a period 28 days after the expiry of Defects Liability Period.</p> <p>Costs of such insurances shall be borne by the contractor.</p>
Sub-Clause 19.6 Optional Termination, Payment and release by the Employer	Delete paragraph (c), (d) and (e) in entirety.
Sub-Clause 20.1 Contractor's Claims	<p>Insert following at the end of Sub-Clause 20.1</p> <p>The Contractor shall not be entitled for any extension of Time for Completion and/or additional payment in respect of the claim(s) if the Contractor fails to comply with the requirements or any of the requirement of Sub-Clause 20.1 within the time period stipulated there in the Clause above mentioned and/or fails in keeping and producing necessary records whenever demanded by the Engineer.</p>
Sub-Clause 20.6 Arbitration	<p>Delete the Clause in entirety and replace with following</p> <p>Any dispute in respect of which:</p> <ol style="list-style-type: none"> <li>the decision, of the Dispute Board has not become final and binding pursuant to sub-clause 20.2, and</li> <li>amicable settlement has not been reached within the</li> </ol>

each of them and to the Other Members (if any), any fact or circumstance which might appear inconsistent with his/her warranty and agreement of impartiality and independence.

When appointing the Member, the Employer and the Contractor relied upon the Member's representations that he/she is:

- (a) experienced in the work which the Contractor is to carry out under the Contract;
- (b) experienced in the interpretation of contract documentation; and
- (c) fluent in the language for communications defined in the Contract.

4. General Obligations of the Member

The Member shall:

- (a) have no interest financial or otherwise in the Employer, the Contractor or Engineer, nor any financial interest in the Contract except for payment under the Dispute Board Agreement;
- (b) not previously have been employed as a consultant or otherwise by the Employer, the Contractor or the Engineer; except in such circumstances as were disclosed in writing to the Employer and the Contractor before they signed the Dispute Board Agreement;
- (c) have disclosed in writing to the Employer, the Contractor and the Other Members (if any), before entering into the Dispute Board Agreement and to his/her best knowledge and recollection, any professional or personal relationships with any director, officer or employee of the Employer, the Contractor or the Engineer, and any previous involvement in the overall project of which the Contract forms part;
- (d) not, for the duration of the Dispute Board Agreement, be employed as a consultant or otherwise by the Employer, the Contractor or the Engineer, except as may be agreed in writing by the Employer, the Contractor and the Other Members (if any);
- (e) comply with the annexed procedural rules and with Sub-Clause 20.4 of the Conditions of Contract;
- (f) not give advice to the Employer, the Contractor, the Employer's Personnel or the Contractor's Personnel



## APPENDIX: DISPUTE BOARD

### General Conditions of Dispute Board Agreement

#### 1. Definitions

Each "Dispute Board Agreement" is a tripartite agreement by and between:

- (a) the "Employer";
- (b) the "Contractor"; and
- (c) the "Member" who is defined in the Dispute Board Agreement as being:
  - (i) the sole member of the "DB" and, where this is the case, all references to the "Other Members" do not apply, or
  - (ii) one of the three persons who are jointly called the "DB" (or "Dispute Board") and, where this is the case, the other two persons are called the "Other Members."

The Employer and the Contractor have entered (or intend to enter) into a contract, which is called the "Contract" and is defined in the Dispute Board Agreement, which incorporates this Appendix. In the Dispute Board Agreement, words and expressions which are not otherwise defined shall have the meanings assigned to them in the Contract.

#### 2. General Provisions

Unless otherwise stated in the Dispute Board Agreement, it shall take effect on the latest of the following dates:

- (a) the Commencement Date defined in the Contract,
- (b) when the Employer, the Contractor and the Member have each signed the Dispute Board Agreement, or
- (c) when the Employer, the Contractor and each of the Other Members (if any) have respectively each signed a Dispute Board Agreement.

This employment of the Member is a personal appointment. At any time, the Member may give not less than 70 days' notice of resignation to the Employer and to the Contractor, and the Dispute Agreement shall terminate upon the expiry of this period.

#### 3. Warranties

The Member warrants and agrees that he/she is and shall be impartial and independent of the Employer, the Contractor and the Engineer. The Member shall promptly disclose, to

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concerning the conduct of the Contract, other than in accordance with the annexed procedural rules;

- (g) not while a Member enter into discussions or make any agreement with the Employer, the Contractor or the Engineer regarding employment by any of them, whether as a consultant or otherwise, after ceasing to act under the Dispute Board Agreement;
- (h) ensure his/her availability for all site visits and hearings as are necessary;
- (i) become conversant with the Contract and with the progress of the Works (and of any other parts of the project of which the Contract forms part) by studying all documents received which shall be maintained in a current working file;
- (j) treat the details of the Contract and all the DB's activities and hearings as private and confidential, and not publish or disclose them without the prior written consent of the Employer, the Contractor and the Other Members (if any); and
- (k) be available to give advice and opinions, on any matter relevant to the Contract when requested by both the Employer and the Contractor, subject to the agreement of the Other Members (if any).

**5. General Obligations of the Employer and the Contractor**

The Employer, the Contractor, the Employer's Personnel and the Contractor's Personnel shall not request advice from or consultation with the Member regarding the Contract, otherwise than in the normal course of the DB's activities under the Contract and the Dispute Board Agreement. The Employer and the Contractor shall be responsible for compliance with this provision, by the Employer's Personnel and the Contractor's Personnel respectively.

The Employer and the Contractor undertake to each other and to the Member that the Member shall not, except as otherwise agreed in writing by the Employer, the Contractor, the Member and the Other Members (if any):

- (a) be appointed as an arbitrator in any arbitration under the Contract;
- (b) be called as a witness to give evidence concerning any dispute before arbitrator(s) appointed for any arbitration under the Contract; or
- (c) be liable for any claims for anything done or omitted in the discharge or purported discharge of the Member's functions, unless the act or omission is shown to have



been paid to him.

The Employer and the Contractor hereby jointly and severally indemnify and hold the Member harmless against and from claims from which he is relieved from liability under the preceding paragraph.

Whenever the Employer or the Contractor refers a dispute to the DB under Sub-Clause 20.4 of the Conditions of Contract, which will require the Member to make a site visit and attend a hearing, the Employer or the Contractor shall provide appropriate security for a sum equivalent to the reasonable expenses to be incurred by the Member. No account shall be taken of any other payments due or paid to the Member.

#### 6. Payment

The Member shall be paid as follows, in the currency named in the Dispute Board Agreement:

(a) A retainer fee per calendar month, which shall be considered as payment in full for:

- (i) being available on 28 days' notice for all site visits and hearings;
- (ii) becoming and remaining conversant with all project developments and maintaining relevant files;
- (iii) all office and overhead expenses including secretarial services, photocopying and office supplies incurred in connection with his duties; and
- (iv) all services performed hereunder except those referred to in sub-paragraphs (b) and (c) of this Clause.

The retainer fee shall be paid with effect from the last day of the calendar month in which the Dispute Board Agreement becomes effective; until the last day of the calendar month in which the Taking-Over Certificate is issued for the whole of the Works.

With effect from the first day of the calendar month following the month in which the Taking-Over Certificate is issued for the whole of the Works, the retainer fee shall be reduced by one-third. This reduced fee shall be paid until the first day of the calendar month in which the Member resigns or the Dispute Board Agreement is otherwise terminated.

(b) A retainer fee which shall be considered as payment in full for:

- (i) each day or part of a day up to a maximum of two

days' travel time in each direction for the journey between the Member's home and the site, or another location of a meeting with the Other Members (if any):

(ii) each working day on Site visits, hearings or preparing decisions; and

(iii) each day spent reading submissions in preparation for a hearing;

(c) all reasonable expenses including necessary travel expenses (air fare in less than first class, hotel and subsistence and other direct travel expenses) incurred in connection with the Member's duties, as well as the cost of telephone calls, courier charges, faxes and telexes: a receipt shall be required for each item in excess of five percent of the daily fee referred to in sub-paragraph (b) of this Clause;

(d) any taxes properly levied in the Country on payments made to the Member (unless a national or permanent resident of the Country) under this Clause 6.

The retainer and daily fees shall be as specified in the Dispute Board Agreement. Unless it specifies otherwise, these fees shall remain fixed for the first 24 calendar months, and shall thereafter be adjusted by agreement between the Employer, the Contractor and the Member, at each anniversary of the date on which the Dispute Board Agreement became effective.

If the parties fail to agree on the retainer fee or the daily fee, the appointing entity or official named in the Contract Data shall determine the amount of the fees to be used.

The Member shall submit invoices for payment of the monthly retainer and air fares quarterly in advance. Invoices for other expenses and for daily fees shall be submitted following the conclusion of a site visit or hearing. All invoices shall be accompanied by a brief description of activities performed during the relevant period and shall be addressed to the Contractor.

The Contractor shall pay each of the Member's invoices in full within 56 calendar days after receiving each invoice and shall apply to the Employer (in the Statements under the Contract) for reimbursement of one-half of the amounts of these invoices. The Employer shall then pay the Contractor in accordance with the Contract.

If the Contractor fails to pay to the Member the amount to which he/she is entitled under the Dispute Board Agreement, the Employer shall pay the amount due to the Member and any other amount which may be required to maintain the operation of the DB; and without prejudice to the Employer's rights or remedies. In addition to all other rights arising from this default, the Employer shall be entitled to reimbursement of all sums paid in excess of one-half of these payments, plus all costs of recovering these sums and financing charges calculated at the rate specified in Sub-Clause 14.8 of the Conditions of Contract.

If the Member does not receive payment of the amount due within 70 days after submitting a valid invoice, the Member may (i) suspend his/her services (without notice) until the payment is received, and/or (ii) resign his/her appointment by giving notice under Clause 7.

#### 7. Termination

At any time: (i) the Employer and the Contractor may jointly terminate the Dispute Board Agreement by giving 42 days' notice to the Member; or (ii) the Member may resign as provided for in Clause 2.

If the Member fails to comply with the Dispute Board Agreement, the Employer and the Contractor may, without prejudice to their other rights, terminate it by notice to the Member. The notice shall take effect when received by the Member.

If the Employer or the Contractor fails to comply with the Dispute Board Agreement, the Member may, without prejudice to his other rights, terminate it by notice to the Employer and the Contractor. The notice shall take effect when received by them both.

Any such notice, resignation and termination shall be final and binding on the Employer, the Contractor and the Member. However, a notice by the Employer or the Contractor, but not by both, shall be of no effect.

#### 8. Default of the Member

If the Member fails to comply with any of his obligations under Clause 4 (a) - (d) above, he shall not be entitled to any fees or expenses hereunder and shall, without prejudice to their other rights, reimburse each of the Employer and the Contractor for any fees and expenses received by the Member and the Other Members (if any), for proceedings or decisions (if any) of the DB which are rendered void or ineffective by the said failure to comply.

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If the Member fails to comply with any of his obligations under Clause 4 (e) - (g) above, he shall not be entitled to any fees or expenses hereunder from the date and to the extent of the non-compliance and without prejudice to their other rights, rights reserved to each of the Employer and the Contractor for any fees and expenses actually received by the Member, for proceedings or decisions (if any) of the DB which are rendered void or inoperative due to the said failure to comply.

**9. Disputes**

Any dispute or claim arising out of or in connection with this Dispute Board Agreement, for the breach, termination or invalidity thereof, shall be finally settled by institutional arbitration. If no other arbitration institute is agreed, the arbitration shall be conducted under the Rules of Arbitration of the International Chamber of Commerce by one arbitrator appointed in accordance with these Rules of Arbitration.



Dispute Resolution Rules

Unless otherwise agreed by the Employer and the Contractor, the DB shall visit the site at intervals of not more than 140 days, including times of critical construction events, at the request of either the Employer or the Contractor. Unless otherwise agreed by the Employer, the Contractor and the DB, the period between consecutive visits shall not be less than 70 days, except as required to convene a hearing as described below.

The timing of and agenda for each site visit shall be as agreed jointly by the DB, the Employer and the Contractor, or in the absence of agreement, shall be decided by the DB. The purpose of site visits is to enable the DB to become and remain acquainted with the progress of the Works and of any actual or potential problems or claims, and, as far as reasonable, to endeavour to prevent potential problems or claims from becoming disputes.

Site visits shall be attended by the Employer, the Contractor and the Engineer and shall be co-ordinated by the Employer in co-operation with the Contractor. The Employer shall ensure the provision of appropriate conference facilities and secretarial and copying services. At the conclusion of each site visit and before leaving the site, the DB shall prepare a report on its activities during the visit and shall send copies to the Employer and the Contractor.

The Employer and the Contractor shall furnish to the DB one copy of all documents which the DB may request, including Contract documents, progress reports, variation instructions, certificates and other documents pertinent to the performance of the Contract. All communications between the DB and the Employer or the Contractor shall be copied to the other Party. If the DB comprises three persons, the Employer and the Contractor shall send copies of these requested documents and these communications to each of these persons.

If any dispute is referred to the DB in accordance with Sub-Clause 20.4 of the Conditions of Contract, the DB shall proceed in accordance with Sub-Clause 20.4 and these Rules. Subject to the time allowed to give notice of a decision and other relevant factors, the DB shall:

- (a) act fairly and impartially as between the Employer and the Contractor, giving each of them a reasonable opportunity of putting his case and responding to the other's case, and
- (b) adopt procedures suitable to the dispute, avoiding unnecessary delay or expense.

The DB may conduct a hearing on the dispute, in which event it will decide on the date and place for the hearing and may request that written documentation and arguments from the Employer and the Contractor be presented to it prior to or at the hearing.

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Except as otherwise agreed in writing by the Employer and the Contractor, the DB shall have power to adopt an inquisitorial procedure, to refuse admission to hearings or audience at hearings to any persons other than representatives of the Employer, the Contractor and the Engineer, and to proceed in the absence of any party who the DB is satisfied received notice of the hearing; but shall have discretion to decide whether and to what extent this power may be exercised.

The Employer and the Contractor empower the DB, among other things, to:

- (a) establish the procedure to be applied in deciding a dispute,
- (b) decide upon the DB's own jurisdiction, and as to the scope of any dispute referred to it,
- (c) conduct any hearing as it thinks fit, not being bound by any rules or procedures other than those contained in the Contract and these Rules,
- (d) take the initiative in ascertaining the facts and matters required for a decision,
- (e) make use of its own specialist knowledge, if any,
- (f) decide upon the payment of financing charges in accordance with the Contract;
- (g) decide upon any provisional relief such as interim or conservatory measures, and
- (h) open up, review and revise any certificate, decision, determination, instruction, opinion or valuation of the Engineer, relevant to the Dispute.

The DB shall not express any opinions during any hearing concerning the merits of any arguments advanced by the Parties. Thereafter, the DB shall make and give its decision in accordance with Sub-Clause 20.4, or as otherwise agreed by the Employer and the Contractor in writing. If the DB comprises three persons:

- (a) it shall convene in private after a hearing, in order to have discussions and prepare its decision;
- (b) it shall endeavour to reach a unanimous decision; if this proves impossible the applicable decision shall be made by a majority of the Members, who may require the minority Member to prepare a written report for submission to the Employer and the Contractor; and
- (c) if a Member fails to attend a meeting or hearing, or to fulfil any required function, the other two Members may nevertheless proceed to make a decision, unless:
  - (i) either the Employer or the Contractor does not agree that they do so, or
  - (ii) the absent Member is the chairman and he/she instructs the other Members not to make a decision.



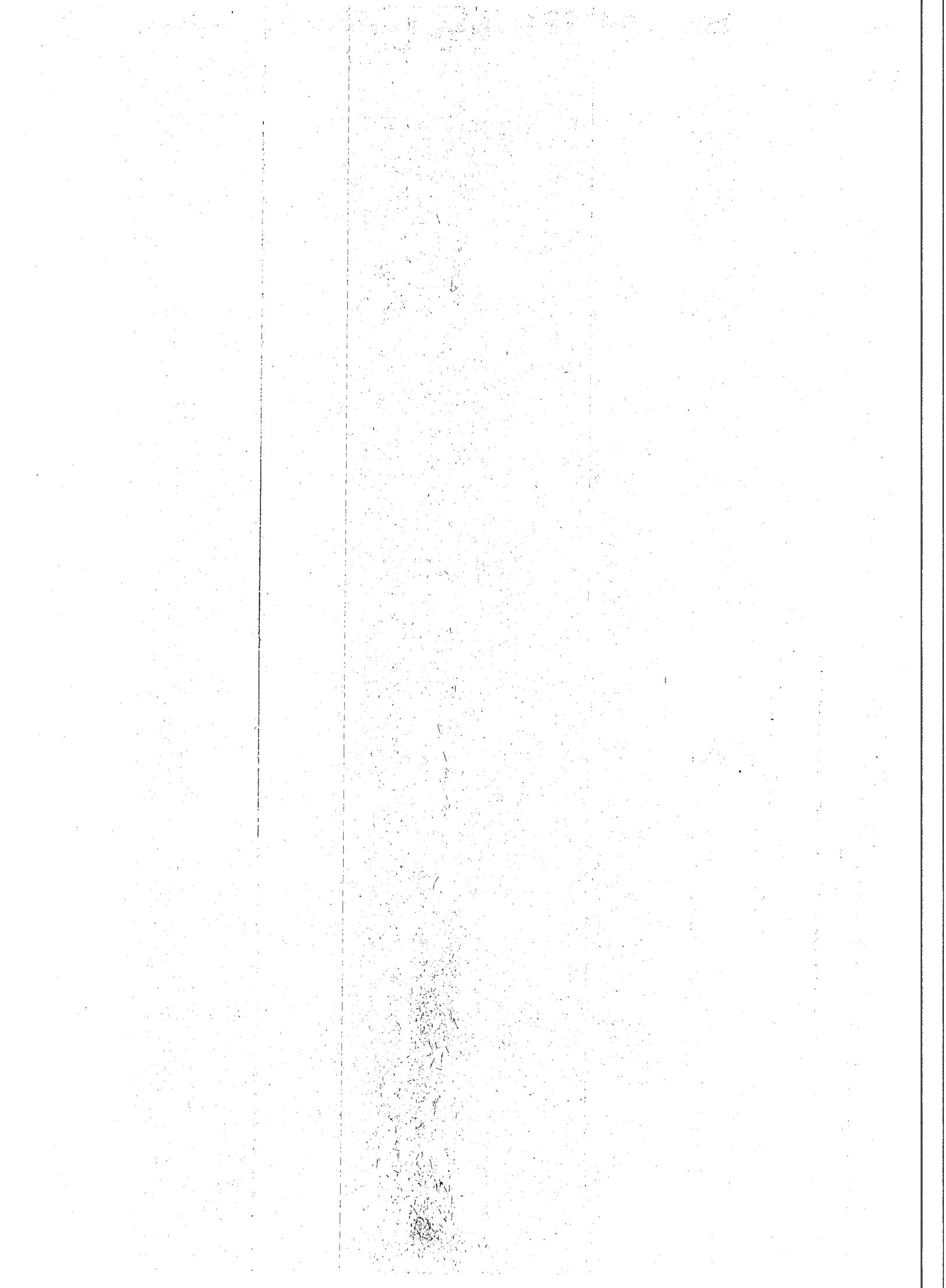
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- 6.7 Complying with any requirements specified in the Contract.
- 6.8 Clearing and cleaning the whole of the works on completion including the removal of the surplus materials, plant, equipment, rubbish, etc., and leaving all in a clean and tidy state.
- 6.9 Providing and testing samples of materials before placing orders to ensure compliance with the specification.
- 6.10 Collecting from the Employers store any articles if provided as free-issue by the Employer including any inspection and testing deemed necessary by the Contractor to ensure issue items are un-damaged before he removes them from store.
- 6.11 Working in the vicinity of and coordinating and liaising with other Contractors including providing for any inconvenience, delay, lack of working space, changes in programming or methods of working and all other costs incurred due to the presence of other Contractors.
- 6.12 Construction of approach road for access for the labour materials, construction machinery and equipment to the site of construction where required in connection with execution of work under this Contract.
- 6.13 Dewatering encountered during excavation or foundations or in trenches for laying pipelines etc.

7. All items or groups of items, which are designated "Provisional" shall be used only at the direction of the Engineer, and if not used either wholly or in part, the amount not used shall be deducted from the Contract Price without any further adjustments to the Contract Price. Provisional sum has been provided in the Bill of Quantities for such items of work, which can not be assessed at the time of preparation of tender documents. In case the necessity of such items arises, the Contractor shall carry out such works only after the approval of the rates and quantities for such works has been issued by the competent authority.

## 8. EARTHWORK

- 8.1 The respective rates for excavations shall include removing and setting aside all or any surface materials and their subsequent replacement or disposal, immediate removal and disposal of any material not deemed by the Engineer suitable for subsequent refilling work in all types of soils of whatsoever nature including compacted fill except rock, working adjacent to the excavation or pipe-laying; working without machinery where deemed necessary by the Engineer; shoring and timbering in the trenches and excavations and driving steel sheeting or sheet piling; rectification and making good all slips, falls, adjoining subsidence, weakening or damaging of roads, structures and the like provision of temporary fencing, preparation of formations and foundations, provision of a concrete 1:4:8 bed or any other work that may be required if a suitable bottom to an excavation is needlessly, damaged by exposure or from other causes, provision and operation of any necessary pumping or dewatering plant including dealing with water arising from sub-soil, or rain water or water from any other source and its disposal, refilling excavations, reinstatement of all surfaces other than those in carriage ways and footways of public roads, footpaths and public footpaths.



maintaining effective flow of traffic, protecting surfaces damaged due to lack of proper maintenance, moving plant and equipment or other operations of the Contractor, removal and return of excavated material where ordered working under, alongside, across or near existing services pipes, cables, nullahs, drains and refilled ground or similar difficult locations maintaining existing services.

8.2 The cost of the removal of surplus excavated material of any kind shall be included in the rates of the work, material or structures. All surplus shall be removed from the site or sites as it arises.

8.3 Under no circumstances shall a measurement for bulk excavation be made.

8.4 The quantities of excavation for all other work except pipe laying shall be measured as the product of the horizontal area of the bottom of the wall or other structure, shown on the drawings multiplied by the mean depth and the Contractor will be paid in accordance with the quantities thus ascertained, irrespective of the gross volume of excavation which the Contractor may carry out.

8.5 The Contractor shall include in his rates for excavation for carrying out excavation and disposal of any materials, including disposal of surplus, excavated earth, any additional excavation required either to accommodate steel sheeting or timbering or to provide working space for the construction of the work.

8.6 The rates for excavation shall be inclusive of breaking open existing surfaces, excavation of any ground or other substances, other than rock, timber or other supports to the excavation, pumping, keeping open for the inspection of the Engineer, refilling, and reinstatement other than in paving of roads and footways.

8. PIPE WORK

8.1 The rates for pipe laying shall include for the provisions enumerated in the earthwork section as necessary, supplying all materials unloading and laying out pipes, protection of coating on pipes and penstocks valves and making good the coating if necessary, laying and Jointing pipes; the cost of trimming pipes where butt in, and for handling and removing untested pipes inspection and testing of pipes and pipelines including replacing any defective pipes, valves, etc., laying under, alongside; across or near existing pipes, cables, services, etc. or under hedges, fences, tree roots, nullahs drains, water courses, culverts or walls and their reinstatement; provision of temporary facing, reinstatement and maintenance of trenches surfaces in fields, and Paths other than carriageways and footways of public roads and footpaths, both in short or long lengths and all as specified.

9.2 The rates for bedding material shall include for placing in position, compaction in one or more layers and for any excess material greater than that specified to fill the additional excavation due to fault of Contractor.

10. CONCRETE WORK

10.1 The rates for concreting shall include for preliminary samples and testing for establishing mix design and for storing cement and aggregates; providing and testing samples, screening or washing aggregates where ordered, provision and handling of materials, manufacture of test cubes and any expense incurred in proportioning or varying the concrete mixes or delay incurred due to awaiting test results, proportioning, gauging and mixing, site testing, forming construction joints, placing in Position, proper compaction with vibrators or tampers as specified, screeding, the surface to the line and level ordered by the Engineer, formwork where used, protecting concrete finishing surfaces, reconstructing faulty work and testing for ensuring water tightness. The rates for concrete shall include for curing work and curing with water for required period.

10.2 The rate shall include for forming holes for concreting, grouting and making good, to pipes, fittings, and fixing bolts etc. to be supplied by the Contractor for a complete installation.

10.3 No payment will be made for costs incurred in alteration or cutting out of sub-standard concrete because of inaccuracies in any site testing or measuring equipment, or for any other reasons and no payment will be made for reconstructing the faulty work.

10.4 The rates for concrete shall cover all costs involved in making finished concrete of required specifications including during work.

10.5 No deduction in the measurement of concrete is made for chamfers, holtholes, rails, joists or reinforcement for pipes and holes with an area of less than 2 sq. ft. (0.186 Cu m) except for concrete surround to pipes.

10.6 The rates for pre-cast concrete items shall include the provision of samples for testing.

10.7 The concrete rates shall include for all materials and labour in erecting formwork and moulds for all necessary strutting, supports, props, cleats and bearings, cleaning holes and cleaning for easing, striking around pipes, steelwork and cleaning fittings; ends & intersections. Their proper design and the calculations shall be made available to the Engineer upon request.

10.8 The rates for steel reinforcement shall include for providing reinforcement fixed in place in accordance with the drawings including all reinforcing bars, wire or other material for binding or supporting the bending, hooking, wire brushing and all other work in providing, and fixing the reinforcement. The rates also include for displacing and cutting reinforcing bars at all openings for pipes, providing and fixing concrete walls for installation of pipes.

10.9 The weight of steel reinforcement given in the Bill of Quantities are net and no extra weight will be allowed for mill tolerance, which shall be allowed for by the Contractor in his prices.

10.10 The rates for concrete blinding shall be fully inclusive of screeding the surface to the lines and levels ordered by the Engineer for providing all formwork etc.

#### 11. CONSTRUCTION WORKS

11.1 The rates for masonry work shall include for building to the specified bond, building in wall ties, cutting, forming joints as the work proceeds, scaffolding, protection and clearing and forming openings and building in all pipes, fixtures and the like.

11.2 The Contractor in his price shall include for all necessary temporary wood and other screeds, stops, dressing around installation already completed etc., and making good cracks, blow holes or other defects.

#### 12. SITE WORK AND BUNDS

The rate for construction of bunds and embankments shall include.

12.1 Transportation of earth from excavation / temporary dumps any where on the site or works and approved borrow areas.

12.2 Forming of embankment in layers to regular slopes or shapes specified on the drawing up to required level.

12.3 Compaction of each layer including water, scarifying.

12.4 Control of moisture content including dewatering in borrow areas to achieve the required degree of compaction and rolling.

12.5 Pumping or dewatering the sub-soil or any other water met with during excavation or making embankment.

#### 13. AS-BUILT DRAWINGS

After completion of the Contract Works, the Contractor, at no extra cost, shall provide two copies of all drawings, correctly modified as final as-built drawings. These shall be submitted to the Engineer for approval before taking over of entire Contract Works and shall be a complete record of work, carried out by the Contractor. After approval the Contractor shall submit one complete set of drawings on tracing paper and five set of all record drawings along with a set of drawings on CD.

The rate of excavation shall include all works described in the Section-1 of specification under excavation including fully stripping and setting a side separately top soil.



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# GENERAL

## SECTION - I GENERAL

### 1. SCOPE OF WORK

This general specification is to be taken as applying to all works under the Contract unless otherwise specifically mentioned elsewhere. Dimensions given on the working drawings shall be followed in preference to the scale.

### 2. INTERPRETATION

2.1 The Clause headings in these specifications shall not be deemed to be part thereof or to be taken into consideration in the interpretation or construction hereof or of the Contract.

2.2 Any Clauses in these specifications that relates to work or materials not required shall be deemed not to apply.

2.3 Where these general specifications contain any amendments, implications etc. to subsequent sections of the specifications, the general specifications shall be deemed to apply in cases of conflict.

### 3. AUTHORITY'S LETTERS

The Authority's letter referred to in these specifications shall be Highway Division, Shehad Benazirabad unless specified otherwise.

### 4. CLIMATE

The climate of Nawabshah Town is hot to extremely hot during the summers and cold/foggy during the winters. The highest temperatures each year in Pakistan, typically rising to above 50 °C (122 °F), are usually recorded in Nawabshah District and Sibbi from May to August. On 26 May 2010 record breaking severe heat wave hit the city and the mercury level reached 52 °C (126 °F) which is the highest temperature ever recorded in Nawabshah, third highest temperature recorded in Pakistan and the sixth highest temperature ever recorded on earth. The climate is generally dry and hot, but sometimes the temperature falls to 6 °C (32 °F).

#### 4.1 Temperature

Maximum and minimum temperatures over the period of the records obtained are given in Table - 1. The coldest months are December and January with May and June being the hottest.

Table 1.1 Climate Data for Nawabshah Town, Pakistan

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °C (°F)	33.7 (92.7)	38.0 (100.4)	43.8 (110.8)	48.5 (119.3)	51 (124)	50.5 (122.9)	47.5 (117.5)	48.9 (120.0)	44.5 (112.1)	43 (109)	41 (106)	35 (95)	51.0 (123.8)
Average high °C (°F)	24.3 (75.7)	27.5 (81.5)	33.6 (92.5)	39.6 (103.3)	43.4 (110.1)	43.6 (110.5)	40.3 (104.5)	38.8 (101.8)	38.7 (101.7)	37.4 (99.3)	31.9 (89.4)	25.8 (78.4)	28.7 (83.7)
Average low °C (°F)	6.1 (43.0)	8.8 (47.8)	14.3 (57.7)	19.7 (67.5)	24.6 (76.3)	27.5 (81.5)	27.4 (81.3)	26.1 (79.0)	23.3 (73.9)	18.4 (65.1)	12.3 (54.1)	7.8 (46.0)	14.4 (57.9)
Record low °C (°F)	-2.6 (27.3)	-3.6 (25.5)	3 (37)	7 (45)	15 (59)	17 (63)	20 (68)	18.9 (66.0)	14.6 (58.3)	7.5 (45.5)	2.8 (37.0)	-1 (30.2)	-3.5 (25.7)
Precipitation mm (inches)	1.9 (0.075)	2.7 (0.106)	3.4 (0.134)	2.7 (0.106)	1.3 (0.051)	6.6 (0.26)	54.5 (2.145)	43.7 (1.72)	12.9 (0.508)	3.4 (0.134)	1.0 (0.039)	3.6 (0.142)	114.1 (4.492)

4.2 Rainfall

This table is for the amount of average rainfall (both in millimetres and inches) in Nawabshah throughout the year.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total rainfall in MM	1.6	1.9	3.1	3.4	1.4	8.3	51.8	45.4	10.4	2.9	1.5	2.7
Total rainfall in inches	0.1	0.1	0.1	0.1	0.1	0.3	2.0	1.8	0.4	0.1	0.1	0.1

5. SITE LOCATION AND ACCESS

As per related plans and drawings in Volume - II of Tender Documents.

6. LEVELS AND REFERENCE POINTS

The levels shown on the drawings are related to Survey of Pakistan. 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, and dimensions and for the alignment of all the components for the work. If at any time any error in this respect shall appear during the progress of work, the Contractor shall at his own cost, rectify the error to the satisfaction of the Engineer or his authorized representative (s). The Contractor shall construct accurate benchmark so that the Engineer's representative can easily check the lines and levels.

Year
51.0
(123.8)
28.7
(83.7)
14.4
(57.9)
-3.5
(25.7)
114.1
4,492
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7. DRAWINGS

These specifications shall be read in conjunction with the drawings given in Volume - III of the Tender Documents. In case of errors, mistakes, or any thing missing if required so shall be as decided by the Engineer.

Before proceeding to make preparation for fabrication, execution and erection of any fittings and other details of any temporary or permanent works scaffolding, railings, shuttering, doors and windows, iron mongery works etc, the Contractor shall be under obligation to prepare and submit all detailed shop drawings for the approval of the Engineer before doing any or all of that described above or directed. Highways Division, Shaheed Benazirabad shall have the right to require the Contractor to make any change in the design which may be necessary in the opinion of the Engineer to make the material or equipment conform to the requirements and intent of these specifications without any additional cost. Approval of Contractor's drawings shall not relieve from any part of his obligations to meet all the requirements of the specifications or correctness of their drawings.

8. MAKE OF MATERIAL, STANDARDS AND REGULATIONS

8.1 Until and unless specified otherwise, all goods and materials are to be Pakistan manufactured and to be of the best quality.

8.2 All references to standards throughout these specifications shall be deemed to refer the latest current edition at the date of tender, unless a particular edition has been referred.

8.3 All materials and equipment shall comply with the appropriate standard publishing by the British Standard Institution, Pakistan Standard Institution, American Society of Testing Materials or with an acceptable International Standard. The Engineer may also supplement such specifications during the progress of work based on Standard international Practice.

8.4 Alternative International Standards will only be acceptable if found equal to or better than the relevant British or Pakistan or American Standards. Two copies of each alternative standard, all in English must support any request by the Contractor for approval of alternative International Standards.

9. UNITS OF MEASUREMENT

9.1 The units shown in these specifications are in S. I. Units unless specified otherwise.

9.2 All gauges and instruments shall be calibrated in S. I. Units unless specified otherwise. Equipment and pipe work shall be designed in S. I. Units unless as desired by the Engineer.

10. WATER, ELECTRICITY SUPPLY, GAS AND OTHER UTILITIES

10.1 The Contractor shall make his own arrangements with regard to the supply of water and electricity as required by him for the purpose of Contract construction, installation, testing and commissioning.

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10.2 The Contractor shall apply for water connection direct to Highways Division, Shaheed Benazirabad and it shall be his responsibility to obtain water connection from and pay water charges directly to Highways Division, Shaheed Benazirabad under their prevailing terms and conditions. At the end of Contract period, the Contractor shall arrange at his own risk and costs and shall furnish No Dues Certificates (s) at the time of his final bill failing which the amount due shall be ascertained at his risks and costs by the Engineer and liable to be recovered from any money due to be paid to the Contractor.

For electricity use for the Contractor's offices and during construction, the Contractor shall make his own arrangements and furnish No Dues Certificates (s) from concerned authorities at the time of his final bills failing which the Engineer shall take necessary action as detailed above in respect of water supply dues. Similar procedure shall be adopted in case (s) of Gas Supply and other Utilities.

11. **PROGRESS REPORTING**

On or about the first working day of every month, the Contractor shall furnish the Engineer Six (6) copies of Monthly Progress Report with the following information.

Activities completed since the last report, on time performance as prescribed by the Engineer. The progress report in general shall contain changes in Contract Program if any, parts of the work ready to be tested, inspected or commissioned prior to handover.

12. **ACCESS ROADS, FOOT PATHS ETC**

The Contractor shall provide & maintain reasonable & safe access to the sites, vehicular accesses to commercial and residential properties, footpaths etc. affected by the work in progress under the Contract. All such access shall be kept clear of Contractor's construction materials, machinery, equipment tools and plants as well as any debris to provide complete 'right of way' to the public, pedestrians and vehicles including vehicles of supervisory staff engaged on work at the site.

13. **DEMOLITION AND DISMANTLING OF THE EXISTING WORKS**

The Contractor shall obtain the prior approval of the Engineer before proceeding with demolition of existing works like sewer, manholes and culverts etc.

14. **CONSTRUCTION OF NEW CONCRETE STRUCTURES**

The Contractor shall submit his proposals including drawings showing form work arrangement and position of construction joints to the Engineer for approval at least two weeks before work is planned to commence. (If form work are proposed for fair faced form works, including those faced plywood these shall be covered with plywood sheets (minimum thickness 10 mm) to prevent any pen marks being formed on the surface of the concrete.

15. **FLOATATION**

The contractor is reminded that, fulfilling his obligation as to the care of the works in accordance with clause - 20 of the conditions of contract, Volume-I he shall take all necessary precautions against floatation of structures and pipe works.



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16. WORKS IN THE VICINITY OF RAILWAYS, HIGHWAYS, WATER COURSES AND OTHER EXISTING STRUCTURES AND SERVICE LINES

Any works crossing or having effect on railway property public highway watercourse, and other existing structures shall be subject to the approval of the Engineer and the concerned competent authority.

17. PROGRAMME

The Contractor shall submit to the Engineer for approval, his work schedule preliminary construction program and Method Statement of Construction Proposals. A complete plan of the proposed sequence and methods of operations for the execution of work at the time of tender and his detailed Contract program within fourteen (14) days of receipt of letter of acceptance in accordance with clause-14 of conditions of Contract Volume-I.

18. TESTS

18.1 All materials and goods used for such and other items shall be subject to standard testing methods. If any item found below the specified standard shall be replaced at the site immediately at Contractor's own expenses.

18.2 All reasonable facilities and assistance including access to drawings and production data shall be furnished when needed during the inspection at Contractor's or manufacturer's works or any where.

18.3 All testing of material items in finished or unfinished state if required shall be carried out by the Contractor at his cost in the presence of Engineer's Representative(s) for which the Contractor shall make all additional arrangements to the satisfaction and convenience of the Engineer. The Contractor shall construct a reasonably equipped laboratory at site of work as instructed by the Engineer. The Contractor shall provide all machinery equipment, supply of Chemical, operate and maintain the laboratory besides employing competent and efficient staff upto the satisfaction of the Engineer to facilitate timely testing to expedite the progress of the works under Contract. The Contractor shall include testing charges in his tendered rates and shall not be entitled to any reimbursement on this account for testing other than permitted so.

18.4 The Contractor is required to submit the samples of materials required by the Engineer for approval. The Contractor shall indicate the name of manufacturing firm of cement, steel, pumping machinery, Pipes, valves, fittings and sources of aggregates, etc. to be used. Whenever required the samples shall be submitted, at least three weeks before materials are proposed to be used, until and unless specified otherwise whenever materials are ordered to be forwarded to a testing laboratory approved by the Engineer for check and testing. The Contractor will bear all costs for transport, lodging, boarding and reasonable daily expenses on visit by Engineer and his Representative(s) for inspection any goods materials, machinery, pipes, etc at the place or country of manufacture. The Contractor shall quote separate unit rates for each of the aforesaid items in the BOQ of the particular Contract of work under the project at the time of tendering without fail.

Sampling for testing of materials at site shall be carried out as per standard sampling procedure to the satisfaction of the Engineer's Representative(s).

19. TEST CERTIFICATES

- 19.1 When test are carried out upto the approved appropriate standard the Contractor shall furnish to the Engineer such Test Certificate (in quadruplicate).
- 19.2 The Certificates shall display inter alia the date of each test location of each test and the results of each test together with the applicable limits defined in the standard. The certificates shall indicate as to whether in the manufacturer's opinion, the item has passed the test(s) satisfactorily or not. However the Engineer's or his representative's decision shall be final.
- 19.3 For Test which have been witnessed by the Engineer or his representative(s) copies of the test records duly signed by the manufacture and the Engineer or their representatives shall be appended to the test certificate.



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## MATERIAL

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TECHNICAL SPECIFICATIONS

## SECTION - II MATERIALS

### 1. INTRODUCTION

All materials used in the works shall be of the best quality as specified or described in the specification, drawings and Bills of Quantities and shall be obtained from approved manufacturers or suppliers.

- 1.1 The Contractor shall comply with the instructions of manufacturers/suppliers in respect of use, application or installation of any materials, goods etc. required to complete the Contract. The instructions shall be relevant to the prevailing climate and environment of Shaheed Benazirabad.
- 1.2 As soon as possible after the Contract has been awarded the Contractor shall submit to the Engineer a list of supplier from whom he proposes to purchase the material required for the works. Each supplier must be responsible to admit the Engineer, or his representative, to his premises during ordinary working hours or even in odd hours if the contract work is in progress for the purpose of obtaining samples and inspecting the works and processes. In addition, if required by the Engineer, the Contractor shall deliver samples of the materials to the office of the Engineer, or his Representative, nominated testing laboratories, or the site of the works.
- 1.3 Samples shall be taken in accordance with the relevant British Standard where applicable or otherwise as directed by the Engineer. Materials subsequently supplied shall at least be equal to the approved sample in all respects. No source of supply shall be changed without prior Written approval from the Engineer. Any samples not approved shall immediately be removed from the site of the works.
- 1.4 All approvals of materials shall be obtained in writing from the Engineer. The Contractor shall not use any material in construction and installation until such written approval has been given by the Engineer.

### 2. BEDDING - MATERIALS FOR PIPES

- 2.1 Granular bedding material for pipes shall be free draining, broken stone or gravel mixed with free draining coarse sand. It shall be free from organic matter, clay, silt and building rubbish. Bedding material shall be capable of producing a stable formation for pipe laying and shall not be subject to bulking or settlement due to changing weather or ground water conditions after placing and consolidation.
- 2.2 The bedding material shall be provided in two grading, Type I & II, as follows.

BS 410 Test Sieve	Percentage by weight passing	
	Pipe diameter 600 & Over (Type I)	Pipe diameter Less than 600 Type II
37.5 mm	100	-
20.0 mm	85 - 100	100
14.0 mm	-	85 - 100
10.0 mm	0 - 25	0 - 50
5.0 mm	0 - 5	0 - 10

2.3 Granular bedding material shall have a compaction fraction value not exceeding 0.2 when tested as described below.

- a. For testing pipe-bedding material, a representative sample of about 40 kg shall be heaped onto a clean surface and quartered to obtain approximately 10 kg. The moisture content of the sample should not differ from that of the main body of material, at the time of use in the trench.
- b. A 150 mm internal diameter open ended cylinder, 250 mm high, shall be placed on a firm, flat surface and loosely filled, without tamping, from the 10 kg sample. Any surplus material shall be struck off level with the top of the cylinder. The area around the filled cylinder shall be cleaned of all surplus material and then lifted clear of its contents and placed alongside the material.
- c. Approximately the one quarter of the material shall then be replaced into the cylinder and compacted by tamping vigorously with a 40 mm diameter metal rammer weighing about 1 kg until, no further compaction can be obtained. This operation shall then be repeated for each of the remaining quarters, tamping the final surface as level as possible.
- d. The distance from the top of the cylinder to the surface of the final layer shall then be measured and this value divided by the height of the cylinder, shall be taken as the compaction fraction.

3. AGGREGATES

- 3.1 All fine and coarse aggregates to be used shall be supplied from approved sources which shall not be changed without permission in writing from the Engineer. Aggregates shall conform to the test requirements of Pakistan Standard 243:196 or equivalent or BS 5882.
- 3.2 Fine aggregates, shall be approved sand and shall be clean sharp, free from clay, earth, vegetable and organic matters alkaline or acid reactions or other deleterious matter or impurities.
- 3.3 Fine aggregates shall conform to Pakistan Standard Specifications PS No. 243:1963 "Natural Aggregates for Concrete" and shall be graded as follows:

B. S. SIEVE NUMBER	PERCENTAGE (BY WEIGHT)	
	GRADING ZONE I	GRADING ZONE II
3/8" (9.5 mm)	100	100
3/16" (4.8 mm)	90 - 100	90 - 100
No. 7	60 - 95	75 - 100
No. 14	30 - 70	55 - 90
No. 25	15 - 34	35 - 59
No. 52	5 - 20	8 - 30
No. 100	0 - 10	0 - 10

3.4 Coarse aggregates shall be approved hard crushed stone from a source approved by the Engineer and shall be clean, free from sand, dust, salt, lime, chalk, clay organic impurities or other deleterious matter.

3.5 Coarse aggregates shall conform to the relevant Pakistan Standard Specifications PS No. 243:1963 coarse aggregate shall be graded as follows:

For Concrete 1:1½:3 and 1:2:4 (Nominal Size of Grade Aggregates ¾" to 3/16" (19 mm to 4.8 mm).

B. S. SIEVE NUMBER	PERCENTAGE BY (WEIGHT) PASSING
1"	100
¾"	90 - 100
3/8"	20 - 55
3/16"	0 - 10

For Concrete 1:3:6 or 1:4:8 (Nominal Sizes of Grade Aggregates 1-½" to 3/16" (38 mm to 4.9 mm)

B. S. SIEVE NUMBER	PERCENTAGE BY (WEIGHT) PASSING
1½"	100
1"	95 - 100
¾"	35 - 70
3/8"	10 - 33
3/16"	0 - 5

3.6 All aggregates shall be stored on properly constructed paving and in bins and there shall be a physical Partition between the stock piles of coarse and fine aggregates. No mixed up aggregate shall be used in any concrete. Under no circumstances aggregates shall be allowed to be in contact with ground.

3.7 If required the aggregates shall be washed and screened to the satisfaction of the Engineer before use. Adequate time shall be allowed for the moisture content to become substantially uniform before use in works.

3.8 Sieve analysis and other necessary tests of all aggregate shall be carried out as and when required by the Engineer. Samples for such tests shall be taken in presence of Engineer. All costs in connection with the test shall be borne by the Contractor.

3.9 If suitable gravel meeting with the specification is not available the Contractor will arrange suitable crushed stone conforming to the specifications. No extra payment will be made to the Contractor for this aggregates or crushed stone.

3.10 Water absorption of aggregates shall not exceed 2% and mechanical strength (Measured by the aggregate Impact Values) shall exceed 25%.

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3.11 The amount of dust material passing B.S. No. 200 sieve (75 micron) in the combined aggregates shall not exceed 6% by weight for fine aggregates and 1% by weight for coarse aggregates.

3.12 Aggregates for granolithic concrete shall be all in granite aggregate complying with B.S 882 and be 10 mm nominal size.

3.13 All aggregates shall be subject to the approval of the Engineer. Any aggregate not found to the required standard shall be rejected by the Engineer or his representative and shall have to be removed from site without delay. Concrete structures executed and rejected shall be dismantled and rebuilt at the Contractors expense.

4. WATER

Water shall be free from all suspended or dissolved impurities. The water used for concrete shall be generally fit for human consumption. If required, water shall be subject to standard testing at Contractor's expenses and if found unsuitable for construction the Contractor shall take suitable action as directed by the Engineer or his representative(s).

5. CEMENT

Cement used in this Contract for all works shall be SR cement unless otherwise specified

5.1 Grey Cement (Portland) shall be normal setting cement of the specific gravity, fineness and chemical composition fully conforming to Pakistan Standard Specifications PS No. 232 and shall be capable of satisfying all requirements of tests and shall conform SS 12, PS 745.

5.2 Sulfate Resistant Cement shall be normal where required shall conform to Pakistan Standard Specification PS No. 612:1967 or BS 4027 and satisfying to requirements for fineness, chemical composition, strength, setting time and soundness etc.

5.3 The average compressive strength of three mortar cubes prepared with 1:3 cement and standard silica sand shall be not less than 2200 lbs/sq. inch at three days and not less than 3400 lbs/sq. inch at seven days.

The initial setting time shall not be less than 45 minutes and final setting time not more than 10 hours.

5.4 The supply of cement must be so programmed by the Contractor that at no time the quantity of cement stock shall be less than that required for an average consumption of four week. Truck or other means of transportation for the conveyance of cement to the site of works shall be cleaned, dry, metallised lined and covered from top with water proof sheets, so that cement is sufficiently protected from any deterioration during transit.

5.5 The Contractor shall provide at his own cost on the site all necessary sheds that shall be perfectly dry and water tight for the storing the cement delivered to the works to ensure adequate protection for the cement for the works.

5.6 If at any time Engineer or his Representative considers that any batch of cement may have deteriorated on the site during storage for any reason, he will direct that tests shall be made and the batch of cement on the site which may be in question shall not be used until it has been shown by the test at laboratory, approved or appointed by the Engineer to be satisfactory. Contractor shall bear all costs of such testing. The Contractor without delay shall remove rejected cement from the site. Cement reclaimed from cleaning bags or leaking containers shall not be used.

5.7 Cement shall be consumed in the sequence of receipts from factory unless otherwise directed by the Engineer or his Representative.

5.8 The total acid soluble alkali content ( $\text{Na}_2\text{O} + 0.658 \text{K}_2\text{O}$ ) of cements determined in accordance with BS 4550, Part-2 shall not exceed 0.60% by weight, except where otherwise approved or required.

## 6. FENCING

6.1 Unless otherwise detailed in the Bill of Quantities or Drawings, anti intruder fencing and gates shall be chain link conforming to BS 1722: Part 10, General fencing shall be strained barbed wire conforming to BS 1722: Part 3 or galvanized 150 mm square steel mesh (4.80 mm dia wire).

6.2 Fence and gateposts shall be reinforced concrete compacted by vibration to achieve the required strength.

6.3 Temporary Fencing required for protecting the work shall provided.

## 7. FILL

### 7.1 Fill - Granular

a. Granular fill Type material shall comprise well-graded gravel or crushed rock and lie within the following grade limits.

B. S. SIEVE SIZE	PERCENTAGE PASSING BY WEIGHT
75 mm	100
37.5 mm	85 - 100
19 mm	45 - 100
9.5 mm	25 - 85
600 microns	8 - 45
75 microns	0 - 10

b. The particle size shall be determined in accordance with the requirements of BS 812: Part 103 and BS 1377.

c. The material passing the BS Sieve size 250 microns, when tested in accordance with BS 1377 shall be non-plastic.

7.2 Fill Selected

Selected fill shall comprise uniform, readily compactable material free from organic materials, tree roots, vegetable matter, salts, building rubbish and excluding clay lumps retained on a 75 mm sieve, stones retained on a 25 mm sieve and shall be selected from the excavated material. Where the Engineer orders material to be obtained from other sources such material will be classed as imported selected fill.

8. GROUT

8.1 Cement grout shall be made from either ordinary or Sulfate Resistant Portland cement as used for the structures with the minimum amount of water added to give the required degree of fluidity.

8.2 No sand or other materials shall be added except for grouting in holding-down bolts, etc when sufficient sand, graded in accordance with Table 1 of BS 1200, and an approved water reducing mixture complying with BS 5075: Part 1, is used to reduce shrinkage.

9. JOINT SEALING COMPOUNDS AND SEALANTS

9.1 Joint sealing materials shall be of approved manufacture and supplies delivered fresh with adequate shelf life to meet contract requirements.

9.2 Joint sealing compounds shall be impermeable ductile material of a type suitable for the conditions of exposure in which they are to be placed, capable of providing a durable, flexible and watertight seal by adhesion to the concrete throughout the range of joint movement.

9.3 All poured joint sealants shall comply with BS 2499, ordinary Type A-1 sealant.

9.4 Cold poured polymer-based joint sealants shall comply with BS 5212, Normal Type N Sealant.

9.5 Two-part Poly Sulphide based sealants shall comply with the relevant provisions of BS 4254. Pouring Grade shall be applied to horizontal upward-facing and Gun Grade to joints of any other aspect or inclination. Other two-part polymer-based sealants of Gun or Trowel Grade shall comply with the physical and test requirements of BS 4254.

9.6 Silicon based building Sealants shall comply with the relevant provisions of BS 5889.

9.7 Polyurethane-based sealants shall comply with a specification of an approved manufacturer.

9.8 Primers for use with joint sealants shall be compatible with, and obtained from the same manufacturer as, the adjacent sealant. Primers shall have no harmful effects on concrete.

9.9 Sealants and primers that will be in contact with water to be used for potable supply shall not impart to water taste, color, or any effect known to be harmful to health and shall be resistant to bacterial growth.

9.10 Sealants and gaskets that will be in contact with sewage or sewage sludge shall be resistant to biodegradation.

#### 10. JOINT FILLER – PERFORMED

- 10.1 The material comprising the joint filler shall be of such quality that it can be satisfactorily installed in position at the joint.
- 10.2 Adhesives used to retain performed joint fillers in place during construction shall have no harmful effects on concrete and, except for those used in connection with softwood fillers, shall be obtained from the same manufacturer as the joint filler.
- 10.3 Performed filler for joints in structures to retain aqueous liquids shall consist of cork granules, bound together with bitumen or synthetic resin.

#### 11. CEMENT MORTAR

- 11.1 Cement for mortar shall be ordinary Portland Cement except for sub structure, brick work in manholes, chambers, pond division walls where Sulphate Resisting Cement shall be used or except otherwise specified. Sand for mortar shall be as described in BS 1200 Table 1.
- 11.2 Colouring agents and plasticisers shall not be used without the approval of the Engineer.
- 11.3 Cement mortar to be used for plaster and masonry work shall be 1:4 or as specified.

#### 12. JOINT FILLER – PERFORMED

##### 12.1 PVC Lined Concrete Pipes

- a. Reinforced concrete cylindrical pipes and fittings with flexible joints shall comply with the relevant provisions of ASTM C76 class II wall B with latest revisions or other equal approved International Standard. All pipes and fittings shall have words HIGHWAY DIVISION SHAHEED BENAZIRABAD painted on them with approved Paint.
- b. Where detailed on the Drawings or in Bills of Quantities concrete pipes and fittings shall be PVC lined. Plasticised PVC sheeting for lining pipes or structure shall be composed of high molar mass Polyvinyl Chloride (PVC) combined with plasticisers and stabilisers as required. Compound to make permanently flexible sheets Copolymer resins shall not be permitted and Polyvinyl Chloride shall constitute not less than 99% by mass of the resin used. The sheeting shall have on one side locking keys integrally extruded with the sheet and of the same material.

All sheets shall, on manufacture, be 100% spark test Continuity using 10,000 volts (minimum) spark tester. Individual sheets shall be manufactured into blankets where required by shop welding using dielectric welding and the joints shall be probe-tested using a 0.1 mm

feeler probe. The lap used in such welding shall not be less than 10 mm and when tested in tension transverse to the joint, the strength shall not be less than 23 N/mm. The sheeting shall be securely fixed to the formwork prior to pouring concrete, and all in-situ welding of the sheeting shall be carried out by skilled labor using the method specified by the manufacturer.

The PVC sheeting shall not be less than one and a half mm (1.5mm) in thickness. All PVC lined pipes and structure shall be free of runs, sags, blisters or other imperfections that indicate unprotected area or areas where the PVC lining thickness is less than 2 mm.

The distance between locking keys shall not be greater than 75 mm. The dimensions of the locking keys shall be such that when embedded in concrete, they shall withstand a test pull normal to the concrete equivalent to 14 N/mm of embedded key without rupture of the key or withdrawal from the concrete.

#### 12.2 Asbestos Cement Pressure Pipes and Fittings

The Asbestos cement pressure pipes shall be B class for test pressure of 60m (200 ft) head of water conforming to PS 428 ISO 160. The pipes shall be obtained from the approved manufacturer. The joints shall be pushed on rubber ring joint with collars of same material with appropriate groove for rubber ring that shall conform to BS 2494. The fittings including tees, bends, reducers etc, shall be of cast iron strong, tough, even grained, smooth finished and free from all defects and shall be obtained from approved manufacture. These shall be tested for the required test pressure. The rubber rings shall be provided with pipes in quantities required plus 10% extra of the total number of joints.

#### 12.3 Unplasticized Pressure Pipes

- a. These shall be pressure pipes of class B conforming to BS 350 with 2 joints. Rubber rings shall be provided with pipes in quantities required plus 10% extra of the total number of joints. The Contractor shall submit the full details of material and dimensions of the special fittings including tees, bends, reducers, flanges etc with his tender.
- b. Joints and fittings for pressure pipes in accordance with BS 3505 shall comply with the relevant provisions of BS 4346 part 1 and 2 for solvent welded and mechanical joint respectively.
- c. UPVC pipes, joints and fittings for gravity sewers and drains shall comply with the relevant provision of BS 4600 or BS 5481 with mechanical joints i/c sealing rings.
- d. Solvent cements for jointing unplasticized PVC pipes shall comply with BS 4346; part 3. For pipes and fittings complying with BS 4600, solvent cement may alternatively conform with BS 5200.

12.4 Cast Iron Flanged Pipes and Flanged Fittings

The cast iron flanged pipes and flanged fittings shall be good quality and from approved manufacturer. The metal of casting such pipes shall be strong, tough, even grained and smooth surface and free from all defects without any plugging or fillings. These should conform in all respects to BS 2035 or as directed by Engineer wherever necessary. The flanges of fittings shall conform to flanges of pipes and valves to be supplied and fixed by the same Contractor.

12.5 M. S. Pipes and Fittings

The mild steel pipes, manifolds and specials connecting with MS manifold including tees, bends, reducers shall be manufactured of M.S. sheet of approved quality conforming to BS 1449 and 534. The welding shall be carried out and test in an approved manner conforming to BS 2633 to the required circular shapes and required dimensions. The inside outside surfaces of steel pipe and specials shall be thoroughly cleaned and painted with 3 coats of approved bituminous paint conforming to BS 4232 and 4147. The paint used inside shall be of such a quality that shall not impart taste, odour or color to the water passing through it. The shop drawings of all manifolds, specials and fittings shall be got approved before their manufacture. All pipes and specials shall have plain ends suitable for connection on site by welding or flanges as required. The Contractor shall measure the length of manifold and flanged pipe pieces actually required to suit the size and position of pumps, valves and other fittings provided in the Contract. Steel pressure pipe shall conform to BS-3601:part 2.

12.6 RCC Pipes

All RCC pipes shall be got manufactured in SR cement from approved pipe factory. The pipes shall conform in all respects to ASTM C-76 Class-II wall B. The pipes shall be socketed for push on rubber joints. The Contractor shall submit with his tender a detailed sketch of RCC pipe with statement indicating details of socketed joints and also details of reinforcement including numbers and diameter horizontal and spiral bars for each diameter of pipe. All RCC pipes shall be manufactured with S.R cement.

The Contractor shall supply the required number of rubber rings of size and dimension suitable for the diameter of pipe provided for making a fully watertight joint. The rubber ring shall comply in all respect with BS 2494 or equivalent approved by the engineer.

12.7 RCC Perforated Pipe for French Drain

The all RCC perforated pipes shall be manufactured in SR cement from the pipe factory approved by the engineer the pipe shall conform in all respect to ASTM C-76 class II wall B having 12mm diameter hole at 150mm c/c both ways in full length & half of circumference of pipe diameter. To provide holes, MS pipe sleeves of 12mm dia duly filled with thermo pore will be welded with the steel cage before casting. This pipe shall be either socketed or with collars and pipe shall be laid without rubber rings.

12.8 AC Perforated Pipe as Alternate Material for French Drain

All pipes shall be manufactured in SR cement from approved manufacturer. The AC pipes shall conform to ISO 160 and PS 428. The pipe shall be used with loose collar without rubber ring. The perforation on AC pipes 50% of circumferential area excluding the turned portion. The size of hole shall be 10 mm dia of 100 mm

c/c both way. Perforated AC pipes shall be laid at the specified gradient and the pipes shall be encased with granular bedding as per drawing.

### 12.9 HDPE Pipes

HDPE pipes shall be manufactured, except where stated otherwise hereunder in accordance with International Standard ISO 4427 or equivalent as approved by the Engineer. Material for pipes shall be manufactured from polyethylene containing only those antioxidant, UV stabilizers and pigments necessary for the manufacture of pipes conforming to water supply pipeline requirement of ISO 4427 or equivalent as approved by the Engineer.

At the discretion of the ENGINEER test certificates may be required from approved independent inspection agencies for all materials used in the manufacture of the pipes and specials and the cost of this shall be deemed to be included in the Contract Rates.

With every consignment of pipes and fittings delivered under this Contract the Contractor shall furnish a certificate worded as follows:

"This is to certify that the quality of the pipes and fittings delivered in this consignment is not inferior to the sample for which the Contract was awarded or to the quality laid down in the Specification whichever is applicable."

The PE material used in the manufacture of pipeline and the wall thickness of the HDPE pipe should meet the following requirements:

Working pressure of - 80m (115psi)

Maximum design pressure of - 130m (185psi)

(Excluding surge pressure)

Jointing of pipe shall generally be for

Butt Fusion for jointing of pipe of same PE material

Butt Fusion for jointing of pipes of different PE material

Saddle / Conventional Fusion for jointing of saddle

Proper equipment and techniques should be applied for all jointed like clamping and aligning for all jointing like clapping and aligning, the pipes to be jointed facing the pipe ends parallel with each other heating the pipe ends and applying proper fusion force and any other steps required as per relevant standard.

### 12.10 Pipe Protection

All pipes including Cast Iron Pipes, Asbestos Cement Pipes, Mild Steel Pipe, Ductile Iron Pipes, RCC Pipes and Pre-stressed RCC Pipes shall be painted with 3 coats of bituminous paint on the outer surfaces of pipes for safety against the salts present in the sub-soil.

## 13. JOINTS RINGS AND LUBRICANTS

13.1 Rubber joint rings for rising mains and drainage shall be types 1 and 2 respectively, complying with the relevant provisions of BS 2494, and shall be obtained from the pipe manufacturer. Additionally, the Contractor shall supply to

the Engineer's Certificate to qualify the composition of the elastomeric material of the joint rings.

- 13.2 Joint lubricants for sliding joints shall have no deterioration effects on either the joint rings or pipes, and be unaffected by the liquid to be conveyed.

#### 14. GASKETS FOR FLANGED JOINTS

- 14.1 Gaskets for flanged pipe joints shall be of the inside bolt circle type. Dimensions of gaskets shall comply with BS 486 Part I.

- 14.2 Gaskets shall be manufactured from material complying with the provisions of BS 2494 for Type 1 rings.

#### 15. SHORT PIPE LENGTH

- 15.1 Short pipes shall be supplied in specific lengths according to pipe diameter and as detailed on the drawings and in the Bill of Quantities.

- 15.2 Additional random short lengths of PVC lined concrete pipes diameter less than 600 mm will be necessary for completion of pipeline gaps between manholes where no cutting of pipes is permitted under normal circumstances.

#### 16. VALVES

- 16.1 General - All the valves shall be made of cast iron of approved quality obtained from approved manufacturer. The metal of casting shall be strong tough, even grains, smooth surfaced and free from all defects without plugging or filling. All valves shall be flanged conforming to the flange dimensions of specials, fittings and pipes to be supplied and installed by the same contractor. All valves shall be designed for a working pressure of not less than 10.55 Kg/Sq.Cm and tested Hydro statically to a pressure of 21.10 Kg/Sq.Cm. The markings cast on the body of the valve shall indicate manufacturer's name, size of valve and designated working water pressure. Asphalt or/and varnish as directed by the Engineer shall be applied to the ferrous parts of the valve except bearing surfaces. Packing material including nuts, bolts, washers and rubber packing shall be supplied in quantities of approved quality required plus 10% packing extra. The Contractor shall submit along with his tender a statement showing the name of manufacturer or alternate manufacturers along with cost details, type, pressure, rating and weights of each type of valves and pipes if required so in the form as approved by the Engineer.

- 16.2 Sluice Valve - The sluice valves shall in general conform to the requirements of BS 5163. The Sluice valve shall provide an unobstructed waterway of the same nominal diameter as of connecting pipe. The valve shall be provided with bronze seats accurately machined and fitted. The spindle shall be non-rising and shall be of solid forged bronze with a tensile strength of 4.34 to 4.65 Tons per Sq. Cm. shaped properly and machined all over with strong square threads suit valve nut. The stuffing box shall be deep large and liberal and capable of packing under pressure. The stuffing box shall be properly packed and ready for service when delivered. The stuffing box packing shall be made of Asbestos Hemp or

jute packing shall not be used. The valve shall be provided with cast iron wheel for manual operation of the valve. The valve shall open anticlockwise and close in clockwise direction.

16.3 **Double Acting Air Valves** – Air valves shall be of float type having cast iron body and bolted cover, bottom inlet, a ball float and valve operating mechanism. The ball and all parts of the valve and operating mechanism shall be made of non-corrodable materials. All double acting valves shall be fitted with isolating valve required during repairs or replacement. The valves shall be complete in every respect with regard to all fittings and accessories.

16.4 **Non-Return Valves** – Non-return valves shall in general conform to the requirement of BS 5153. These shall be free-acting single door type capable of with-standing and reducing shock following rapid flow reversal in pipeline. The valve body shall be in two parts of grey homogeneous cast iron with detachable cover plate to facilitate inspections of the bearing and door. The door shall be of same superior quality of cast iron with renewable gunmetal seats to BS 1400. The hinges pins shall be of stainless steel totally enclosed within the valve body. The door shall be so arranged that they do not swing through an angle of more than 45 degrees conforming to similar test pressures as those of Bypass valves and air release plug shall be essential. Provided with a non-return valve.

16.5 **Surge Relief Valves** – The surge relief valves shall be of approved quality. The body shall be of highest-grade cast iron or cast steel capable of withstanding a pressure 21.10 Kg/Sq cm. The spring and seat shall be of high grade steel and capable of withstanding the highest pressure likely to be encountered.

The spring and seat shall remain watertight and static at pressures up to 8.44 Kg/Sq.Cm and for 21.1Kg/Sq Cm as specified by the Engineer. Beyond this pressure the relief mechanism should come into operation and release excess pressure by allowing discharge of reasonable quantity of sewage from manifold to wet well. The release of sewage shall stop automatically as soon as the pressure falls to 8.44 Kg/Sq Cm. The flanged end shall be of minimum diameter of 300 mm and shall be installed with the manifold through flanged connector or reducer. The surge relief valve shall be provided with the following accessories of suitable diameters as determined by the Engineer in writing.

- a. Shut off valve as per prior written approval by the Engineer in writing.
- b. Discharge water drain pipe from manifold to wet well as approved by the Engineer.
- c. Pressure gauge suitably calibrated as notified in writing by the Engineer.

## 17. PRE-CAST CONCRETE

17.1 Pre-cast concrete manhole segments shall comply with the relevant provisions of BS 5911: part 1 and shall be lined with thermo-plastic material or GRP including a projecting length for overlapping at joint. The segment joint shall be form and the lining overlap will be sealed by thermo-welding or bonding in case of GRP. Top and bottom manhole segments in assembled manholes including those in contact with slabs shall be provided with a flange to allow direct vertical load

transmission. The internal faces of cover slabs including opening shall be lined with thermo-plastic material or GRP.

17.2 The Contractor is also referred to Section V Concrete Work of the specification for other items of pre-cast concrete.

#### 18. ROAD MATERIAL

18.1 The aggregate for base course and wearing course shall consist of clean durable crushed rock complying with the quality requirements of BS 4987 "Bitumen Macadam with Crushed Rock or Slag Aggregate."

18.2 Filler shall consist of crushed rocks or other material approved by the Engineer, and least 75% of it shall pass a No 200 BS Sieve. Filler shall be used, if required for compliance with the grading limit for aggregates in base or wearing courses or for surface application.

18.3 Bitumen for surfacing shall be of grade 80/100 penetration BS 3690 Part (1) and shall have a known specific gravity and known temperature/viscosity relation.

18.4 Bitumen for prime coat to base shall be of mix composite on (MC-O) or similar approved cut back bitumen.

18.5 Bitumen for tack coat to existing carriageways prior to resurfacing shall be of Mix Composition (MC-1) or similar approved cut back bitumen.

#### 19. SAND FOR MORTAR, RENDERING AND SCREEDS

19.1 Sand shall pass a 5mm (3/16") sieve and consist of disintegrated rock or crushed hard stone or gravel or combination of these, graded in accordance with BS 1200: Table - 1 as follows:

BS SIEVE	% BY WEIGHT PASSING SIEVE
No. 4	100
No. 7	90 - 100
No. 14	70 - 100
No. 25	40 - 80
No. 52	5 - 40
No. 100	0 - 10

19.2 Sands shall be washed and free from impurities such as sulphates and organic material incompatible with cement; clay or oil that reduce bonding qualities, material that will expand or shrink, organic matter that can decompose salts and substances that attract moisture and minerals that can cause staining of mortar.

19.3 Sands shall be tested regularly in accordance with BS:812 Part 103 to give a continuing proof of suitability. The presence of fine clay, silt and dust shall be limited to 5% by weight.

#### 20. REINFORCEMENT STEEL

Reinforcing steel shall be new pillet stack of mild steel (Plain bar) hard grade (deformed bar) and Ribbed Tor Steel as specified on the drawings and shall be obtained from the approved manufacturer and shall conform to British Standard Specifications or equivalent ASTM or Pakistan Standard. It should comply with BS. 4360 and be of No. 1 quality.

The Contractor, if required shall furnish to Engineer's Representative, Manufacturer's certificates to guarantee that steel meets the standard, specifications, requirement and minimum certified yield stresses as follows:-

Mild steel plain bars conforming to B.S.S. 4449 or PS-231-1962, Hard graded deformed bars conforming to PS 605-1960 or ribbed bar steel conforming to BS-4461.

Tensile Strength = 438 to 517 N / mm<sup>2</sup> (28 to 33 tons / sq. in)

Yield strength = 250 N / mm<sup>2</sup> (16 Tons / sq. in)

Elongation = 16% to 24% (av. - 20%)

Hard grade deformed bars conforming to PS-605-1960

Tensile strength = 560 N / mm<sup>2</sup> (35.7 Tons / sq. in)

Yield strength = 350 N / mm<sup>2</sup> (22.3 Tons / sq. in)

Elongation =  $1100000 \times \frac{\text{Tensile strength}}{\text{Yield strength}}$  %

Ribbed Tor steel conforming to B.S. 4461

Tensile strength = 400 N / mm<sup>2</sup> (70,000 lbs / sq. in)

Yield strength = 420 N / mm<sup>2</sup> (60,000 lbs / sq. in)

Elongation = -14.5 %

All steel to be true to the Standard Specifications with regard to bend ability specially the hard grade deformed bars under 19 mm (3/4") shall be capable of being bent cold through 90 degree round a bars of four times its own diameter without fractures or injury of any kind. In case of deformed bars over 19 mm (3/4") and above, round bar of 6 times its own diameter.

18 gauge galvanized wire shall be used for binding the steel reinforcement.

Samples shall be tested for above specification in an approved Laboratory when required by the Engineer or his Representative and all costs of such tests shall be borne by the Contractor. Samples shall be taken from the stocks brought by the Contractor. All under gauge bars shall be rejected. Engineer may allow use of over gauge bars on the condition that only standard weight shall be allowed for such steel bars.

Steel bars for reinforcement of concrete shall comply with the requirements of B.S.4461 for cold worked steel bars Grade 460/425 and B.S.4449 for hot rolled steel bars Grade 250.

## 21. DAMP PROOF COURSE

Two types of DPC are to be used as per direction of Engineer

21.1 Damp Proof Courses shall be of hessian based bituminous sheeting weighing 4.3 kg per sq.m and conform to BS 743. The damp proof course shall be of the proper width to suit the walls.

21.2 Damp Proof Course of cement concrete class C (1:2:4) of 50 mm thickness shall be laid on walls at plinth or at location shown in drawing. Pudio or other water proofing agent as approved by Engineer shall be mix with concrete as per the manufacturer's direction and approved by the Engineer. The size of the coarse aggregate shall be limited to 3/4" to 3/16" (19 mm to 4.8mm) the damp proof course shall be of proper width to suit the wall.

22. MANHOLE COVER

- 22.1 Mild steel frame and R.C.C. cover shall be made as per drawings.
- 22.2 Cover shall be fitted with frames and tested at the manufacturer's working. Each set (cover and frame) shall be similarly numbered in a legible and permanent manner. The marked position is not to be visible when fitted in place.
- 22.3 The Contractor shall ensure that the covers are fitted to the appropriately numbered frames after the frames have been fitted.
- 22.4 Covers shall have the words ~~D.P.O. DIVISION SHAHEED BENAZIRABAD~~ clearly cast in the upper side of the covers in letters of approximately 75 mm.
- 22.5 Covers shall be locked to the frame by means of a inside catch which is key operated

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23. PAINTS

- 23.1 All brands of paint, oil, putty or other finishing material shall be approved by the Engineer. Different brands of paint shall not be intermixed or interchanged on any surface.
- 23.2 All coating materials shall be stored in container not more than 5 litres capacity and labelled with the type of material and manufacturer's batch number, date of manufacture and manufacturer's name, brand name, formula and shall be mixed and applied in accordance with directions of the manufacturer.
- 23.3 Batch delivered of coating material shall be dated for use in order of delivery, shall be stored in a dry area, protected from extreme temperatures and shall not be used if more than 18 months-old from date of manufacture.
- 23.4 All material shall be acceptable, proven top grade products and shall meet or exceed the minimum standards of reputed manufacturer as approved by the Engineer.
- 23.5 Colours shall be pure, non fading pigments mildew-proof finely ground in approved medium. Colours used on plaster and concrete surfaces shall be lime proof. All materials shall be subject to Engineer's approval.
- 23.6 All emulsion paints and primers for metal work and walls will be the best available of its type. The make and shade shall be got approved by the Engineer prior to procurement.
- 23.7 Approved quality of Cement wash paint shall be used for painting the exteriors of the structures or other surfaces as directed by the Engineer.
- 23.8 The plastic emulsion paint or similar as approved by the Engineer shall be used for interior surface.
- 23.9 Un-slaked lime, gun and marine blue shall be used for white washing.

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23.10 All material for bitumen painting shall consist of Bitumen PB-4 Grade 10/20. It shall be used for foundation or wherever recommended by the Engineer.

23.11 Approved quality, ~~Epilac enamel~~ paint shall be used for chemicals and water resistance where specified.

23.12 **DUROCEM** a cement base heavy duty water proof coating manufactured by ~~QI~~ or any equivalent as approved by the Engineer shall be used for painting on the surface specified. The cement base water proof coating for concrete shall conform to ASTM C-109, C-67, D-822 and G-23 Solvent for cleaning metal work prior to application of metallic lead primers to BS 2523 shall be as recommended by manufacturer.

#### 24. WATER PROOFING

24.1 Cement, aggregate and coarse sand shall be in accordance with the Specifications for Concrete. Bitumen used for this purpose shall be as per BSS or PS.

24.2 Samples of all materials proposed for use under this section shall be submitted to the Engineer for his approval.

24.3 Water Proof Building paper shall be grade 82 as per BS-1521.

#### 25. BRICKS

25.1 Bricks shall be machine made of the best kind and of size ~~8.75" x 4.5" x 2.5"~~ or as directed and approved by the Engineer. They shall be hard, cubical in shape, with well-defined edges sound, well burnt regular in colour and uniform in size. When the bricks are struck together they shall give a ringing sound. The Engineer's Representative shall approve samples at intervals and consignments rejected shall be immediately removed from the site. Resistance to crushing shall be 2,000 lbs per sq.inch. The brick shall not absorb more than 15 percent water for 24 hours. Bricks shall be obtained only from Kilns approved by the Engineer.

25.2 Brick tiles for facing shall be machine made and a product of reputed manufacturer approved by the Engineer. These shall be of same specification as per Burnt bricks above. These shall be hard with well-defined and straight edges and free from warping.

#### 26. LADDERS - RUNG TYPE

26.1 Steel ladder shall consist of specified size of M. S. Plates in strings and 1" (25 mm) dia. M. S. Steel bars in rungs. The Rungs shall be riveted and welded in 25mm dia. holes in plates. The end of each limb of the ladder shall be embedded in the concrete.

26.2 Ladder shall be fixed using M 16 stainless steel bolts unless otherwise detailed.

26.3 Ladder shall be of integral or welded construction and shall comply with the requirements of BS 4211 for the spacing of stringers, rungs, safety hoops and hand holds unless otherwise detailed.

26.4 Ladders shall be made of mild steel and be hot dip galvanized after manufacture.

27. BOLTS, NUTS, WASHERS AND FASTENINGS

27.1 Bolts, nuts, washers, straps etc shall be of stainless steel except where otherwise specifically required. The heads and nuts of bolts shall comply with BS 4190. The ends of the bolts & nuts shall be cleanly cut with standard threads and the nuts must fit with bolts accurately and so tightly that they can just be screwed down by hand. Washers of approved shapes and sizes are to be provided when required.

27.2 Machinery and stanchions shall be held in position with stainless steel foundation bolts suitable for the purpose with a minimum embedded length of 200 mm. Rag bolts and self tapping bolts will not be acceptable in these conditions.

28. SHEETING - POLYTHENE

Polythene sheeting shall not be less than 125 microns thickness.

29. SLEEVING POLYTHENE

Polythene used for underground pipe protection shall be natural polythene tabular film with a single nominal thickness of 250 microns. It shall be made from a polymer with a melt flow index, as measured according to BS 2782, of 10 or less, and a density in the range of 0.915 to 0.925 g / ml. It shall be free from gels, un-dispersed raw materials and particles of foreign matter. The tabular film may not contain more than 5% by weight of material other than polythene.

30. STEPS IRON

Step irons for building into walls shall be galvanized malleable cast iron as described in BS 1247 general purpose pattern 254 mm x 152 mm x 1.59 Kg unless otherwise described.

31. WATER STOPS

Rubber and PVC water stops shall have the following properties when tested in accordance with the relevant British Standard as set out below:

Property	Rubber (BS 903)	PVC (BS 2782)
Density	1100 kg / m <sup>3</sup> (+ 5%)	1300 kg / m <sup>3</sup> (+ 5%)
Hardness	60 - 70 I.R.H.D.	70 - 90 I.R.H.D.
Softness Number		42 - 52
Tensile Strength	Not less than 20 N / Sq. mm	Not less than 18 N / Sq. mm
Elongation at Break Point	Not less than 450%	Not less than 285%
Water Absorption (48 hrs. immersion)	Not exceeding 5%	Not exceeding 0.15% by mass (after 24 hrs.)

Rubber and PVC water stops shall be suitable for storage handling, installation and service within a temperature range of 0 degree to 50 degree Centigrade.

32. **CHAIN -- SAFETY**  
Safety chains shall be 6.4 mm diameter x 3 links per 100 mm mild steel complete with "S" hooks and eyes fitted to the balls on adjacent standards of eye plates on walls.

33. **HAND RAILING AND STANDARDS**  
Hand railing shall generally conform to BS 6180 and be of approved design. The designed load shall be 360 N/m.

Mild Steel standard shall be made of double line hand rails made from 35 mm nominal bore medium class 10 SWG tube conform BS 1387 with standard type internally screwed nipple joints otherwise specified complete with all necessary bends (where removable sections of hand rail are required, the half lap joint shall be used). The external finish shall be completely smooth, free of all blemishes and rough areas.

Standards shall be spaced at the maximum of 1500 mm centres except at bends where one should be supplied on each side. They shall be of uniform, solid, circular section 50 mm in diameter between the rails.

Handrail tubes shall be incorporated with the balls on the standards at the heights of 550 and 1100 mm above floor level. The diameter of the walls shall be 84 mm where removable lengths of handrails are detailed; half lap joints shall be used.

Each standard shall be equipped with a screwed or welded base plate for attaching to a horizontal, vertical or inclined surface, as appropriate, and shall be fixed with 16 mm diameter gunmetal or stainless steel indented bolts 120 mm long. Standards fixed to the face of walls or the edges of landing, etc. shall be fitted with special bases for side fixing and be extended to that the rails remain at the specified heights above the tops of walls and nosing in the case of steps.

Openings in the hand railing at the tops of ladder or stair etc. shall be protected with twin safety chains.

Hand railing around floor openings in Pumping Stations and similar locations shall be fitted with mild steel kicker plates of minimum height 100 mm.

After manufacture, the handrails, standards, kicker plates and chains shall be hot dip galvanized to conform with BS 729 Part 1, unless otherwise specified.

34. **PAINT -- METAL WORK**  
All paints shall be provided by an approved manufacturer, solvents for cleaning metal work prior to application of metallic lead primers to BS 2523, shall be as recommended by manufacturer.

35. **PENSTOCK GATES**  
Penstock frames and gates shall be made of high grade cast iron to BS 1452 Grade 260, stems of high tensile forge bronze, seating faces of Bronze to BS 3374; BS 102, an operating nuts of gunmetal to BS 1422 LG-2.

Parts subject to wear shall be so designed that they may be easily replaced and shall be constructed of wear resistant material.

Penstocks shall be provided with wedge /door adjusters of large contact area suitable for adjustment of the door seating on side, bottom or top faces where required.

Penstocks shall be fitted locked suitable for fixing to vertical concrete walls and be supplied complete with all stainless steel indented bolts, nuts and washers.

The penstocks shall be designed for on or off seating pressures as required.

Penstocks shall be arranged for clockwise closing and shall be fitted with hand wheel, geared pillars, headstocks, and actuator or arranged with square non-rising spindles for tee key operation as specified on the Drawings and/or bills of quantities.

Headstocks and geared pillars shall be of cast iron and be supplied complete with stainless steel indented bolts, nut and washers for fixing to horizontal concrete surfaces. Hand wheels shall be of maximum diameter 600 mm.

Wall brackets shall be made of cast iron and be suitable for mounting headstocks or geared pillars. They shall be supplied complete with stainless steel bolts, nuts and washers. Brackets must be designed to withstand normal operating loads with "L" shaped fixing plates for bolting to both the vertical and the horizontal concrete surfaces of the floor and wall top.

Extension spindles shall be of high tensile forged bronze complete with adapters, couplings, etc. as required. Spindle guides shall be of cast iron with adjustable brackets at intermediate supports where necessary.

Penstock spindles for tee key operation shall have CI protection caps securely fixed.

Penstock shall be protected with two application of hot applied coal tar based coating to BS 4164.

### 36. STRUCTURAL STEEL

Except when otherwise specified structural steel shall comply with the requirements of BS 4360 and be of No. 1 quality.

All steel for structural steel work shall be free from lpos rust, mill scale, pitting, oil, paint etc. and shall be truly straight and of uniform thickness throughout. Steel works item shall be painted with one priming coat at the manufacturer's works. All structural rolled steel members shall be manufactured in accordance with BS 4 and its use shall be in accordance with BS 449.

### 37. GABIONS

Gabion wire cages shall be manufactured in high tensile, heavy duty, steel wire SWG 8 welded in mesh size of 75 x 75 mm and minimum weight of 2.912 Kg/mm<sup>2</sup>. The welded wire mesh shall conform to the requirements of BS 4483.

Gabions in their assembled form shall produce cages of 1000 x 1000 mm cross section and of varying meter lengths upto a maximum of 4 meters to suit the requirements of the drawing details. Such gabion cages shall include diaphragm dividers to form one metre

square boxes, all secured firmly with galvanized iron wire and the hole hot dip galvanized.

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# EXCAVATION

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## SECTION - III EXCAVATION

### 1. GENERAL EXCAVATION AND BACKFILLING

The work covered by this section of the specifications consists of furnishing all plants, equipment, appliances, labor and materials in performing all operations in connection with excavating, filling and backfilling for all types of construction works including pipelines and other foundations complete in strict accordance with proper gradient, slope with top and bottom of trenches etc. as per specifications and drawings and subject to the terms and conditions of the Contract.

### 2. EXCAVATION - GENERAL

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

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

The major works for excavation involved in borrow pits indicated on drawings or otherwise proposed by the Contractor. The Contractor shall carry out the excavation in borrow areas for obtaining earth for construction of embankments. The Contractor shall provide necessary transport for excavated earth from the borrow areas to the site / location of embankment with means approved by the Engineer. The Contractor shall ensure that earth obtained from borrow areas is suitable for construction of embankments and shall not contain excess water. Excess water if any shall be removed by the Contractor through exposure to natural weather or through any other means approved by the Engineer. The borrow pits shall not be measured for accessing the quantity of earth required for excavation.

### 3. EXCAVATION - PIPELINES ~~AND~~ DRAINS

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

- 3.2 The quantity of excavation shall be the volume of materials removed from below the original surface of the ground to the limits of excavation specified or shown on the drawings. For soft and unstable soils, the Contractor shall provide adequate side supports. The cost of supply of all material, plant and labor necessary for site clearance, excavation, over break, timbering, sheet piling, shoring, shuttering, refilling, watering and ramming etc. shall be included in the Contract rates for excavation. In case sides or ends of any excavation collapse under self-weight or due to any other reason, the Contractor shall at his own cost remove all disturbed material. Should sides or ends of any excavation give way, the Contractor shall at his own cost remove all disturbed material. Any excavation outside the limits shown shall be treated as excess and shall not be paid for.
- 3.3 Where the Contractor has excavated to depths in excess of the requirements, he shall refill and compact the excess excavation with 1:4:8 cement concrete up to the correct level at his own cost. Any excavation done in excess of specified width due to any reason whatsoever shall not be paid.
- 3.4 For excavation the width of the trench shall be equal to the external diameter of the pipe plus 450 mm up to sewer diameters not exceeding 200 mm. For sewers of internal diameters exceeding 200 mm the width of trench payable shall be equal to external diameter of pipe plus 750 mm.
- 3.5 Additional excavation will be necessary at all manholes, valves chambers and pipe joints to facilitate the making of joints. Additional excavation for construction of manholes, valve chambers and joint holes shall be of such dimensions as shown in the drawing, so as to give clear working space. The Contractor shall make allowance for the additional excavation required for the manholes and valve chambers in the price tendered for trench excavation. These shall not be separately measured or paid.
- 3.6 The length of the trench shall be measured along the centerline of the trench and the depth shall be measured vertically for original ground level to the average bed level.

#### 4. TIMBERING, SHORING AND BRACING

##### 4.1 General

The Contractor shall provide when required all shoring, supports etc., to the sides of excavation to prevent sliding or any movement. The timbering, shoring and bracing shall be of adequate strength to withstand the pressure encountered and the Contractor shall be solely responsible for the losses due to collapse or failure of shuttering, bracing, shoring etc.



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No payment for side support including shoring, shuttering or bracing or sheet piling shall be made. The Contractor's rate for excavation shall be deemed to include the cost of providing and removing side supports timbering, sheet piling, shoring, strutting and bracing with all connected operations.

The Contractor shall at all times support effectively the sides of the pipe trenches and other excavation by suitable timbering, sheet piling, sheeting, bracing, shuttering etc.

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

4.2 Pumping, Bailing and Dewatering.

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

4.2.1 The Contractor shall at all times during the progress of work remove any water from any source which may accumulate, inflow or be found in the trenches and other excavations made under the contract and shall keep them entirely free from water at all time while excavating.

4.2.2 The Contractor shall keep excavations free from water at all time and provide adequate pumping plant including special dewatering equipment and means of disposing off the pumped water as directed by the Engineer in charge. The Contractor shall ensure to keep away un-desired water from all surr clear of excavation and provide all necessary plant and equipment for dealing with any special conditions that may be encountered.

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

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

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

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

#### 5. FILL, BACKFILLING AND RESTORING OF GROUND TO ORIGINAL CONDITION

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

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

Backfill shall not be placed against walls etc. prior to the water proofing treatment if provided and approved by the Engineer. Backfill shall be brought up evenly on each side a wall as far as practicable. Heavy equipment for spreading and compacting backfill shall not be operated closer to tie wall than distance equal to the height of the backfill above

the top of base slab footing. No back filling shall be done before the new structure has been cured for at least two weeks.

## 6. BACKFILLING AND RESTORING OF GROUND TO ORIGINAL CONDITION

The back filling of the trench shall be allowed after the sewer pipe has been laid and jointed over the specified bed, inspected, checked, tested and approved by the Engineer.

Backfilling of the trenches shall be carried out by filling half pipe level. The filling shall then be thoroughly rammed. More filling shall be carried out and rammed again until the consolidated filling reaches pipe top level. Only selected dry materials free from stones or debris shall be used for backfilling that shall be spread and rammed evenly across the trench. Thereafter, the trench shall be filled in layers not exceeding 150 mm in depth, each layer being properly rammed before the next layer is placed so that 95-100% compaction is obtained as per AASHO Standard.

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

### 6.1 Rough Grading

Necessary rough grading if required shall be carried out by the Contractor to establish the finish grade as specified in the drawings or construction requirements of the site, or otherwise indicated shall have uniform levels or slope between points on existing and finished grades. Abrupt changes in slopes shall be rounded.

## 7. COMPACTION

Fill and/or backfill within the building or structure and for a distance of five (5) feet outside building or structure shall be compacted to a density of not less than 95% of the maximum density at optimum moisture as determined by AASHO T-99.

isolated boulders and rubble not exceeding 0.1 cubic meter in volume may be incorporated at the Engineer's discretion.

If any material after placing reaches a condition such that it cannot be thoroughly compacted the contractor shall either remove all of the material which is in unsuitable condition or improve the condition of the material by mechanical or chemical means.

## 8. REMOVAL OF EXCESS AND UNDESIRABLE MATERIALS

8.1 Excess and undesirable material from excavation not require for fill or backfill shall be disposed off, removed and/or deposited and levelled on the site where directed by the Engineer. Earth suitable for backfill if required shall be

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stored at site in a manner not to interfere with the progress of construction works in progress.

- 8.2 The Contractor shall keep all excavated soil sprinkled with water during the excavation work so as to prevent any dust nuisance.
- 8.3 All surplus soil arising out of the work shall be carried away to approved site within a week, deposited and spread as directed by the Engineer.
- 8.4 The Contractor shall carry out the cutting of existing bituminous road as required for excavation for carrying out the work to the full depth of hard crust of any existing thickness. The stone metal soling etc. shall be separately stacked along the side of excavation for possible reuse.

## 9. PROTECTION OF UTILITY SERVICES

### 9.1 Damage to Surface

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

### 9.2 Maintenance of Traffic

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

### 9.3 Control of Traffic on Roads

The Contractor shall ensure that the flow of traffic over existing roads and access to properties is maintained at all times during the contract. The flow of traffic is to take place at all time over a reasonable surface that is to be segregated as far as possible from areas where work is progress.

## 10. MEASUREMENT AND PAYMENT

The measurement and payment for different categories of earth excavation inclusive of disposal of surplus earth up to any lead or lift shall be done in accordance with BOQ rates.

No payment shall be made to the Contractor for excavation from borrow areas for the purpose of construction of embankments. Payment for construction of embankments



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shall be made on the basis of actual measurement of embankment to be constructed as per drawings and specifications. The Contractor's rates shall be deemed to include for excavation in borrow areas, transport to the site, location of embankment and construction of embankment to correct size and shape, fully watered and compacted in layers as per requirements of the Contract, including checking the moisture content and taking necessary measures for bringing the moisture content to the requirements of the specifications.

The rates for excavation quoted by the Contractor shall include for any trial pits or trial holes.

No payment shall be made for dewatering in this Contract. The rate of excavation quoted by the Contractor shall include for any dewatering required for excavation from trenches or excavation in borrow areas for construction of embankments.

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# LAYING AND JOINTING

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SECTION - IV  
**LAYING, JOINTING & TESTING OF PIPES, VALVES  
AND FITTINGS FOR RISING MAINS**

1. **SCOPE OF WORK**

This Section covers transportation of pipes and accessories site of work, handling, cleaning, lowering in trenches, making alignment, cutting, jointing setting of valves, fittings, pressure pipes and sewer pipes and gravity mains including testing and commissioning and handing over / taking over in strict accordance with specifications and condition of the contract or as directed by the Engineer. For specification of pipes, fittings and valves refer Section II.

2. **ALIGNMENT AND GRADE**

The pipes shall be laid in trench to the required level slopes, lines, alignment and grades at the required location as shown in the drawings or as directed by the Engineer or his representative(s).

3. **CLEANING AND CHECKING OF PIPE AND FITTINGS**

All pipes shall be brushed and wiped clean before the pipes are laid. Before laying all pipes shall be inspected for defect and when required by the Engineer shall be tapped with a light hammer to detect cracks. The pipes and fittings found containing any defects shall be removed from the site to be replaced with defect free items which shall be got inspected in the same way as described above.

4. **BEDDING FOR PUMPING AND GRAVITY MAINS INCLUDING SEWERS**

In all types of soils above water table and hard soil that can stand vertical without support, the pumping and gravity mains including sewers shall be laid on approved granular bedding if required. This bedding material shall consist of broken stone or gravel mixed with coarse sand. The materials grading shall be in accordance with BS 410 and as described in Section II. The material should be free from dust, plants or any organic compound etc. The thickness of bedding material below the pipe shall be up to full width of trench and shall be thoroughly compacted up to 95-100 % as per AASHTO Standards after laying pipes; further granular bedding shall be laid and compacted in a similar manner to fill the entire space between the pipes and undisturbed sides of trench up to a depth equal of half ( $\frac{1}{2}$ ) of the outer diameter of pipe. Adequate space as prescribed by the Engineer shall however be provided for pipe socket at required points.

If the granular bedding material is contaminated by water, sewage or soil materials due to the collapse of the sides of the trenches it shall be removed from the trench and replaced with new material before any of the pipes are laid or re-laid.

5. **BEDDING FOR PUMPING AND GRAVITY MAINS IN SOFT SOIL BELOW GROUND WATER TABLE**

In case the invert of pipes is below ground water table or stable strata is not available at the pipes invert level, the same shall be supported on the following bedding:

5.1 **Concrete bedding**

In case the pipe is required to be laid below ground water table where the sub soil is unstable and may cause settlement of the pipe during the excavation and dewatering a bed

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of concrete of 1:3:6 shall be provided for laying pipes in the trenches. The thickness of this concrete bed shall be as under:

200 mm for all sewer pipes upto 300 mm internal diameter.

300 mm for all sewer pipes exceeding 300 mm internal diameter.

This concrete bed shall be laid over a stone soling 225 mm to 450 mm thick packed layer granular bedding upto half or three quarter of the pipe over the concrete bedding as directed by the Engineer shall be provided.

The concrete bed shall be laid in full width of trench and adequately vibrated as per direction of the Engineer / Engineer's representative present at site. Space shall however be provided for pipe sockets at required places.

After laying pipe sewer, further cement concrete of mix 1:3:6 shall be placed and vibrated in a similar manner to fill the entire space between the pipe and the undisturbed sides of trench up to depth equal to  $\frac{1}{4}$  of the outer diameter of the pipe or as directed by the Engineer in writing depending upon the stability of the strata encountered at each individual location.

The Engineer can however reduce or increase to any required extent the thickness or width of concrete granular bedding below pipe or depth of granular bedding or, concrete on the sides of pipes through instructions in writing and the Contractor shall be paid accordingly.

In case of excessive slush formation in the trench for which the Engineer, who shall be the sole judge may instruct in writing to lay gravel or stone soling below the bed of concrete. This shall be done after detailed inspection of excavated trench by the Engineer. The Engineer shall instruct the depth of such bed of gravel or soling in writing before laying the bedding. No payment of bedding shall be made if no such written instruction specifying depth, width and length of bedding and its location is specified by the Engineer.

## 5.2 Concrete Encasing for Pipes

When directed the Contractor shall encase (surround) pipe with concrete. The concrete for surrounding the pipes shall be 1:1½:3 ratio (grade 30) to the dimensions given in the drawings or as directed by the Engineer.

5.2.1 For pipes less than 1000 mm internal diameter the cradles shall be 150 mm wide and a minimum of 300 mm long. For pipes 1000 mm diameter and above cradles shall be 200 mm wide and a minimum of 600 mm long or as directed by the Engineer.

5.2.2 Neither trench sides nor trench timber or sheeting to be used in lieu of proper formwork to concrete surrounds. All spaces at the sides or in other places shall be filled up with selected fine material and the ground made solid as the work advances. No extra payment will be made for the concrete in excess than shown in drawings.

5.2.3 Concrete shall be placed evenly over the entire width of the surround (encasing) and to within 25 mm of the bottom of the pipe then without stopping. It shall be placed gently on one side of the pipeline only and carefully worked under the pipe ensuring that no voids are left under the pipe. The concrete shall be brought up equally on each side of the pipe to the required finished height.

5.2.4 Horizontal construction joints will not be permitted, the in the concrete surround below half pipe height. Vertical construction joints shall be formed only at each pipe joint and must extend through the bedding where appropriate Diaphragm of approved compressible expansion jointing material cut to the exact shape of the outside face of the pipe and the bedding surround shall be positioned and supported in contact with the end face of each socket. The contractor shall take precautions to ensure that a firm seat exists between the diaphragm and the end face of the socket and that no concrete intrudes into the joint. Flexible joint at the pipe joint should be provided all along the concrete encasing and concrete bedding as specified by the Engineer.

## 6. PLACING AND LAYING

Pipes, specials and fittings where applicable shall be carefully lowered into the trench by means of derrick, rope slings, or other suitable equipment. Under no circumstances shall any of the pipeline or any materials be dropped, dragged or dumped into the trench. The full length of each section of pipe shall completely rest upon the pipe bed with recesses excavated to accommodate joints. Pipe that has the grade or joints disturbed after laying shall be taken up and re-laid. Pipe shall not be laid in water or when trench conditions are unsuitable for the work. The sewer pipes shall be correctly laid in correct position, alignment, level and grade and checked so that the invert of the sewer conform to that shown on the drawings and sockets are placed on the places provide for them in the excavation and the complete sewer will have smooth and uniform inverts. Each pipe shall be inspected for defects before being put in place.

6.1 In laying out pipes, fittings and specials they shall not be allowed to impede or harm traffic pedestrians or animals or to obstruct paths and access to private and other property. Pipes shall not be laid out in beds of water courses and every precaution shall be taken to preserve their sound and perfect condition before laying.

6.2 Trench excavation and pipe laying shall proceed in an orderly and continuous fashion working from one end of the pipeline to the other. Piecemeal excavation and pipe laying of isolated lengths will not be permitted prior to written approval of the Engineer. Similarly manhole / chamber foundation bases shall be correctly proposed to avoid cutting of pipes wherever possible.

## 7. LAYING PIPES ALONGSIDE EXISTING PIPES AND SERVICE ETC.

Where new pipes are to be laid alongside, over or under existing sewer, surface water drains, nallahs, water or gas mains, conduit electric cables or telephone cables, the contractor shall take care to interfere as little as possible with the existing services and connections thereto and the Contractor shall repair, or arrange for the repair of any damage to the satisfaction of the Utilities

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The contractor shall make all arrangements for supporting existing services and for temporarily dealing with the flow from any pipe, drain, main, channel, etc. and shall provide all troughs pumps plant and material necessary for this purpose.

8. LAYING PIPE UNDER HEDGES, FENCES, WALLS AND NEAR TREES

Where hedges are damaged or destroyed the whole shall be restored and reinstated with two rows of the same kind as the hedges planted in due season in topsoil 300 mm deep and fenced on each side with post and wire Stock proof fences finished on top with one strand or galvanised barbed wire, or otherwise protected as required by the owners or occupiers and the Engineer.

Where fences or walls are damaged or destroyed, the whole shall be restored and reinstated with like materials to the satisfaction of the owners or occupiers and the Engineer.

9. LAYING PIPES THROUGH WATERCOURSES CANALS ETC.

Work shall be carried out in such a manner that in the opinion of the Engineer, the watercourses are left unimpeded and their appearance and use unimpaired. The work shall be so completed that the trench line cannot in the opinion of the Engineer, be eroded, and water cannot seep along the trench line.

The top 300 mm of the trench shall be refined with clay puddle to the watercourse bed level and for at least two meters into each bank.

The pipeline shall be laid with a minimum cover as indicated on the Drawings under the base of watercourse, canals, etc. and surrounded with concrete for distance extending into the banks as far as the Engineer may determine at site. Different types of materials excavated from the bed of the ditch shall be set on one side separately and after the pipe surround has been completed. The trench shall be backfilled and consolidated in such a way as to restore as far as possible each type of material of which the bed is composed to its original position and state of compaction.

The contractor shall submit Methodology of all temporary works he intends to construct to maintain the flow in watercourse during construction of the work for the Engineer's approval.

Where a pipeline runs parallel to a watercourse, the distance between the edge of the ditch and the edge of the pipeline trench shall not be less than either the depth of the ditch or the depth of the pipeline trench, whichever is greater.

10. LAYING PIPE ACROSS RAILWAYS

Where any pipe crosses a railway or work is carried out within railway property, the work shall be carried out in an approved manner and to the requirements and satisfaction of Pakistan Railways and their Engineer.

Details of the method of working and any particulars that Pakistan Railways may request shall be furnished to their Engineers, and approved by them before work commences. After approval has been received the contractor shall give written notice to Pakistan Railways of at least one month, or longer, if required, of his proposed date of commencing work on any crossing.

11. JOINTING

After a length of pipeline is laid in trench, the pipe specials, and fittings, shall be jointed in accordance with the recommendation of the manufacturers of pipes. The welding of M. S. pipe work shall be done as per BS 2633 wherever provided.

Both sewer pipes, socketed or flanged, shall be jointed with rubber rings. Rubber ring shall be mounted on the spigot end, socket of pipe or collar as required and pipe be pushed into socketed /collar after lubrication of approved quality grease approved by the Engineer in writing, to form watertight joint. For cut pipes of RCC for sewers the contractor may provide a collar joint for connecting the pipes only on written approval of the Engineer. The adjacent ends of cut pipes shall be butted together concentrically so that a dowel is left between the two ends. Jute or hemp yarn soaked in cement or melt bitumen shall be wound in the dowel spaces and joint smoothed with cement mortar (one part of cement and 1½ parts of fine aggregate). The RCC collar shall be carefully pushed in position and the space between the pipe and the collar shall be filled and adequately caulked with cement mortar 1:1½ so that even space appears all around the external diameter of pipe. The work of jointing / working joints shall be done only in the presence of the Engineer's representative (s). Any joint not made in presence of Engineer's representative shall be rejected and will have to be dismantled and remade at the Contractor's risk and cost.

The open ends of pipes being laid for sewers and pumping / rising main after a day work shall not be left open by the Contractor. These open ends shall be carefully closed adequately by wooden plug of appropriate size to stop sand, garbage, debris, insects, animals or water entering in the pipe. No payment shall be made for such plug that shall be watertight. The cost of providing and dismantling of such plugs shall be deemed to be included in Contractor's rate of laying and jointing of pipes or sewers.

Where shown on the drawings flanged joints shall be provided. The flanges shall face parallel. The faces of the flanges shall be cleaned and wiped. Proper gasket shall be inserted between the flanges and bolts shall be installed and nut tightened in opposite pairs to form fully watertight joints.

On completion of joints in a section or whole of pipeline backfilling shall be done for the length of pipe except joints which shall be kept open till the pipe or sewer line is pressure tested and approved.

All valves on rising or pumping mains shall be laid and jointed as shown in the drawings or as specified by Engineer.

Unless otherwise detailed, all pipelines shall have approved flexible joints.

All joints shall be sound and watertight when subject to pressure test and under all working conditions. Before any pipe joint is made, the ends of the pipes to be jointed shall be thoroughly cleaned.

Care shall be taken to ensure that the rubber rings, where fitted, shall be concentric with the pipe.

Flanged joints shall be liberally coated with two coats of bituminous paint or other approved protective coating.

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Care shall be exercised to ensure that, with flexible rubber ring joints of all types, the pipe spigots are not driven tight home. The correct space as recommended by the manufacturer, between the spigot end and socket shall be maintained.

12. **CUTTING OF PIPE**

The cutting of pipe shall be done neatly without damage to the pipe so as to leave smooth end at right angles to the axis of pipe.

Pipe ends shall be properly beveled for the required joints.

The contractor shall fix all manholes, junctions, valves, hydrants etc. in the positions as directed by the Engineer and shall as far as possible select the lengths of pipes to avoid cutting to waste.

Alignments on rising or pumping mains shall be laid and jointed as shown in the drawings or as directed by the Engineer.

13. **BENDS**

Bends, tees etc. on rising mains shall be laid as shown in the drawings or as directed by the Engineer. Jointing of these specials shall be done as per requirement of pipes.

14. **CONCRETE THRUST BLOCKS**

Concrete thrust blocks on rising or pumping main alignment shall be constructed of CC 1:2:4 as shown on the drawing. Formwork shall be constructed where necessary to continue the concrete to the required dimensions. The thrust blocks shall be poured against undisturbed earth where possible or otherwise on compacted bed and side as per Engineer's satisfaction. These shall be provided against all bends. The concrete shall be cured for a minimum of 14 day by keeping surface wet.

15. **CONSTRUCTION OF MANHOLES AND VENT SHAFTS**

Contractor shall construct the manholes and vent shafts in positions as shown in drawings or when otherwise directed by the Engineer. The work of construction of manholes and vent shafts shall proceed along with the work of laying of sewer pipes. The timbering steel sheet piling and other side supports of trenches shall not be removed, dewatering for trenches shall not be stopped and backfilling of trenches over laid sewers shall not be allowed until the manholes are fully constructed at the required places, checked, tested and approved by the Engineer.

Manholes shall be constructed concurrently with the adjacent pipe lengths. The contractor shall build in pipes and for grades as directed. Short length pipes with flexible joint shall be used immediately adjacent to manholes, as detailed Benching shall be left completely smooth to the satisfaction of the Engineer.

Manholes and vent shafts shall be constructed of cast in-situ vibrated concrete. Dimensions and mix of concrete shall be as shown in drawings. All steel section and pipe shall be painted with three coats of approved paint over primer.

All channels and benching shall be finished smooth and accurately shaped in accordance with the drawings.

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Mild Steel steps shall be provided as shown in drawings. The M.S. reinforcement Bars shall conform to the requirements of Drawings and specifications.

The manhole walls shall be constructed of fair face steel form and no plaster will be required. However in case smooth surface is not attained inside and outside of manholes shall be plastered smoothly with 19 mm thick cement sand mortar of 1:3 using S.F. cement and the manhole shall be absolutely watertight. Two coats of hot bitumen at the rate of 7Kg per 10 Sq.m shall be applied on external surfaces. No extra payment shall be paid for this work.

Mild Steel sheet frame and R.C.C. covers shall be made as per drawing.

The concrete used in the manholes shall conform to the specifications given in Section - V of this Specification. The cement used shall be sulphate resisting.

Refilling around manholes shall be carried out as specified for refilling excavations.

16. NEW MANHOLES ON EXISTING PIPES

Where directed, excavation shall be made down to and around existing pipes and concrete 1:1½:3 foundations shall be formed under the existing pipe. The manhole shall be constructed thereon and the new pipe connected built-in.

The section of the existing pipe inside the new manhole shall when directed be carefully removed and new benching formed. The ends of the disused pipes shall be stopped off with concrete seats or provided with rodding eyes through a new benching.

Care shall be taken to ensure that no material from the excavation or debris of any kind enters the pipes during the construction of manholes.

17. PAYMENT

Rate shall include for supplying, laying, jointing and testing for pipes for each type or category of pipes, provided as per rates quoted in the BOQ. The rate shall include the cost of the pipes, rubber rings, sockets, collars and all other material, equipment, plant and labour required for laying, jointing and testing of pipes or sewers for a complete job. No deduction shall be made for the manholes in the measurement for the length of the pipe laid in continuation.

Payment for manholes and vent shafts shall be made for complete as per drawings and specifications.

Payment for thrust blocks if required shall be made for each thrust block of the required size and dimension as per drawings and specifications or as directed by the Engineer as per item rate of concrete quoted in BOQ.

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# CONCRETE

## SECTION -- V CONCRETE

### 1. SCOPE OF WORK

The work covered by this section of the Specifications consists of furnishing all plants, labour, equipment, appliances and materials and in performing all operations in connection with concrete work complete in strict accordance with the applicable drawings and the Specifications herein and subject to the terms and Condition of the Contract.

### 2. GENERAL

Full cooperation shall be extended to other trades to install embedded items, and opening etc. Embedded items shall have been inspected and check tests for concrete and other materials or for mechanical operations, shall have been completed and approved before concrete is placed.

### 3. MATERIALS

Cement -- For Specification referred to item 5 of section II (Materials)

Aggregates -- For Specification referred to item 3 of section II (Materials)

### 4. CONCRETE STRENGTH

The minimum compressive strength of concrete required on the basis of test cubes and minimum quantity of cement required for the concrete shall be as under:

Nominal Minimum Ratio	Minimum Quantity of Cement		Preliminary Cube Strength				Work Cube Strength			
	Lbs. Per 100 Cft.	Kg. Per Cu.m.	7 Days		28 Days		7 Days		28 Days	
			Lbs/ in <sup>2</sup>	N/ mm <sup>2</sup>	Lbs/ mm <sup>2</sup>	N/ mm <sup>2</sup>	Lbs/ in <sup>2</sup>	N/ mm <sup>2</sup>	Lbs/ in <sup>2</sup>	N/ mm <sup>2</sup>
1:1½:3	2520	404	3350	23.4	5000	35	2500	17.5	3750	26.2
1:2:4	2016	323	2700	18.9	4000	28	2500	14	3000	21
1:3:6	1344	216	1300	9.1	2000	14	1000	7	1500	10.6
1:4:8	1008	161	550	5.9	1350	9.4	650	4.5	1000	7

### 5. PROPORTIONING OF CONCRETE MIXES

All concrete shall be proportioned by volume for design of concrete mixes, unless specifically directed by the Engineer to proportion them by weight. The Contractor shall submit to the Engineer before the start of concreting proposed mix designs for concrete to be used based on laboratory tests to determine the proportion of cement, aggregates, and water in the concrete conforming to the quality and strength requirements specified. The source, and specific gravity of aggregates and name of laboratory shall be submitted along with mix design. The cost of all such testing and mix design shall be deemed to have been included in the item rates of Contractor.

### 6. MAXIMUM ALLOWABLE WATER CONTENT

All concrete specimens shall be made, cured and tested in accordance with British Standard or ASTM Standard and Water cement ratio shall be varied to achieve the required strength and this ratio shall be got approved by the Engineer before the start of concrete work.

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## 7. SLUMP TEST

The slump for concrete, but with an allowance with PS 422:1964 "Slump Test for concrete" should be minimum of 25 mm (1") and a maximum of 75 mm (3") provided the requisite strength is obtained.

## 8. MIXING

Concrete shall be mixed by mechanical mixing with adequate facilities for accurate measurements and control of each material entering the mixer and for changing the proportions to conform to varying conditions of the work. Volumetric batching can be adopted, using cement by weight, according to the following table:

Nominal	Cement		Sand Cft.	Coarse Aggregate Cft.
	Lbs.	Kg.		
1:1½:3	110 Lbs.	50 Kg.	1 7/8	3 ¼
1:2:4	110 Lbs.	50 Kg.	2 ½	5
1:3:6	110 Lbs.	50 Kg.	3 ¼	7 ½
1:4:8	110 Lbs.	50 Kg.	5	10

Water shall be measured for every batch with due allowance made for water already present in aggregates.

- 8.1 Mixers shall not be charged in excess of noted capacity nor be operated in excess of noted speed. Excessive mixing shall not be permitted. The entire batch shall be discharged before re-charging.
- 8.2 Mixing time shall be measured from the instant water is introduced into the mixer drum containing all solids.
- 8.3 Mixing water shall be introduced before one-fourth of the mixing time has elapsed. Mixing time for mixers of one cubic meter or less shall be 2 minutes.
- 8.4 No hand mixing shall be permitted. If during concreting the mixing plant fails, the concrete already poured shall be removed, unless otherwise directed by the Engineer or his Representative.
- 8.5 Test cubes of concrete shall be prepared and stored by the Contractor, in accordance with PS 560:1965, as and when directed by the Engineer or his Representative. Test cube be tested in laboratory and the Contractor shall bear the charges for the same.

## 9. TRANSPORTING AND PLACING CONCRETE

- 9.1 Concrete shall be conveyed and deposited as quickly as possible after mixing and shall proceed so that, as far as possible, a complete section of the work is done in one operation. Concrete that has attained its initial set or has contained its mixing water for more than 30 minutes shall not be allowed to be placed in the works.
- 9.2 Transport of concrete shall be in a manner approved by the Engineer or Engineer's Representative and shall be so as to avoid segregation or loss of ingredients of concrete.

# RELOCATION

and shall be flat with no warpage and edges and accurately rectangular. The doors shall be provided with all the required hardware like locks, hinges and bolts etc. as approved by the Engineer and from an approved manufacturer. The door and the frame shall be complete in all respect including the cost of 3 coats of enamel paint of approved make and shade over a coat of primer.

10. MEASUREMENT AND PAYMENT

Measurement for the accepted quantity of doors, windows, ventilators provided as per specification and directions of the Engineer shall be made as per standard method of measurements and payment shall be made as per the approved tender rates.



specified. The mixtures shall be turned over and over till the ingredients are thoroughly mixed.

- h. Only limited quantity of 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.

#### 5.4 Application of Plaster

The minimum thickness of plaster shall be 13 mm. If the plaster is to be more than 18 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 plasterwork is to cover all conduits, pipes etc. fixed in the walls and ceiling.

#### 5.5 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 directed by the Engineer.

Contractor shall remove completely and provide plaster in lieu of all defective work in patches as directed, at no additional expense to the employer.

Patching plaster shall match appearance of and shall be finished level with the adjoining plaster.

#### 5.6 Drips

The Contractor shall make drips for rainwater protection.

#### 5.7 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 Engineer.

#### 5.8 Cleaning and Protection

Rubbish and debris shall be removed as necessary to make way for work of other trades and as directed by the Engineer.

As each room or space is completed all rubbish, debris, scaffolding and tools should be removed to leave the roof clean.

Protect finished plaster from injury by any source.

Prior to plastering all 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.

### 6: WATERPROOF PLASTER

#### 6.1 Structure Below Ground Water Table

All structures to be constructed below ground water level shall be given a waterproofing treatment on the inside and outside. The plaster shall be made by mixing Puddle or an

other equivalent waterproofing compound approved by the Engineer in the cement-sand mix of 1:3 by volume according to the manufacturer's instructions for treatment and applied in a layer of 19 mm on all required surfaces. Waterproofing compound in sealed containers only shall be allowed. Only water proofing compound duly approved by the Engineer shall be allowed for use. The surfaces to receive waterproofing treatment shall be made rough for bonding. The layer of waterproofing plaster 19 mm thick shall be then applied and its surface shall be made smooth by the use of a trowel or other suitable instrument. The plaster shall be allowed to cure for a minimum of 14 days.

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6.2 Waterproof plasterwork shall not be started till all pipes have been installed. Any damage or leak discovered shall be repaired by the Contractor at his own cost.

7. CUTTING AND PATCHING

When so directed and prior to painting and finishing of cement plastered surfaces, the Contractor shall check all cement plastering throughout the work, including all cutting, patching and refinishing required in a manner satisfactory to the Engineer.

8. PROTECTION AND CLEANING

8.1 During the operation of cement plastering, protect the work of other trades against undue soilage and damage by the exercise of reasonable care and precautions. Repair, replace, or both, any work so damaged and soiled.

8.2 Upon completion of all work remove all rubbish, scaffolding and tools from the work and leave the premises clean and to the Engineer's satisfaction.

9. MEASUREMENT AND PAYMENT

Plasterwork will be measured and paid for the net area over which it is laid. All openings exceeding one sq. metre shall be deducted. The cost for drips and architectural grooves corner jombs and sills shall be included in the unit rate of plaster and no separate payment shall be made for these. All unit rates shall include cost of all materials, labour, scaffolding and curing etc.

No extra payment shall be made to the Contractor for thicker plaster required due to unevenness in the masonry or defective masonry.

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## SECTION - X PLASTER

### 1. SCOPE OF WORK

The work covered by this section of specifications consists of furnishing all plant labour, appliances and material and services required for cement plastering, including all items incidental thereto as specified herein and as shown on the Drawings.

### 2. GENERAL REQUIREMENTS

- 2.1. Contractor shall examine all other sections of the specifications for requirements that affect work of this section whether or not such work is specifically mentioned in this section. Plaster surface shall include walls, partitions, jambs, recesses, heads of doors & windows soffits etc.
- 2.2. Contractor shall co-ordinate work with that of all other trades affecting or affected by work of this section especially all embedded items in walls.

### 3. MATERIALS

For specification of sand and cement for plastering refer Section III (Materials).

### 4. WORKMANSHIP

- 4.1. 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 Engineer at no additional cost.
- 4.2. All finished surfaces shall be even and properly trowelled. 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.
- 4.3. All work shall be protected from rapid drying- Exterior openings shall be kept properly adjusted to regulate the drying and curing of cement plaster.

### 5. CEMENT PLASTER APPLICATION

#### 5.1 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 before starting of plasterwork. Chiselling and repairing of cement plaster shall not be permitted. Before commencing plasterwork Contractor shall check to ensure that all embedded and other items are in place.

#### 5.2 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 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 to make a thick creamy mix. The slurry shall be applied with a stiff brush on surface that shall be well wetted before the application of the slurry.

#### 5.3 Preparation of Cement Mortar for Plaster

- a. The mortar shall be prepared from prescribed cement mixed with clean sieved sand in the volumetric ratio of one part cement to three parts of sand (1:3) or as

## 8. MAINTENANCE MANUAL

The Contractor shall furnish 3 copies of the illustrated maintenance and installation manual for all electrical and mechanical equipment. The Contractor shall furnish complete priced list of spare parts required for the operation of electrical and mechanical equipment for a period of two years.

## 9. PACKING

The Contractor shall ensure proper packing of the components of pump assembly for safe shipment.

## 10. INSTALLATION OF HORIZONTAL CENTRIFUGAL PUMP

The pumps shall be carefully installed as per drawings and manufacturers instructions. These pumps shall be mounted on separate concrete foundation to be built by the contractor with foundation bolts grouted at appropriate positions. Separate suction pipes shall be provided for each pump with combined delivery pipe work with all valves and fittings as per drawings and instructions of the engineer.

## 11. INSTALLATION OF MOTOR CONTROLS &amp; WIRING

a) The installation of the motor controls including voltmeter, ampere meter, indication lights for phases and other electrical equipment, and materials shall conform to the applicable requirements of local electricity authority. The Contractor shall submit the required documents including required test certificates considered necessary before power connection to the pumping station. The motor controls and other electrical equipment and materials shall be installed at appropriate location subject to the approval of Engineer.

b) All wiring between the motor, motor controls and other electrical equipment shall be of adequate size for the requirements and of adequate insulation and shall run in P.V.C. conduits. Conduit sizes shall be adequate for the size and number of conductors for each circuit. The conduit pipe shall run exposed and supported at suitable intervals.

The ends of conduits shall be protected as required to prevent the entrance of concrete, sand or other foreign material during installation and afterwards. All conduits shall be installed with proper fittings and supports and all bends shall be gradual and smooth to permit pulling of conductors without damage. The radii of all conduit bends shall be not less than that of standard or long radii bends for the applicable size, shall be free from kinks, indentation, or flattened surfaces. Bushing, chase nipples or approved connectors shall be installed on the ends of the conduit at boxes and cabinets to protect conductors from abrasion.

## 12. OPERATION AND ACCEPTANCE TESTS

The operation and acceptance tests shall include a physical inspection of the completed machinery installation, testing of the insulation resistance of the electrical wiring,

resistance measurement of the grounding system and an operating test of the pump, (pumps) and motor controls, and a complete installation.

The insulation resistance test of the electrical wiring and resistance measurement test of the grounding system shall be carried out as per requirements of electrical department.

Upon completion of the electrical insulation resistance tests and grounding system test, the Contractor shall conduct an operating test of complete installation to (demonstrate that the equipment function properly. The test shall consist of operating the equipment as a unit continuously for a period of seven days for each pumping unit. During this period the Contractor shall provide full operating staff, lubricants and other materials. If there is any indication during this period of defective materials or workmanship, the Contractor shall make any or all necessary replacements or repairs, following which the acceptance test shall be re-run. The Contractor shall furnish all pipes fittings and gauges, equipments and accessories all of which shall be subject to the approval of the Engineer. The Contractor shall give the Engineer 24 hours notice before conducting the test, and the Engineer or his Representative will be present during all tests. The Contractor shall take draw down and discharge measurements, power input readings, and other pertinent data on forms furnished by the Contractor and approved by the Engineer. The originals of all such forms shall be delivered to the Engineer.

#### 13. MAINTENANCE PERIOD

The contractor shall be responsible for operation and maintenance of pumping machinery and equipment for a period of 3 months. The Engineer shall arrange all operating staff, power, lubricants and other requirements. The contractor shall depute his full time supervisor for operation timings during this period. During this period the contractor at his own cost shall replace all defective parts and components. The Contractor shall be responsible for a further period of maintenance. This maintenance period shall be counted from the date of issue of certificate of commissioning by the Engineer or date of last replacement of spare or component part of equipment or date of taking over the pumping station from the Contractor.

#### 14. MEASUREMENTS AND PAYMENT

No separate payment shall be made for supply of pumping machinery and equipment. The work shall be measured and paid on the basis of approved tendered rate in the Contract. The rate shall be inclusive of all plant, tools, equipments labour and all components, for installation testing, commissioning and satisfactory performance after commissioning and during the maintenance period and including all overheads and profits.



*not applicable*

**SECTION - IX**  
**SUPPLY & INSTALLATION OF PUMPING**  
**MACHINERY & EQUIPMENT**

**1. SCOPE**

The work covered by these specifications consists of furnishing all plants, labor, equipments, appliances and material and performing all operations in connection with supplying, installation, testing and commissioning of pumps and motors with all accessories of electrical system & valves and pipe work inside the pump house including jointing material for pipes, fittings and valves in strict accordance with the specifications and terms and Conditions of the Contract.

**2. GENERAL**

The pumps shall be either KSB or approved equivalent equipment. All components and accessories of pumps shall be the product of reputed manufacturer engaged in the manufacture of such pumps and equipments for the last ten years, and the materials supplied shall be the standard product of the manufacturer. The catalogues and other details of the pumps including characteristics curves of the pumps offered shall be supplied with the offer. The contractor shall get the details of pumps and equipment approved by the Engineer before placing order for the pumping machinery and equipment.

**3. DESIGN**

The material, design, fabrication and assembly of equipment shall be in strict accordance with "American Water Works Association Standard E 101-61" American Standard or equivalent and the requirements given in these specifications and specific requirements of HESCO for electrical equipment and installation.

**4. CENTRIFUGAL PUMPS SET**

The centrifugal pump set shall consist of following basic components:

a) **Centrifugal Pumps Electric Driven**

The centrifugal pump shall be single stage, cast iron body, bronze impeller of radial type with double curvature vanes, stainless steel shaft sleeve for the pump shaft, properly lubricated bearings, readily accessible stuffing box with flanged discharge and suction connections, integral base plate of M.S channels for pump and motor, with drain outlet connected to nearest drain point, flexible coupling between motor and pump shaft covered with approved guard, pump casing to be complete with drain plug and vent plug.

The pump shall be capable of pumping the required quantity of water to the required total head as specified in BQQ while running at the specified rpm with a minimum efficiency of 70 percent when operating continuously without heating the motor. The motor shall be tested twice the maximum working pressure.

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b) **Electric Motor**

The centrifugal pumps shall be directly coupled with electric motor 3 phase, 400 volts 50 cycles of required rpm and horse power on common base plate, suitable for working with the centrifugal pump. The motor shall have class E insulation and shall be continuously rated as laid in BS 5000.

c) **Motor Control**

The motor controls shall consist of a combination motor starter and push-button control with all necessary components, for a complete installation. Each motor-control shall be suitable for controlling and operating 380-400 volts, 3 phase, 3 wires, 50 cycle electric supply. Motor controls shall be furnished in complete accordance with the applicable standards and shall have a minimum insulation level of 600 volts. The combination motor starter shall consist of circuit breaker and magnetic starter and shall be designed to provide protection for the motors for short circuit. Protection in all three phases, under voltage protection in all three phases and overload protection in all three phases and shall provide for automatic stopping of motor if the sump is dry without sewage. The motor control equipment shall be carefully and securely mounted. The "Start" and "Stop" push buttons and the thermal overload relay reset device shall be mounted to be operable without the necessity of, opening the casing. Motor control shall be furnished complete as a unit with all component parts and accessories including ampere meter volt meter, phase indicating lights etc completely wired. The conductor shall be 600 volts heat-resistant rubber insulated type RH wire, or, moisture and heat-resistant, rubber, with 50 degree centigrade as the operating temperature.

5. **QUALITY CONTROL TESTS**

The manufacturer shall perform all the quality control tests during manufacturing and all test results shall be submitted in triplicate, along with characteristics curves of the pumps offered to the Engineer before procurement of pump sets.

6. **DEVIATION FROM SPECIFICATIONS**

Water pumps differing in minor respects from that specified may be proposed, provided such differences are clearly stated in the proposal

7. **GUARANTEE**

Equipment furnished under this section shall be guaranteed for a period of one year from date of acceptance thereof against defective materials, design, and workmanship. Upon receipt of notice from the Engineer-in-Charge of failure of any part of the guaranteed equipment during the guarantee period, new replacement part or parts shall be furnished, installed and commissioned promptly by the Contractor and no additional cost shall be payable to Contractor.

# PUMPING

roof and wall, being a. . . . the pipe, making good the roof and painting the pipe complete in all respect as directed by the Engineer.

7. **WATER PROOFING BASE SLAB**

The cement concrete of mix 1:4:8 below the base slab shall be finished smooth. After this concrete has been cured and dried hot Bitumen PB-4 shall be applied over the surface at the rate of 7 Kg per 10 Sq. m. while the bitumen is still hot and in liquid stage, one layer of 2 ply bituminous felt shall be spread over the surface so that the felt fully sticks to the surface of bituminous coat. Overlapping joints of two rolls of bituminous felt shall be made fully watertight by application of continuous coat or other approved method.

8. **MEASUREMENT AND PAYMENT**

The items of Bitumen Coating, Damp Proof Course, Bituminous felt and Rain Water spout for the accepted work as executed according to the drawings, specifications and directions of the Engineer shall be measured as per standard method of measurement and payment shall be made as per the approved tender rates.



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# WATER PROOFING AND MOISTURE TREATMENT WORKS

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## SECTION - VIII WATER PROOFING AND MOISTURE TREATMENT WORKS

### 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 installation of insulation waterproofing complete in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and conditions of the contract.

### 2. MATERIALS:

- a) Cement, aggregate and coarse sand shall be in accordance with the specifications for Concrete.
- b) Samples of all materials proposed for use under this section shall be submitted to the Engineer for his approval.

### 3. APPLICATION:

After the entire surface to be treated has been broomed and cleaned a 2" (50 mm) thick average screeding with cement concrete 1:2:4 shall be provided over RCC roof slabs with proper slope for roof drainage through rain water spouts. Screeding shall be finished to have smooth surface and junctions with vertical walls or surfaces shall be chamfered as shown in drawing or as directed by the Engineer.

After the concrete of screed has been cured and has set and dried it shall be cleaned and one coat of plastic Bitumen # 4 with coarse sand shall be applied as mentioned hereunder: -

3.0 Kg Bitumen with 0.05 cu. m of coarse sand for binding per 10 sq. m.

### 4. BITUMEN COATING

Unless otherwise specified all concrete and brickwork in contact with earth upto plinth level shall be given a application of hot bitumen PE-4 at the rate of 7 Kg per 10 sq. m. ensuring that no pin holes or patches are left out. Bitumen should be applied after ensuring that concrete has been cured and dried. One layer of two-ply bitumen felt weighing 32 Kg. per 20 sq. m shall be applied with sticking coat, paint coat and flood coat. Backfilling of earth in foundation up to plinth will only be carried out after applying the bitumen coat as specified herein above or as directed by the Engineer.

### 5. DAMP PROOF COURSE

Damp proof course of cement concrete class C (1:2:4) of 50 mm thickness shall be laid on walls or at plinth or at location shown in drawing. Puddle or other waterproofing agent as approved by the Engineer shall be mixed with concrete as per manufacturer's directions and approved by the Engineer. The mixing, laying and curing etc. of the concrete shall be as described under the section of Concrete. The size of the coarse aggregate shall be limited to 3/4" to 3/16- (19 mm to 4.8 mm). The damp proof course shall be of proper width to suit the wall.

### 6. RAIN WATER SPOUTS

A.C. pipe 4" (100 mm) diameter shall be provided on roof at locations shown on the drawing or as directed by the Engineer. These shall be fixed in the roof at proper level so that rainwater easily passes out through the spouts without any hindrance. The job will include making chase in the



- c) All masonry shall be laid plumb, true to line and level in accurately spaced courses with each course breaking joints with the course below. Corners & reveals shall be plumb and true. Chases, grooves, register block and raked out joints shall be kept free from mortar and other debris.
- d) All brickwork shall be cured with water. The brickwork shall be kept wet for at least 7 days after laying.
- e) To join the brick masonry wall with RCC or CC work proper type of dove-tail shall be used as directed and approved by the Engineer without extra payment.

5. COORDINATION

- a. The Contractor shall provide chases and openings required under other sections to sizes and location shown in the drawings.
- b. The Contractor will be required to ascertain all particulars relating to positions in which chases, holes mortises, conduit ducts and similar item will be required to be formed or left before the general work is put in hand and this will be deemed to be included as part of the Contractor's attendance as described in the specifications for Contract under Particular Conditions.
- c. The Contractor shall operate with other trades in setting built-in-items, take special care in cutting, fitting, setting units so that built in members are in their true and respective positions.
- d. Items provided in other sections such as doorframes, hold fasts, miscellaneous metal work occurring in the masonry, sleeves, anchors supports, walling strips, braces, Jamb, etc. are to be built-in the masonry.
- e. Special care shall be taken in laying bricks at doorframes. Contractor shall see that frames are square and in plumb. Brick masonry at door location shall be carried out after wooden or hollow metal doorframes are installed in plumb. The anchors are embedded in mortar joints, filling of hollow metal doorframes with 1:2:4 concrete shall be done along with masonry work.
- f. The Contractor shall be responsible for any damage to his own work, and also to the work of other sections.

6. SAMPLES

Samples of all bricks & other materials to be used under this section shall be submitted to the Engineer for his approval.

7. TESTING

All the brick samples and materials shall be subject to standard testing and if found below the recognized standard specifications such as BS, ASTM or equal shall be rejected. Rejected material shall be removed from the site immediately. All testing shall be done at Contractor's cost from laboratory approved by the Engineer.

8. MEASUREMENT AND PAYMENT

8.1 Measurement

Measurement for payment for brickwork will be made for actual front face of brick work. No measurement of Jamb sills etc. shall be made.

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e.2. Payment

Payment for brick work will be made as per the unit rate in the Bill of Quantities for actual work executed. The unit rate tendered for such work shall include the cost of bricks, mortar and, placing curing and all other operations, procedures and requirements necessary to complete the brick work in accordance with this specification.



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# BRICK

## SECTION -- VII BRICK MASONRY

### 1. SCOPE OF WORK

The work covered by this section of the specification 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.

### 2. BURNT BRICKS

For specification of bricks refer Section III (Materials)

### 3. CEMENT MORTAR FOR MASONRY

3.1 Cement mortar to be used for all brick masonry work shall be 1:4 (one part cement and 4 parts of approved fine sand).

3.2 The dry mix of cement and sand can be dry mixed for approximately 2 minutes and for 3 minutes after addition of water making total minimum time of 5 minutes. If mixing is not satisfactorily done, then the Contractor shall take such steps as directed by the Engineer.

For dry mix, turn over materials for each batch before adding water, until uniform colour of mixed material indicates cementing material thoroughly distributed throughout the mass. After dry mixing is complete, add water thoroughly until mortar of the required plasticity is obtained.

Mortars shall be used within half an hour of mixing. Mortars standing more than half an hour shall not be used.

3.3 The ingredients for mortar shall be measured in boxes. No re-tampering of mortar shall be allowed nor mixing of any anti-freezing ingredients shall be permitted.

3.4 The thickness of joints shall not be less than 6 mm. The overall height of 4 courses of Bricks shall not be less than 300 mm.

### 4. MASONRY AND JOINTING

a) All bricks to be used in brickwork with mortar joint shall be immersed in water from 3 to 4 hours before these are used.

b) No half bricks or bats shall be used except where necessary to complete the bond. At all corners alternate courses of bricks shall be laid header wise and stretcher wise, so as to bind the two walls together. All brickwork shall be truly plumb and each set of four brick courses shall be checked with plumb bob for straight edges. The Joints of brickwork which is to be pointed or plastered shall be raked out to a depth of half an inch. The raking shall be done before the mortar sets each day.

## SECTION - VI REINFORCEMENT STEEL

### 1. SCOPE OF WORK

The work covered by this section of the specifications consists of furnishing all materials, tools labours and in performing all operations in connection with the providing, straightening cutting, bending, binding, fixing including binding wire, chairs, pins, 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.

### 2. MATERIALS

For Specification refer Section III Materials

### 3. 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 shall not be used in the works unless brushed and cleaned by proper steel wire brushes and after being approved for use by the Engineer.

### 4. REINFORCEMENT CUTTING AND PLACING

All reinforcement steel shall be cut and bent cold in strict accordance with bar bending schedules approved and drawings supplied by the Engineer. The Contractor shall prepare bar bending schedule from approved structural working drawings and instructions to be provided to him by the Engineer. The bending schedules shall be drawn on approved forms and submitted to the Engineer 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 bars, 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 Engineer, the Contractors 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. The system 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 Engineer's Representative shall be used for supporting and spacing purposes of bars. In case any bars are bent or displaced, they shall be straightened or replaced prior to pouring.

### 5. LAPS AND SPLICES

No splicing of bars shall be allowed at position other than shown on the drawings. All lap lengths shall be of the minimum sizes as indicated on the drawings and in no case shall lap length be less than 40 times the diameter for bars in tension and 35 times the diameter for bars in compression for nominal M.S. bars. Hard grade bars and TOR steel shall have laps of 50 times the bigger diameter of lapping bars. Splices of adjacent bars shall be staggered unless approved otherwise by the Engineer or his Representative.

All reinforcing steel fixed in position shall be inspected by the Engineer Representative and no concrete shall be poured until steel placement has been approved by the Engineer's representative. For inspection purposes the Contractor shall give to the Engineer Representative reasonable notice before the scheduled time. When concrete cover to reinforcement steel shall be as indicated specific.



3. MEASUREMENT AND PAYMENT

Payment for steel reinforcement shall be made on the basis of approved tendered rate for all steel supplied, cut, bend and binded by the Contractor as required and as determined from the approved bar bending diagrams and incorporated in the concrete and checked and accepted except that no separate payment of steel reinforcement will be made for manholes. This will be deemed to have been included in the lump sum rate of manholes quoted by the Contractor. The weight of plain or deformed bars will be computed from the theoretical standard weight of M.S. bars, in case of oversize bars. If the Engineer allows the use of undersized bars only within allowable tolerance of weight the Contractor shall be paid on the basis of actual weight of bars supplied.

No separate payment shall be made for the spacers, binding wire and chairs etc., not included in the bending schedule



14. **CLEANING AND REMOVAL OF RUBBISH**

On completion of works herein the Contractor shall remove all concrete debris, rubbish, shuttering materials, scraps etc., from the vicinity of the structures completed. All areas shall be cleaned to the satisfaction and approval of the Engineer.

15. **PLACING STEEL REINFORCEMENT ON FORM WORK**

15.1 Clear cover to main reinforcement in concrete members be as follows:

a.	For slabs, projections, chajjas, fins, walls, staircases pre-cast slabs.	19 mm
b.	For beams, Columns, all members of water retaining structures on the side in contact with water	37 mm
c.	For foundations retaining walls and foundation beams	50 mm

15.2 All the reinforcing bars are to be properly placed and spaced as shown on the working drawings. Steel chairs and concrete spacer blocks are to be used without any extra cost. Concrete spacer blocks are to be properly cured to avoid their damage during concreting thereby causing displacement of bars. Holes made by bolts etc., introduced for keeping the shuttering in tact should be properly treated after striking the shuttering. No such hole shall be allowed in walls of water retaining structures and earth retaining walls.

16. **WATER PROOF CONCRETE**

All concrete work below ground level shall be executed in SR cement with water proof compound of approved type and shall be mixed in with concrete in strict accordance with the instruction of manufacturer or as directed by the Engineer.

17. **FINISHING OF FORMED SURFACES**

All concrete surfaces exposed to public view or inside of sump or wet well and screening chamber shall be smooth form finish. No plastering will be allowed or paid for. The concrete surfaces not exposed to public view e.g. external surfaces of sump or wet well or screening chamber shall be fairly smooth for application of water proofing treatment. Other surface may be rough form finish.

18. **MEASUREMENT AND PAYMENT**

Payment for concrete shall be made on the basis of approved tendered rates of the Contractor for all types of concrete work carried out by the Contractor and approved by the Engineer except that no separate payment shall be made for concrete work in manholes. This shall be deemed to have included in the lump sum rate of manholes quoted by the Contractor.

No payment shall be made for the concrete work done by the Contractor without the issue of pour slip by the Engineer or his representative.

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# STEEL REINFORCEMENT

## 11. FORMWORK

### 11.1 General

The form work shall be inclusive of all labour, material, workmanship and alike. All formwork and supports thereto shall be designed by the Contractor and relevant drawings shall be submitted to the Engineer and his Representative for approval before the work is put in hand. Such approval shall not relieve the contractor from all the obligations of the contract or give rise to any claim.

### 11.2 Making Forms

The formwork for all concrete work to be cast in situ shall be made of sound and properly seasoned timber or other approved material for all works above ground water table. For all works below ground water table formwork of steel shall be used. These formwork shall be properly jointed and erected with packing material to provide watertight forms. These forms shall be properly cleaned to give a smooth finished surface and shall be rigidly formed and designed by the Contractor to the shapes and forms as per drawings in accordance with the best existing practices so as to be able to withstand, without displacement deflection or deformation movements of any kind, the pressure of the moist concrete and all other loads.

### 11.3 Rigid with Allowance for Camber and Bulges

It shall be fabricated and erected in position, perfect in alignment, levels and true to plumb and shape and securely braced so as to enable it to withstand all weights, live and vibrating, to be endured during placing of concrete and its subsequent hardening till the formwork is struck. It shall be sufficiently rigid as not to lose its form or bulge, or deflect and to give the finished concrete the required lines, plumb, size and shape.

### 11.4 Materials and Labour

The Contractor shall supply all materials and labour necessary for a good and speedy erecting formwork such as shuttering, planks, struts, bolts, stays, gangways boards, fillets etc. and shall do all that is essential in executing the job in a workmanlike manner to the satisfaction of the Engineer.

### 11.5 Formwork not to Interfere or Injure Work

The formwork shall be so designed and arranged as not to unduly interfere with concrete during its placing and easy to be removed without injuring the finished concrete.

Wedges, clamps, bolts and the rods shall be used when permitted and where practicable in making the formwork rigid and in holding it to true position.

### 11.6 Joints in Formwork

All joints in the formwork shall be sufficiently closed to prevent undue leakage of mortar from concrete or show an appearance of leaking mortar on concrete surface.

### 11.7 Treatment and Inspection of Forms

All rubbish particularly chipping, shavings and saw etc. shall be removed from the interior of the forms immediately before placing concrete. Forms shall be coated with approved oil or grease before placing. Surplus oil on forms and any oil on reinforcing

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- 11.8 Removal of Shuttering  
 No struts or timbering which serve the purpose of supporting the shuttering or centring shall be struck or removed before the minimum periods for the main classes of work given as under:

Removal of Shuttering	Cold Whether Days	Normal Whether Days
Beams, sides, walls and columns (unloaded)	5	3
Slabs soffits (Props left under)	10	7
Removal of props to slabs	18	14
Beams soffits (props left under)	13	10

Struts or other timbers or supports the removal of which may cause the transference of load to the finished work shall be kept in place for three weeks after the placing of the concrete.

- 11.9 Injury or damage  
 The Contractor shall be responsible for any injury to the work and any consequential damages caused by or arising from the removal and striking of forms, centring and supports, and any advice, permission or approval given by the Engineer or his Authorised Representative, related to the removal and striking of forms, centring and support shall not relieve the Contractor from the responsibilities herein defined.

- 11.10 Treatment after Removal of Forms  
 Any minor surface honey combing or other irregularities are to be properly made good immediately upon the removal the formwork and the surface made good to the satisfaction of the Engineer and his Representative. Any small voids shall be neatly stopped with cement mortar consisting of one part of cement to two parts of sand and the whole surface rubbed over with carborundum stone and cement wash and bring the whole to a smooth and pleasing finish and uniform colour.

- 11.11 Measurement and Payment  
 Formwork shall not be measured or paid for separately and shall be deemed to be included in the unit price of concrete whether cast-in-situ or pre-cast and subsequently fixed in position.

12. CONSTRUCTION JOINTS

Construction joints shall be located as indicated on the drawings and / or as approved or directed by the Engineer or his Representative.

13. ANCHOR BOLTS, INSERTS, SLEEVES, CHASES, RECESSES, STEEL FRAMES ETC.

The Contractor shall furnish and place in position accurately shown on drawings, all inserts, sleeves, chases, recesses, etc., supplied by himself or other Contractors, as directed, and full cooperation and coordination shall be maintained with other Contractors, Sub-Contractors in this regard.

## SECTION - XVIII

### POLYVINYLCHLORIDE WATER STOPPER

#### 1. DESCRIPTION

The work shall comprise providing and installing of all types of polyvinylchloride (PVC) water stops and expansion joints, in concrete structures and elsewhere, in accordance with these specifications and to the location, lines, grades and cross-sections shown on the Drawings and/or as directed by the Engineer.

#### 2. MATERIAL REQUIREMENTS

- a) PVC water stops shall be extruded from an elastomeric plastic compound, having basic resin of polyvinylchloride (PVC).
- b) The compound shall contain such additive resins, plasticizers, stabilizers or other materials, needed to ensure following physical characteristics when tested by the US Corps of Engineers Test Methods, as specified below:

Characteristics	Minimum Requirement	Test Method
Tensile strength, using die III	123 kg/cm <sup>2</sup> (1750 psi)	568
Ultimate elongation, using die III	350%	575
Low temperature brittleness with no sign of failure such as cracking or chipping	-35° F	576
Stiffness in flexure, 1/2" span	28 kg/cm <sup>2</sup> (400 psi)	571

#### 3. CONSTRUCTION REQUIREMENTS

All the operations of installing, jointing and splicing the water stops shall be carried out in accordance with the recommendations and instructions of the Manufacturer and the directions of the Engineer.

- a) All embedment in concrete, lapping, turning and sealing shall ensure absolute water tightness.
- b) No holes shall be made through any water stops.
- c) The water stops, wherever indicated on drawings or directed by the Engineer, shall be cast
- d) integrally with the in-situ concrete, with separate junction and intersection pieces, placed and jointed at Site.
- e) The water stops shall be installed, in such a way that they are held securely, in their correct position, during the placement of concrete.
- f) The concrete shall be fully and properly compacted around the water stops to ensure that no voids or porous areas remain.
- g) Where reinforcement is present, adequate clearance shall be left, between water stops and the reinforcement, to ensure proper placement of concrete.

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# PVC WATER STOPPER

12.1.2 Cutting, jointing and laying of pipes, valves, fittings, gaskets and bolts and gaskets and jointing compound etc.

12.1.3 Pipe work supports such as clamps, brackets, hangers etc.

12.1.4 Testing, cleaning, flushing, disinfection and commissioning.

12.1.5 Ultraviolet protection for above ground uPVC pipes.

12.1.6 Arranging water required for flushing, testing, disinfection and disposal of water after completion of works.

### 12.2 Measurement

Measurement of acceptably completed works of uPVC pipe work shall be made on the basis of actual length in linear meter of pipe work installed, tested, disinfected and commissioned as specified in the Bill of Materials, or as shown on the drawings, and/or as directed by the Engineer.

### 12.3 Payment

Payment will be made for the acceptable measured length of pipe work at the unit rate per linear meter quoted in the Bill of Materials for all the works related to the item.

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### 11.2 Acceptance Testing

If portions of the pipeline are to be tested, and if the joints are to be exposed during testing, center loading of pipe to resist movement of the pipe during testing is recommended. After testing, the pipe embedment requirements are to be followed in placing the initial backfill around the exposed joints prior to completing the final backfill.

### 11.3 Cleaning of Pipeline

The pipe must be cleaned before disinfecting the water main. Mud, sand, dirty water, or a variety of debris left in the water main during construction will shield bacteria from contact with the chlorine solution resulting in incomplete disinfection and possibly delivery of contaminated water to consumers. Water mains may be successfully cleaned by flushing or swabbing.

Water mains should be filled slowly with potable water at a rate that allows air to leave the line at the same rate as the water entering the line. All air should be vented from the pipe and fittings to prevent entrapment of air in the main.

For flushing of the pipeline, it is suggested that sufficient flow in the system be created to cause the pipe line flow velocity to be equal to or greater than 0.91 m/sec (3.0 ft/sec). The duration of the initial flushing procedure should be continued until the discharge appears clean.

### 11.4 Disinfection of Pipe lines

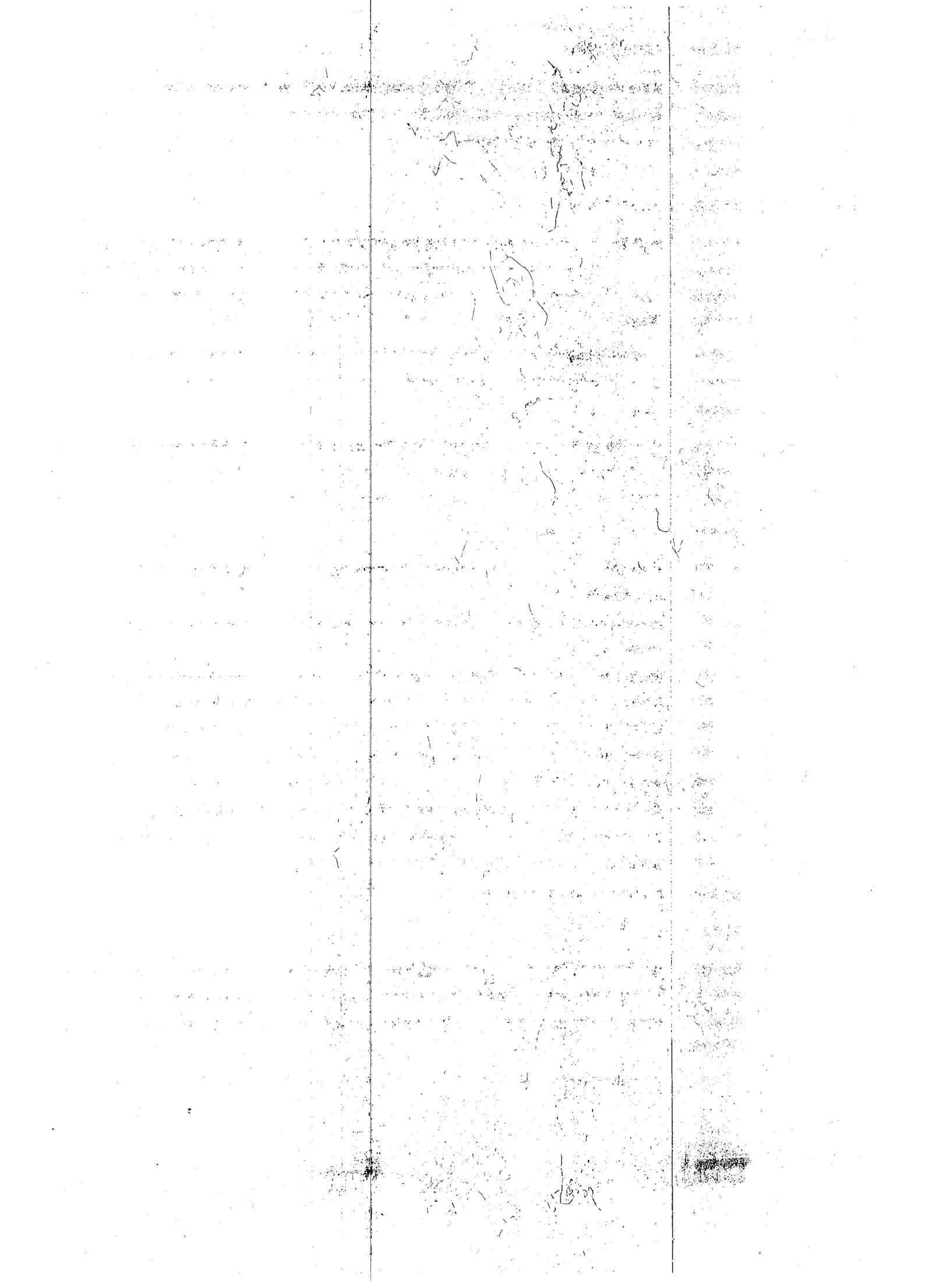
- The pipeline shall be placed in service only after it has been cleaned and disinfected. Disinfection should comply with AWWA C651.
- Water from the existing system is allowed to flow into the section of water main to be disinfected at a controlled rate.
- All chlorinated water used for testing, flushing or disinfecting water mains should be disposed of safely. High chlorine residuals may cause significant negative health effects on wildlife and humans. Confirm acceptable levels of chlorine with local, state or federal authorities.
- If the chlorine residual in the water main under disinfection remains relatively high, then usually there are no impurities in the systems creating a chlorine demand. However, if the chlorine applied to the section is gone, it can be concluded there are impurities in the system.
- After the water main has been recharged after successful chlorination, samples should be taken for bacteriological test according to C651 24 hour after refilling.

## 12. MEASUREMENT AND PAYMENT

### 12.1 General

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

#### 12.1.1 Fittings and specials



## 11. INSPECTION AND TESTING

Before testing, the pipeline must be backfilled and braced sufficiently to prevent movement under pressure.

The following three points should be considered when testing:

- The pipe to be tested must be sufficiently backfilled to prevent movement while under test pressure.
- Thrust resistant at fittings should be permanent and constructed to withstand test pressure. If concrete thrust blocks are used, sufficient time must be allowed before testing to permit the concrete to cure.
- Test ends should be capped and braced to withstand the thrusts that are developed under test pressure.

### 11.1 Pressure and Hydrostatic Test

A combined pressure and hydrostatic test is recommended. The test pressure should be specified in the drawings or be carried out as per manufacturer's recommendation. Tests are necessary to verify that the pipeline can withstand normal pressures, occasional excesses, functioning of automatic relief valves, slow closing, opening of valves, slow pump starting and other controls. It is recommended that large and/or complex systems be tested in segments as they are installed to permit evaluation and correction of improper installation techniques or other deficiencies as the project progresses. Hydrostatic testing is to be carried out at the direction of the Engineer. Before carrying out the tests, following checks have to be carried out:

- Check pressure ratings of all fittings.
- Never use air pressure.
- Backfilling should be enough (a minimum of one and one-half pipe diameters) to prevent pipe movement during the test (try using a plumb bob over the pipe to detect movement as the pressure builds).
- During testing of buried lines, fittings and joints should be left exposed for visual inspection for leakages.
- Minimum three days be allowed for concrete thrust blocks curing.
- Necessary precautions shall be carried out in the installation of pressure gauge. If it's too high in the line, it may give false low reading, as the actual pressure will be higher and it may accidentally subject too much pressure on line during testing.
- Pipe line should be filled at the preferred rate of 300 mm (1') per second (but not in excess of 600 mm [2'] per second), as an overly-aggressive filling rate could cause water hammer effects from any available low pressure source.
- Test pressure should be 150% of the maximum stated system design/ working pressure. The test pressure selected must not exceed the working pressure rating of the lowest pressure rated components in the system (i.e. threaded components, flanges, union, valves etc.).
- Air vent valves shall be installed at the high points in the pipe line. Necessary steps should be taken to ensure all entrapped air is released from the line while filling. Entrapped air can lead to



- Always keep a piece of wood between the face of the pipe bell and the bar used for pushing.
- For large diameters, mechanical assembly methods may be required such as jacks, pulleys and even the backhoe bucket. Of all the methods, backhoe bucket is the least preferred.
- A backhoe bucket cannot feel the resistance to the spigot entering the bell and therefore cannot tell if the joint is going together correctly.
- Over insertion by the backhoe will damage the fitting joint and may also damage other joints previously installed.

### 10.2.10 Solvent Cement Jointing Method

#### Handling of PVC Cement

Keep PVC cement containers covered while not in use. Prior to use an unopened can of cement, it is well to shake it vigorously to insure proper dispersion of the resin and solvents. The solvent contained in PVC cements are highly flammable and should not be used near an open flame. The area in which the cement is being used should be well ventilated and prolonged breathing of the fumes should be avoided.

#### Jointing of Pipes and Fittings

- Cut ends of the pipe square as possible provides the surface of the pipe with a maximum bonding area. If any indication of damage or cracking is evident, cut off at least 50 mm (2 inches) beyond any visible crack. Burrs and filings should be removed using a chamfering tool or file.
- A slight bevel shall be placed at the end of the pipe to ease entry of the pipe into the socket and minimized the chances of wiping solvent cement from the fitting. Place a 10° to 15° bevel approximately 1/16" to 3/32" in width on the end of the pipe.
- The pipe should enter the pipe/ fitting socket easily one-quarter to three-quarter of the way. If the pipe bottoms in the fitting/ pipe with little interference, use extra solvent cement in making the joint.
- Measure the socket depth of the fitting and mark this distance on the pipe end. This reference mark can be used when joining to ensure the pipe is completely bottomed into the fitting during assembly.
- Position the pipe and fitting for alignment.
- Primer must be applied to both the pipes and fittings. Use a proper applicator- a natural bristle brush or roller (approximately 1/2 the size of the pipe diameter). A rag must not be used.
- Apply primer to the fitting socket, then to the outside of the pipe end, then a second coating to the fittings socket, re-dipping applicator as necessary to ensure entire surface is wet. Repeat applications may be necessary.
- The solvent cement shall be applied to the joining surfaces while primer is still tacky.
- Apply a heavy, even coat of cement to the outside pipe end to equal to the depth of the fitting socket. The amount should be more than sufficient to fill any gaps.
- Apply a medium coat to the fitting socket. Avoid puddling. If there was little or no interference when the dry fit was checked, a second application of cement should be made to the pipe end.
- While the surfaces are still wet with solvent cement, immediately insert the pipe into the fitting/ pipe socket while rotating the pipe 1/4 turn.

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- Pipe must bottom completely to the bedding stop. Carefully align the fitting for installation at this time.
- Hold the assembly for approximately 30 seconds to ensure initial bonding. Due to the taper on the interference fit, the pipe can backoff the fitting stop if steady pressure is not held on the joint during initial bonding.
- A bead of cement should be evident around the pipe and fitting junction. If this bead is not continuous around the socket shoulder, the joint must be cut out, discarded and begun again. Cement in excess of the bead can be wiped off with a rag.
- The assembly must be allowed to set without any stress on the joint, for 1 to 5 minutes depending on the pipe size and temperature.

#### 10.2.11 Haunching

Loose material should be placed in the trench alongside and, in particular, under the haunches of the pipe, in layers not exceeding 100 mm (4"). This material should be well laid and consolidated between the pipe and trench wall. Proceed upwards in 100 mm (4") increments to the spring line of the pipe.

#### 10.2.12 Initial Backfill

Follow pipe assembly with backfilling to protect the pipe from freezing, shifting or damage due to temperature extremes. Tamp the embedment materials using tamping bars under the haunches and around the pipe to the spring line of the pipe to provide effective support for the pipe. Consolidate the bedding by tamping layers around the pipe barrel to a height of 300 mm (12") only above the crown of the pipe. After testing, cover the exposed joints in exactly the same way.

#### 10.2.13 Final Backfill

Backfill materials free of rocks should be used to surround the pipe with 150 mm (6") or 200 mm or (8") of cover or as specified in the drawings. It should be placed in layers. Each soil layer should be sufficiently compacted to uniformly develop lateral passive soil forces during the backfill operation. Vibratory methods are preferred when compacting sand or gravels. Best results are obtained when the soils are in a nearly saturated condition. Where water flooding is used, the initial backfill should be sufficient to insure complete coverage of the pipe. The remainder of the backfill should be placed and spread in uniform layers in such a manner to fill the trench completely so that there will be no unfilled space under or about rocks or lumps of earth in the backfill.

After placement and compaction of pipe embedment materials, the balance of backfill material may be machined placed. The final backfill should contain no large stones or large rocks, frozen material or debris. Proper compaction procedures should be exercised to provide required soil densities. Rolling equipment or heavy tampers should only be used to consolidate the final backfill.

#### 10.2.14 Supports for online Valves/ Appurtenance

The full weight of valves, hydrants and fittings should not be carried by the pipe. Valves, hydrants and fittings should be provided with individual support, such as treated timbers, crushed stone, concrete pads, or well compacted trench bottom. Valves should connect directly to PVC pipe using elastomeric gaskets supplied by the valve manufacturers.

used in pipe zone must maintain the specified soil density. If a coarse, granular Class I material is used for bedding the pipe, it should also be used for haunching to, at least, the spring line of the pipe. Otherwise, side support may be lost due to the migration of Class II, III or IV material into the bedding. When selecting embedment materials, make sure the native soil migration from the trench walls cannot occur. A well-graded compacted granular material will prevent this. In trenches subject to ground water inundation, the granular material should be compacted to a minimum of 85% Proctor density.

#### 10.2.6 Preparation of Trench Bottom

- The trench bottom should be continuous, relatively smooth and free of rocks.
- The trench bottom should be constructed to provide a firm, stable and uniform support for the full length of the pipe.
- Bell holes should be provided at each joint to permit proper joint assembly and pipe support. Any part of the trench bottom excavated below grade should be backfilled to grade and should be compacted as required to provide firm pipe support.
- When an unstable sub-grade condition which will provide inadequate pipe support is encountered, additional trench depth should be excavated and refilled with a suitable foundation material as recommended by the project's Geotechnical Engineer. Large rock, boulders and large stones should be removed to provide 100 mm (4") of soil cushion on all sides of the pipe and accessories.

#### 10.2.7 Inspection

Pipe and fittings shall be visually inspected for any evidence of damage, ovality or hair cracks. The turned ends of pipes and fittings shall be inspected for any local irregularities which could affect the water tightness of the joint. Damaged pipes and fittings shall be rejected and replaced at the Contractor's expense.

#### 10.2.8 Laying of Pipe

Laying of pipe shall start at the lowest point in the area in which work is being done, pipe sections shall be laid with socket upstream. Each length of uPVC Pipe between manholes shall be in a straight line and to the true alignment, position, gradient, and the inverts as shown on the Drawings, unless otherwise directed in writing and set out by the Engineer. The Contractor shall check and satisfy himself as to the correctness of the final gradient, position, and slope of the complete trench as before commencing the laying operation.

At all times when the work of laying the pipe is not in progress, all openings into the pipe and the ends of the pipe in trenches shall be kept tightly closed to prevent entrance of ground water, dirt, animals and foreign materials. The Contractor shall take all necessary precautions to prevent the pipe from floating due to water entering the trench from any source, and shall assume full responsibility for any damage due to this cause and shall, at his own expense, restore and replace the pipe to its specified position and grade if it is displaced due to floating.

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The Contractor shall maintain the pipe free from foreign materials and in a clean condition until the work is completed and approved by the Engineer. Pipe joints should be assembled with care.

Pipe and accessories shall be carefully lowered into the trench by means of derricks, ropes, belt slings, or other suitable methods. Under no circumstances shall any of the pipe and other materials be dropped or dumped into the trench. Care shall be taken to avoid abrasion of the pipe. The full length of each section of pipe shall rest solidly up on the prepared bed of trench. Pipes that have the alignment, grades or joints disturbed after laying, shall be removed and re-laid by the Contractor at his own cost. Pipe shall not be laid in water or when trench conditions are unsuitable for the work.

#### 10.2.9 Assembly of Gasket Joints

- i. Except where otherwise detailed on the drawings, all pipes and joints shall be of flexible type. Joints shall be flexible UPVC machine made coupling type having two rubber rings gaskets.
- ii. All joints shall be capable of withstanding the various tests specified for the appropriate class of pipe. Joints shall withstand while maintaining the specified test pressure at a deflection of not less than the values specified in the relevant specification No. BS 4346.
- iii. Rubber rings shall meet the requirements of the appropriate parts of BS 2494.
- iv. Clean the gasket, bell interior and spigot area with a dry, clean rag, brush or paper towel to ensure all debris is removed from bell and spigot ends of the pipe.
- v. Check the gasket position. Inspect the gasket, pipe spigot bevel and sealing surfaces for damage or deformation. Be sure that gasket is installed properly. Do not remove gasket as it is locked in during manufacturing.
- vi. Use only recommended lubricant with the pipe. Lubricant shall be applied axially on pipe joints. Longitudinal application of lubricants should be strictly prohibited. Liberally apply lubricant to the entire circumference of spigot, especially the beveled end. Do not lubricate the gasket or the gasket groove in the bell because the lubrication could cause gasket displacement. After the spigot end has been lubricated, it must be clean and free of dirt and sand.
- vii. Align the spigot and the bell and insert the spigot into the bell until it contacts the gasket uniformly. Do not suspend the pipe and "stap" it on to the bell.
- viii. The spigot end of pipe should be marked by the pipe manufacturer to indicate the proper depth of insertion. The insertion line should be exposed in front of the face of the bell. Do not over insert the joint.
- ix. If pipe is not supplied with a reference mark or if pipe has been cut, the reference mark can be re-established by measuring the distance from the spigot end to the factory-installed insertion mark on another length of PVC Pressure Pipe of the same.
- x. In placing the pipe and making the joints care shall be taken to avoid disturbance of bedding underneath the pipe barrel. If the joints cannot be made manually, mechanical pulling devices will be needed.

#### NOTES:

- For small diameters, the assembly effort should be able to be delivered by hand using a block and bar. Never push directly against the pipe.



some portion soft clayey material or loose material is encountered, 300 mm of this material shall be replaced by specified bedding material in that reach. If excavation is carried below required depth, the excess excavated part shall be refilled with bedding material at no extra cost to the owner. No bedding material shall be placed nor any permanent work commenced until the trench has been inspected by the Engineer and his permission to proceed to the work is given.

#### 10.2.2 Flotation, Line & Grade

Where conditions are such that running or standing water occurs in the trench bottom, the water should be removed by pumps and other suitable means until the pipe has been installed and the backfill has been placed to a sufficient height to prevent pipe flotation.

If the standing water cannot be removed, hold the pipe at grade with a soil cover about twice the diameter of the pipe, to prevent floating the pipe. Try to schedule a pipe installation as soon after excavating as possible. Undercut the trench bottom by machine and bring it to proper grade by using selected backfill of excavated material; be sure that the soil is free of large stones (larger than 1-1/2" [38 mm] in diameter), hard lumps, organic matter and debris and can be properly compacted by tamping. Selected backfill (not exceeding 3/4" [19 mm] in size to a depth of 4" to 6" [100 mm to 150 mm]) should be placed beneath the pipe to cushion it, but do not deposit such a thick or soft layer that pipe will settle and lose grade. Contour the bedding to allow for the projecting bells. The goal should be to provide firm, stable, uniform support for the pipe. If it sits on the rock, it is subject to breakage under the weight of backfill load, surface load or earth movements, so it will need to excavate deeper and fill with the approved material, compacted to at least 85% Proctor density.

#### 10.2.3 Trench Bedding

Bedding material for pipe shall be of aggregate such as coarse sand, crushed stone or shale, free from large stones, rock, boulders, clay, cinder, ashes and rubbish etc. If heavy equipment is used to place bedding material into the trench, shape the material by hand afterwards to eliminate any pockets and above all, to ensure that the pipe is supported uniformly along its entire length. Concrete may be specified for use in specific spots for pipe support and anchorage.

#### 10.2.4 Embedment Materials

There are a number of processed materials plus the soil types listed under USCS Soil Classification System (FHA Bulletin No. 373 or ASTM D2487) which are grouped into five broad categories according to their suitability for this application.

#### 10.2.5 Selection of Embedment Materials

Bedding material and its placement is of critical importance to installation and performance of both water and sewer pipes. It is essential that resident and imported materials are properly classified before use in bedding. Proper selection of haunching material is essential to PVC pipes' ability to support vertical loads and is frequently a special material with sizes not exceeding 19 mm (3/4"). Many jurisdictions have their own bedding specifications which call for special material to completely cover the pipe, care must be taken to clarify these requirements. Soil to be placed for bedding and

## 9.5 Transporting Pipes

When it's necessary to transfer pipes, handle them carefully, observing the guidelines you followed to unload it. Do not allow pipes to slide onto the truck as protrusions or other irregularities in the truck bed could damage it. Pipes and fittings damaged during transportation, handling or storage or lowering shall be rejected and replaced at the Contractor's expense. Storage of uPVC pipes, fittings, rubber rings, jointing compound shall be under shade to prevent damage by sunlight and extreme heat.

## 10. INSTALLATION

### 10.1 Above Ground (Unburied)

Above ground pipe should be protected against ultraviolet degradation i.e. external painting etc. The manufacturer shall take prior approval of the Engineer before application of this ultraviolet protection system. Pipelines shall be erected true to the location, alignment and grade as shown on the drawings and/or as directed by the Engineer. All vertical pipelines shall be erected plumb and shall be parallel to wall and other pipelines. All horizontal pipelines shall be kept close to walls and shall be parallel to floor, ceiling or roof and other pipelines. If any deviation is required from the route and arrangement as shown on the drawings, the Contractor shall obtain approval from the Engineer before installation.

Solvent welded joints shall be made water tight with use of jointing compound. The jointing compound shall be spread liberally over the external surface of the spigot end and the internal surface of the socket end. Solution shall be applied axially on the surface. The sockets and spigots shall be joined as quickly as possible after application of jointing compound. The joints shall not be disturbed for at least 30 minutes and the pipeline shall not be subjected to testing at least for 24 hours. Elastomeric joints shall be made with rubber ring. The ring shall be inserted in the groove of the socket end and then the spigot end shall be pushed into the socket end welding. Flanged joints shall be made water tight with gasket, nuts and bolts. Pipes passing through wall, floor or roof shall be provided with black steel pipe sleeve. The annular space between the pipe sleeve and the outside diameter of the pipe shall not be less than 12mm. The space shall be filled with approved packing and sealant. Pipelines passing through water retaining structure shall be provided with black steel puddle (anchor) flange. The Contractor shall submit to the Engineer for approval of shop drawings showing the dimensions and thicknesses of the sleeves and puddle (anchor) flanges before installation.

### 10.2 Below Ground (Buried)

#### 10.2.1 Trenching

Trenches can be hazardous, so be sure to observe all safety regulations designed to protect workers and public. Pipe trenches shall be excavated up to required depth as indicated in the drawing. The excavated soil should be placed on one side of the trench leaving the other side clear for equipment and pipe handling. The bottom shall be carefully leveled. In-situ field density of trench bottom shall be determined. The bottom shall be compacted if insitu density is less than 60% of relative density as determined by ASTM-D 2043. The test shall generally be carried out at spacing of 200 meters. If in



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## 9. TRANSPORTATION, HANDLING & STORAGE

The Contractor shall be responsible for proper transportation, handling (loading and unloading) and storage of pipes and fittings as per the manufacturer's recommendations and direction of the Engineer.

### 9.1 Transportation

Transportation of pipes shall be done in such a way that they are secure and that no more than an absolute minimum of movement can take place on the vehicle during transit. The same care is needed if pipes are to be transferred from one vehicle to another, how short the final journey may be. Ends of the pipes would be provided with end caps to ensure that foreign materials and rodents etc. do not enter the pipe.

### 9.2 Receiving

When receiving the pipes and/ or fittings shipment at the job site, the Contractor should be inventoried and inspected each shipment with care. It is the carrier's responsibility to deliver the shipment in good condition. The receiver has the responsibility to ensure that there has been no loss or damage. The following procedures for acceptance of delivery are recommended:

- Examine the load. If the load is intact, inspection while unloading should be sufficient to ensure that the pipe has arrived in good condition.
- If the load has shifted, has broken packaging, or shows rough treatment, then each piece should be carefully inspected for damage.
- Check total quantities of each item against shipping records.
- Note any damaged or missing items on the delivery receipt.
- Notify carrier immediately of any damage or loss and file a claim in accordance with their instructions.
- Do not dispose of any damage material. Ask the pipe manufacturer for instructions in case of disposal off or replacement.

### 9.3 Unloading

The means by which pipes and fittings are unloaded in the field is the decision and responsibility of the receiver. Preferred unloading is in package units using mechanical equipment; however the pipe can be unloaded individually by hand.

The following instructions should be carefully followed when unloading package units:

- Remove restraints from the top of unit loads. These may be fabric or steel straps, ropes or chains with padded protection.
- If there are boards across the top and down the sides of the load, which are not part of the pipe packaging, remove them.
- Use a forklift (or front-end loader equipped with forks) to remove each top unit from the truck, one at a time.
- If a forklift is not available, use a similar device with fabric straps capable of carrying the load. Space straps approximately 2 ft apart under the load. Cables may also

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be used if cushioned with soft material or other material to prevent abrasion of the pipe.

To unload lower units, refer to the loading process described above.

#### CAUTION:

- During the removal and handling, ensure that the bundles of pipes do not impact anything (especially in cold weather).
- Do not handle units with individual chains or single cables, even if padded.
- Do not attach cables to unit frames or banding for lifting.
- Store and place pipe package units on level ground. Do not stack units more than 2.4 metre (8 ft) high. Units should be protected by damage in the same way as they were protected while loaded on the truck. If unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to ensure that pipe is not dropped or damaged. Handling methods considered acceptable for warm weather and unacceptable during very cold weather to prevent impact damage.

#### 9.4 Storage:

The following procedures and practices are recommended to prevent damage to the pipe during storage:

- Pipes should be generally stored at site in unit packages (bundles) provided by the manufacturer. Avoid compression, deformation or damage to bell ends of the pipe.
- Store the pipe on supports that prevent the bells, spigots, couplings or any other joint surface from any contact. Use chocks (with or without fabric or rope tie downs) to prevent the pipe from rolling down due to winds, sloping ground, wash outs, flash flooding or mischief-makers.
- When unit packages of the pipe are stacked, ensure that weight of upper units should not cause deformation to pipe in lower units.
- Support pipe units at 2.4 metre (8 ft) intervals (1.2 metre (4 ft) from each end) on wood blocking to prevent damage to the bottom surfaces during storage.
- When pipes/ fittings are being stored for a prolonged period (more than 2 years), the pipe units should be covered with a translucent cover, to protect against exposure to direct sunlight. Adequate air-circulation above and around the pipes should be provided to prevent excessive heat accumulation.
- Do not store the pipe close to heat sources or hot objects, such as heaters, boilers, steam lines, or engine exhaust.
- When unit packages are stacked, ensure that the stack remains stable to avoid pipe damage or personal injury.
- Protect the interior and sealing surface of pipe & fittings from dirt and foreign material. Cover ends to ensure rodents & foreign materials do not enter the pipe.
- Store lubricant in tightly sealed containers under cover. Do not store pipes & fittings where baskets may be exposed to UV radiations, or contamination (i.e. grease, oil, ozone etc).

### 3. TRANSPORTATION, HANDLING & STORAGE

The Contractor shall be responsible for proper transportation, handling (loading and unloading) and storage of pipes and fittings as per the manufacturer's recommendations and direction of the Engineer.

#### 9.1 Transportation

Transportation of pipes shall be done in such a way that they are secure and that no more than an absolute minimum of movement can take place on the vehicle during transit. The same care is needed if pipes are to be transferred from one vehicle to another, how short the final journey may be. Ends of the pipes would be provided with end caps to ensure that foreign materials and rodents etc do not enter the pipe.

#### 9.2 Receiving

When receiving the pipes and/or fittings shipment at the job site, the Contractor should be involved and inspected each shipment with care. It is the carrier's responsibility to deliver the shipment in good condition. The receiver has the responsibility to ensure that there has been no loss or damage. The following procedures for acceptance of delivery are recommended:

- Examine the load. If the load is intact, inspection while unloading should be sufficient to ensure that the pipe has arrived in good condition.
- If the load has shifted, has broken packaging, or shows signs of damage, then each piece should be carefully inspected for damage.
- Check total quantities of each item against shipping records.
- Note any damaged or missing items on the delivery receipt.
- Notify carrier immediately of any damage or loss and in accordance with their instructions.
- Do not dispose of any damaged material. Ask the pipe manufacturer for instructions in case of disposal or replacement.

#### 9.3 Unloading

The means by which pipes and fittings are unloaded in the field is the decision and responsibility of the receiver. Preferred unloading is in package units using mechanical equipment; however the pipe can be unloaded individually by hand.

The following instructions should be carefully followed when unloading package units:

- Remove restraints from the top of unit loads. These may be fabric or steel straps, ropes, or chains with padded protection.
- If there are boards across the top and down the sides of the load, which are not part of the pipe packaging, remove them.
- Use a forklift (or front-end loader equipped with forks) to remove each top unit from the truck, one at a time.
- If a forklift is not available, use a crane or derrick to remove the load. Space straps...

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- To be used if cushioning is not available, use soft material to prevent abrasion of the pipe.
- To unload lower units, repeat the unloading process described above.

#### CAUTION:

- During the removal and handling, ensure that the bundles of pipes do not impact anything (especially in cold weather).
- Do not handle units with individual chains or single cables, even if padded.
- Do not attach cables to unit frames or banding for lifting.
- Store and place pipe package units on level ground. Do not stack units more than 2.4 metre (8 ft) high. Units should be protected by damage in the same way as they were protected while loaded on the truck. If unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to ensure that pipe is not dropped or damaged. Handling methods considered acceptable for warm weather and unacceptable during very cold weather to prevent impact damage.

#### 9.4 Storage

The following procedures and practices are recommended to prevent damage to the pipe during storage:

- Pipes should be carefully stored in the unit packages (bundles) provided by the manufacturer. Avoid compression, deformation or damage to bell ends of the pipe.
- Store the pipe with supports that prevent the bells, spigots, couplings or any other joint surface from any contact. Use chocks (with or without fabric or rope tie downs) to prevent the pipe from rolling down due to gravity on sloping ground, wash outs, flash flooding or mischief-makers.
- When unit packages of pipe are stacked, ensure that weight of upper units should not cause deformation to pipe in lower units.
- Support pipe units at 2.4 metre (8 ft) intervals (1.2 metre (4 ft) from each end) on wood blocking to prevent damage to the bottom surfaces during storage.
- When pipe/ fittings are being stored for a prolonged period (more than 2 years), the pipe should be covered with a translucent cover, to protect against exposure to direct sunlight. Adequate air-circulation above and around the pipes should be provided to prevent excessive heat accumulation.
- Do not store the pipe close to heat sources or hot objects, such as heaters, boilers, steam or engine exhaust.
- When unit packages are stacked, ensure that the stack remains stable to avoid pipe damage and personal injury.
- Protect the interior and sealing surface of pipe & fittings from dirt and foreign material. Cover to ensure rodents & foreign materials do not enter the pipe.
- Store lubricant in tightly sealed containers under cover. Do not store pipes & fittings. Gaskets may be exposed to UV radiations, or contamination (i.e. grease, oil, ozone etc).

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### 8.3 Hydrostatic Pressure Test

This is an important and very critical test on uPVC Pipes and is regularly carried out during the production run on pipe sample from each extrusion line. It is suggested that it would be helpful practice if before this test, the pipe sample have passed both longitudinal reversion and delamination tests.

#### Test Description:

Test samples are collected from each extrusion line and given hydrostatic (water) pressure at 20°C in a constant temperature water bath of suitable size. Tests are regularly carried out on the pipes from each line. Time of test is one hour and pressure is controlled as per the following table.

S.No.	Class & Pressure	Minimum 1 Hour Failure Pressure
i)	Class B 6 bar	21.6 bar
ii)	Class C 9 bar	32.4 bar
iii)	Class D 12 bar	43.2 bar
iv)	Class E 15 bar	54.0 bar

1 bar = 1.02 kilogram force / cm<sup>2</sup> = 4.50 pound force / in.<sup>2</sup>

### 8.4 Impact Strength Test

Good Impact strength is one of the important characteristics of uPVC Pipes. P.S.3051 (1991) for uPVC Pipes which are based on B.S.3505 (1980) of U.K. specify complete procedure with set of conditions for this impact test on uPVC Pipes.

#### Test Description:

Testing of uPVC Pipes specimen is done under set conditions at 20°C and according to a program detailed in P.S. 3051 (1991). The testing equipment for impact on uPVC Pipes is falling ball type, is very simple, low cost and can be fabricated locally. Testing of uPVC Pipe samples is carried out during production run.

Target value for standard uPVC Pipe is to achieve a True Impact Rate (TIR) of less than 10% and with a 90% confidence limit.

### 8.5 Fracture Toughness Test

This test is carried out in accordance with P.S.3051 (1991) which is based on B.S.3505 (1980) of U.K.

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### Test Description:

The initial test piece shall be cut from the pipe with a reference line along the complete length of the test piece. Cut the pipe into two pieces of length 200 mm for Fracture Toughness and the other of 170±5 mm approximately in such a manner that cut surfaces are perpendicular to the longitudinal axis of the pipe.

Perform Methylene Chloride test first and note the response in accordance with Clause C.2.3.4 of P.S. 3051 identify the response as type 1, 2 or as type 3. With the help of reference line, locate the corresponding area on the test piece (pipe ring of length 30±5 mm which was initially separated from initial test sample 200 mm) where measured attack of Methylene Chloride has occurred, cut a notch in the bore of the 30 mm test ring at this point. Notch would be across the complete width of the ring a depth of 25% of the wall thickness ±0.1 mm at that point. Just opposite the notch, cut a segment of 20±2 mm out of that ring, such that the distance between the ends is 20±2 mm. The remaining segment shall be the test piece.

### Test Procedure:

Condition the test pieces, with clamps at 23±2°C for the period specified below:

Pipe Wall Thickness (mm)	Conditioning Time (Min)
< 8.6	15
> 8.6 < 14.1	30
> 14.1	60

Calculate the required mass of the test weight piece using applicable method Clause 3.4 and tables # 9 & 10 given in P.S.3051 (1991). Support the test piece on the cut out section opposite the notch and apply force to the test piece in the form of hanging weight piece. Maintain the force on the test piece in air at 23±2°C for 15 min or until the test fails at the notch by breaking or by developing cracks visible without magnification, whichever period is the shorter.

### Note:

The test piece for fracture toughness test is the pipe ring of length 30±5 mm which was initially separated from sample of 200 mm length.

This test is recommended to be done on both pressure and non pressure pipes.

### 8.6 Specific Gravity Test

This test shall be carried out in accordance with ASTM Standard D.792. All the manufacturing pipes shall be individually checked for cracks and other defects before transportation to the site. All pipes shall be properly marked at factory by embossing that number to identify the project consignment. Factory Test Certificates for the above shall be submitted by the manufacturer.

Decomposition point	C	205 - 210	Scorching, carbonization and hydrochloric acid	By	
Specific Volume Resistivity	- $\Omega$ -cm	35 x 10 (15)	High Insulator Magnetizing	Electric Non	
Di - electric	KV/mm	23 - 28			

### 7.5 Joints

uPVC pressure pipes and fittings shall be joined with elastomeric rubber ring (gasket). uPVC pressure pipes and fittings shall also be joined together with thermoplastic hot welding or shall be solvent welded as specified herein, in bill of quantities, as shown on the drawings and/or as directed by the Engineer and shall conform to B.S. 4346. The elastomeric rubber rings shall conform to B.S. 2494.

### 8. FACTORY TESTS

The Contractor shall inform the Engineer the schedule of pipe manufacturing in the factory for this particular project. The Engineer may visit pipe factory to inspect the pipe manufacturing process. The Engineer may assign his representative to supervise the manufacturing and testing of pipes. The Contractor shall assign his representative at factory to supervise the pipe manufacturing and quality control test. All test equipments should be calibrated. The tests shall be conducted while the equipment has the test validity which is normally one year from the date of calibration.

The Contractor shall arrange the following tests at factory in the presence of Engineer or his representative on selected pipe samples:

- 8.1 Methylene Chloride test
- 8.2 Longitudinal reversion & resistance to delamination test
- 8.3 Hydrostatic pressure test
- 8.4 Impact strength test
- 8.5 Fracture toughness test
- 8.6 Specific Gravity Test
- 8.7 Vernier Calliper for thickness & diameter

#### 8.1 Methylene Chloride Test

This is a basic quality control test carried out on uPVC pipe sample during production. Methylene Chloride Test gives more accurate idea of homogeneity and quality of the uPVC material in the machine and the die in 20 minutes only.

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Test Description:

UPVC pipe samples from each line is immersed in Methylene Chloride at 20°C for 20 minutes. Length of sample can be between 75 mm to 100 mm and immersion may be between 40 to 50 mm. Immediately after this time limit the test piece is taken out and inspected for any indication of attack of Methylene Chloride on:

- Inside and outside surfaces of immersed pipe sample.
- Across the full cross section of pipe wall.
- Disintegration/ dissolution of pipe or portion of it.

This test is recommended to be done on both pressure and non pressure pipes.

**8.2 Longitudinal Reversion & Resistance to Delamination Test**

This test is carried out regularly on each extrusion line during the production run. The objective of this test is to measure shrinkage of uPVC pipe due to stresses. The shrinkage at any point around uPVC pipe circumference should not be more than 5%. Further when test sample is cut at four places there should be no delamination, cavities, bubbles and cracks when viewed with naked eye along the 150 mm length of cut portions. Passing this test gives indication of long term strength and durability of uPVC pipe in applications.

Test Description:

Test is carried out in temperature controlled Glycerin bath at 150°C by immersing the test pieces. One of the pieces has two marks at 100 mm part along the full circumference and the other piece has no mark. Immersion time in the bath is as per following table.

Pipe Wall Thickness mm	Minimum Period Minutes	Immersion
8.6 or less	15	
From 8.6 to 14.1	30	
More 14.1	60	

After the set times, the two pieces are taken out and the piece with two marks is allowed to cool to room temperature and shrinkage is measured. The second piece is given four longitudinal cuts when hot and the piece is examined for the defects. If pipe is found not meeting the requirements this is deemed to have failed the test. This test is recommended to be done on both pressure and non pressure pipes.

D. Approval by the Engineer shall not relieve the Contractor from any of his contractual responsibility regarding satisfactory performance and other requirements of the pipes and fittings.

## 6. SPECIAL REQUIREMENTS

6.1 Pipes and fittings shall be suitable for the intended use.

6.2 Pipe samples shall be randomly selected from each batch or as directed by the Engineer for hydraulic test. Pipe shall be tested at the manufacturer's works to specified hydraulic test pressure. The test pressure shall be maintained for sufficiently long time for proof and inspection.

6.3 Each pipe and fitting shall be permanently marked or engraved giving the following information:-

(i) Make and Size

(ii) Class, Duty or Pressure Rating

(iii) Standards according to which the pipe and fitting have been manufactured.

6.4 Unless otherwise specified diameters of pipes and fittings shall be nominal. Actual inside and outside diameters and tolerances in diameters of pipes and fittings shall be according to the specified standards.

6.5 Unless otherwise specified, service ratings of pipes and fittings shall not be less than the maximum pressure to which they will be subjected to.

6.6 Unless otherwise specified, wall thicknesses of the pipes shall be according to the class, schedule or duty of the pipes. The wall thicknesses shall be measured at locations excluding the jointing ends. The tolerances in wall thicknesses shall be according to the specified standards. Wall thicknesses of fittings shall not be less than those of corresponding pipes to which they are joined together.

6.7 Pipes and fittings ends shall be matching and compatible with each other and with the ends of valves and appurtenances to which they are joined.

6.8 The ovality of pipe and fitting shall be checked through approved equipments/ gauges.

6.9 Unless otherwise approved by the Engineer, fittings, jointing materials such as rubber rings, gaskets, nuts & bolts and jointing compound etc. shall be from the approved manufacturers.

## 7. MATERIALS

### 7.1 General

Materials shall conform to the latest referred standard specifications and other provisions stipulated herein and shall be new and unused. Prior to procurement of the materials, the Contractor shall be required to prepare and submit to the Engineer for his approval a complete schedule of materials to be used in the works together with a list of the names and addresses of the manufacturers and the trade names of the materials. The schedule shall include diagrams, drawings and such other technical data as may be required by the Engineer to satisfy himself as to the suitability, durability, quality and usefulness of the material intended to be purchased. The material from which the pipe is produced shall consist substantially of virgin polyvinyl chloride, to which may be added only those additives that are needed to facilitate the manufacture of the polymer and production of sound, durable pipe of

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good surface finish, mechanical strength and durability. Old and recycled PVC shall not be allowed to be used under any circumstances. All the above additives shall be used separately or together in quantities sufficient to constitute a toxic hazard or to impair the fabrication or welding properties of the pipe or to impair its chemical and physical properties. The pipe material shall not have any detrimental effect on composition of the water flowing through them. The quantities of lead, dioctyl tin C4 and higher homologues and any other toxic substances extracted from the internal wall of the pipes shall not exceed the values specified in B.S. 3505.

### 7.2 Pipes

uPVC Pressure Pipes shall conform to specified or appropriate class of B.S. 3505 or ASTM D 1785.

### 7.3 Fittings

uPVC fittings and specials shall be of the appropriate class and shall conform to B.S. 4346. Fittings and specials shall have the required shapes, and dimensions of turned ends to be joined with the uPVC pressure pipes.

### 7.4 General Properties of uPVC Pipes

The general properties of uPVC pipes are as under:

Test	Unit	Value at 20° C	Remarks	Design Data
Specific Gravity		1.42 - 1.46	Mode 1.43	1.44 +/- 0.02
Inflammability		Self-extinguishing	Ignites when flame approaches but the fire extinguishes by itself when brought away from flame.	
Weather Resistance		Color fading but no decrease in strength.	Tensile strength increases slightly and elongation decreases.	
Primary Softening Point	C	75 - 80	Softening initiates at this point	
Welding temperature	C	180 - 185	Becomes slightly viscous	
Molding temperature	C	190 - 200	Becomes paste like to collapse pipe shape	

## SECTION - XXIV

### UNPLASTICISED POLYVINYL CHLORIDE (UPVC) PIPES AND PIPE FITTINGS

#### 1. SCOPE

The work under this section of the specifications includes furnishing all plant, labour, equipment, appliances, materials and in performing all operations required in connection with supply, installation, testing, flushing and commissioning of UPVC Pressure Pipes and Pipe fittings as specified herein, bill of quantities and as shown on the drawings and/or as directed by the Engineer.

#### 2. APPLICABLE CODES AND STANDARDS

All works and materials under this section shall conform to the latest edition of the following applicable codes and standards. When the requirements of these specifications or the drawings exceed the code requirements, the Contractor shall be bound by the specifications and/or drawings for that requirement.

B.S. 2494	"Materials for Elastomeric Joint Rings for Pipe works and Pipelines"
B.S. 4346	"Joints and Fittings with Unplasticised PVC Pressure Pipes"
B.S. 3505	"Unplasticised PVC Pipe for Cold Water Services"
AWWA Manual M23	"PVC-Pipe - Design and Installation"
AWWA G651	"Disinfecting Water Mains"
ASTM D 792	"Density & Specific Gravity (Relative Density) of Plastics by Displacement"
ASTM D 1784	"Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds."
ASTM D 1785	"Poly (Vinyl Chloride) (PVC) Plastic Pipe Schedules 40, 80 and 120."
ASTM D 2564	"Solvent Cement for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings."
ASTM D 2665	"Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings."
ASTM D 2000	"Rubber Products in Automotive Applications."
USCS	"Unified Soil Classification System"

Other authoritative codes and standards which ensure equal or higher quality than those references may also be acceptable subject to satisfaction and approval of the Engineer.

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Any conflict between the requirements of any specification and those on the figures herein or in the codes, standards and specifications referred to herein shall be brought to the attention of the Engineer for resolution whose decision shall be final and binding.

### 3. APPLICABLE SECTIONS OF TECHNICAL SPECIFICATIONS

The following specification sections shall be followed for carrying out associated works mentioned herein below.

<u>Section No.</u>	<u>Description</u>
1100	Earthwork
2100	Formwork
2200	Reinforcement
2300	Plain and Reinforced Concrete

### 4. GENERAL REQUIREMENTS

4.1 Pipes and fittings shall be new and unused.

4.2 Where manufacturers of pipes and fittings are specified, they shall be of the same manufacturers unless otherwise approved by the Engineer.

4.3 Where more than one manufacturer of pipes is specified, then their fittings shall be of the same manufacturer.

4.4 If a large diameter pipe is produced from local manufacturers and its fittings are not produced locally then the manufacturer should import quality fittings.

### 5. SUBMITTALS

A. Product Data and Samples: Submit manufacturer's technical product data, including installation instructions, and dimensioned drawings for each type of manufactured piping specialty. Submit samples as may be required by the Engineer.

B. The Contractor shall submit to the Engineer for approval the following information regarding the specified/ proposed items of pipes and fittings.

- (i) Name and address of the manufacturers
- (ii) Country of origin, make and model
- (iii) Dimensions and wall thicknesses of pipes and fittings
- (iv) Factory test certificate from the manufacturer
- (v) Warranty, if so provided by the manufacturers
- (vi) Method of jointing, testing and commissioning

C. Approval by the Engineer shall not be construed as authorizing any deviation(s) from the specifications unless they are specifically brought to notice of the Engineer.



shall have to maintain diversion in proper grade and level to the satisfaction of the Engineer from the beginning of the cutting of road and till it is restored to its original condition. Throughout this period any cut or depression formed on the surface shall have to be filled, watered and properly rolled to give smooth surface. Continuous arrangement of sprinkling water shall be made to avoid formation of dust and dirt. The contractor shall provide necessary diversion signs, fence, guards, flags and lights. The diversion shall be maintained with labour and staff round the clock for convenience of traffic. Cost for maintenance of diversion and arrangements for traffic directions shall be included by the contractor in his rates for excavation and no separate payment shall be made for making diversions or arrangements for diverting traffic. Adequate staff shall be provided by the Contractor round the clock to meet with any emergency.

5. PAYMENT

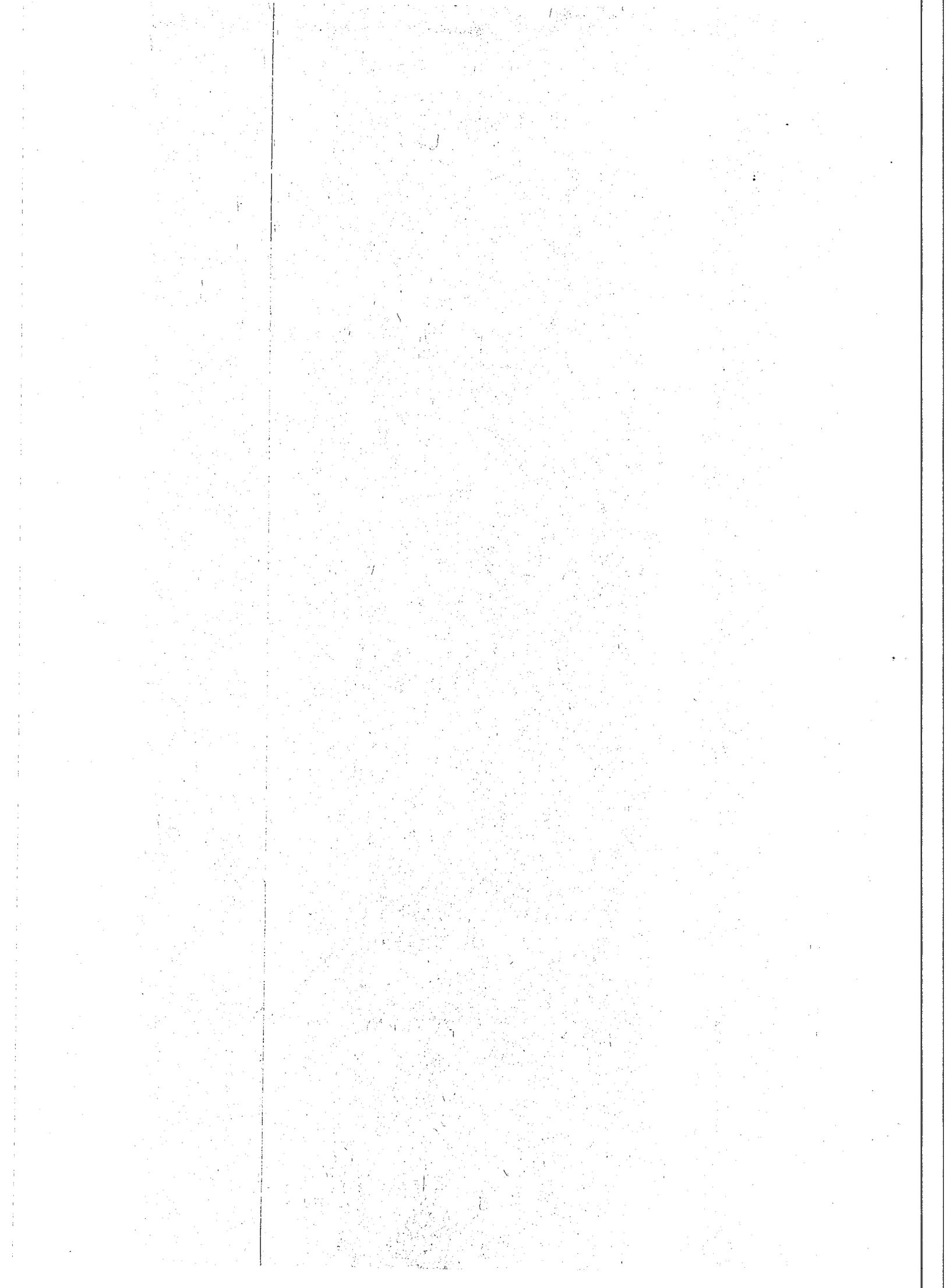
5.1 Payment for each road cutting and reinstatement work if required shall be made as per the approved tender rates after restoring the road to the satisfaction of the Engineer. The work of reinstatement of roadwork shall be subject to the ~~DAEW~~ Division, Sharada Benazirabad regulation. The reinstatement work shall be required to be done by the contractor only, which is as follows by ~~DAEW~~.

The width of road cutting shall be as per the approved plan. It shall be same as allowed for payment of excavation for trenches.

5.2 No separate payment shall be made for making diversion or arrangements for diverting traffic for the purpose of construction of road.

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## SECTION - XIV

### CUTTING & RESTORING OF ROAD AND MAKING DIVERSIONS

#### 1. SCOPE OF WORK

The work covered by this section of specifications consists of furnishing all plants, labour, equipment, appliances, and material required for all operations in connection with road cutting works and maintaining diversion during pipe laying work and restoring the road to original condition.

#### 2. GENERAL

The Contractor shall arrange and provide adequate warning, lights and signs to the satisfaction of the Engineer for the road cutting and diversion in the road from the start of the road cutting work till it is restored to its original condition. Contractor shall be fully responsible for any damage or claim in case any accident takes place due to his negligence in not making proper arrangements in this regard.

#### 3. CUTTING AND RESTORATION OF ROAD

Whenever a road is required to be cut for laying of pipe line or otherwise, prior intimation shall be given by the Contractor and approval taken from the Engineer. Also the Contractor shall have to obtain prior permission for cutting the road from the concerned Authority having the administrative control of the road in question. The Engineer shall provide the required authorization for obtaining the required permission. Cutting of road, digging the trench to the required level, laying and jointing the pipes, and backfilling and reinstatement work of the road shall be done as quickly as possible. After laying jointing and testing of pipes proper compaction of the backfill shall be done. Sub-base course and surface treatment of road in the reinstatement work shall be of the same quality and thickness as that of the original road. The Contractor shall follow the prevalent regulations of the concerned authorities (~~Rawal~~ Division, Shaheed Benazirabad) in respect of the road cutting and reinstatement. In all cases the Contractor shall carry out backfilling with required compaction. The sub-grade shall be prepared by using the dismantled hard crust of existing road. In case a cash deposit is required by the concerned Authority for road restoration work by (~~Rawal~~ Division, Shaheed Benazirabad), the Contractor shall get the estimate of reinstatement of road cut prepared and submit the required cash to the authority for obtaining the permission of road cutting. The actual amount of such cash deposit shall be reimbursed by (~~Rawal~~ Division, Shaheed Benazirabad) to the contractor along with the monthly running bills of the contractor.

#### 4. MAKING DIVERSION

Whenever a road is cut for laying of pipe or otherwise, a diversion of smooth and even surface is to be provided by the Contractor for the unhindered flow of normal traffic before the digging of road is under taken to provide a good smooth road to avoid any inconvenience to traffic. On crossing of two-way traffic road, only one side of road shall be dug first. Full excavation, bedding and pipe laying should be done and get checked and backfilled and adequately compacted and opened to traffic. The other side shall be opened only after the first side is completed satisfactory. Traffic diversion signs in bold letters with arrows shall be provided on both sides for convenience of traffic. For the work of laying sewers along the road, the contractor shall restrict the space required for excavated earth to minimum and provide a reasonable space for flow of traffic with all measures to protect any damage due to excavation work. Suitable pedestrian crossings shall be provided at reasonable spacing to reduce the width of road to minimum. The Contractor

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# CUTTING AND RESTORING OF ROADS AND MAKING DIVERSION

SECTION - XII  
RELOCATION

1. DESCRIPTION

This work shall consist of carrying out relocation of various types of services falling within the Right of Way. The quantum of work shall be established by the design consultant and elaborated in the Special Provisions or as directed by the Engineer.

2. MATERIAL REQUIREMENTS

All materials, if required for the relocation of services shall conform to the Specifications of the relative department whose utilities are being shifted.

a. CONSTRUCTION REQUIREMENTS

The construction requirement such as alignment, level and general workmanship shall conform to the applicable requirements of relative departments.

b. MEASUREMENT AND PAYMENT

i. MEASUREMENT

The quality of each item for which utilities have been relocated shall be measured in the unit as approved by the Engineer or as designated in the Special Provisions.

ii. PAYMENT

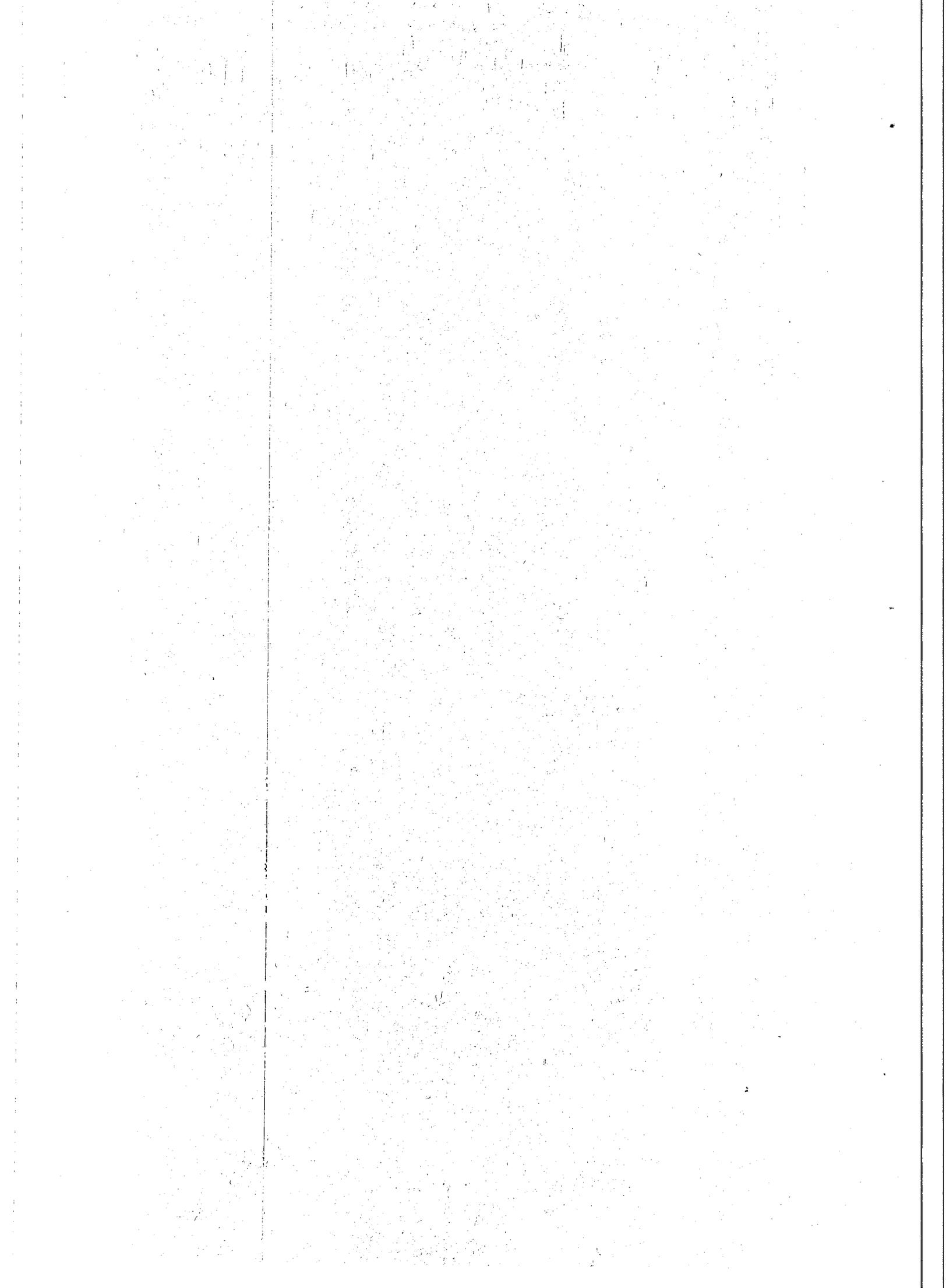
The accepted quantity measured as applicable to each item shall be paid on the unit rate as quoted and agreed with the contractor for each item.

This payment shall constitute full compensation for any design work, coordination with relative department, furnishing of materials and installing or relocation as per requirement of the relative department, which shall also include all labour, equipment, tool and incidental necessary to complete item.

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- 9.3 All foundations and portions of work to be concreted shall be approved by the Engineer's Representative before concrete is poured.
- 9.4 All forms and reinforcement shall be completed, cleared inspected and approved before pouring of concrete. No concrete is to be deposited till the Engineer's Representative has inspected and approved in writing all reinforcement, foundations forms, details, positioning of all fixture and materials to be embedded in concrete. The Engineer or his representative shall issue an authorization to start concrete for each day work in a form to be called pour slip. This pour slip will give the result of checking of form work, reinforcement, and quality of aggregates cement and mixing & vibrating equipment and date of pouring of concrete. This pour slip shall form the basis for payment to Contractor. No payment will be made for the concrete for which pour slip has not been issued by the Engineer or his representative. The Contractor shall maintain a complete record of concrete pour slips issued by the Engineer or his authorized representative. Laying concrete shall be carried out only in presence of authorized representative of the Engineer. Dry concrete laid without the presence of Engineer's representative will not be accepted and will not be paid for.
- 9.5 All concrete shall be thoroughly compacted and consolidated by means of Pneumatic or mechanical vibrators or other approved compacting method. Care shall be taken to avoid segregation due to excessive vibration. The Contractor shall maintain on site at all times one or more stand by vibrators. Tapping or other external vibration of forms shall not be allowed, unless so directed by the Engineer's Representative. Compaction shall be done until the whole mass assumes a jelly like appearance and consistency with the water just appearing on the surface. Concrete shall be sufficiently tamped and consolidated around the steel rods, care taken that the vibrator does not touch steel or formwork and is worked into all parts of the moulds in order that no voids or cavities are left. Steel shall not be disturbed during operations of concreting. Concrete shall be brought up in even layers of about 300 mm (12") thickness or as approved by the Engineer and worked against side of forms to give a smooth and uniform surface. No surplus water shall be allowed to come out and lie on the surface of concrete. The concrete must be of such a consistency that after ramming, consolidating and tamping is completed, a thin film of water is just appearing on the surface.
- 9.6 Hardened concrete, debris and foreign material shall be removed from interior of forms and from inner surface of mixing and conveying equipment.
- 9.7 Runways shall be provided for wheeled concrete handling equipment, and such equipment shall not be wheeled over reinforcement nor shall runways be supported on reinforcement.
- 9.8 Concrete shall not be dropped freely from a height of more than 2.5 m in columns and 1.5 m (5 ft) elsewhere. In case where an excessive drop is inevitable the Contractor shall provide spouts, down pipes, chutes, or side ports to form with pockets that will let concrete flow easily into the form without any risk of segregation. The discharge of the spouts, down pipes or chutes shall be controlled so that the concrete may be effectively compacted into horizontal layers not thicker than 300 mm (12").

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- 9.9 When concrete is placed above sub grade for floor slabs, or other absorbent material, the surface is to be watered, consolidated and, where specified, blinded before the concrete is deposited.
- 9.10 Fresh concrete shall not be placed on previously laid concrete or on old concrete surfaces until the latter has been cleaned of dirt, scum and laitance by wire brushes. The clean surface shall then be thoroughly wetted and grouted with cement slurry as approved by the Engineer's Representative.
- 9.11 Care shall be taken not to disturb newly placed concrete by vibrator, indirect loading or otherwise. No traffic or loading shall be allowed on the concrete until it has thoroughly set and hardened.
- 9.12 No concrete shall be placed during rain or when the sun, heat, winds or other weather conditions prevent proper placing, finishing and curing of concrete or when the temperature is above 43 degree Centigrade and below 35 degree Fahrenheit or when the concrete is likely to be subjected to freezing temperatures. All fresh concrete shall be suitably protected from rain, fall and excessive heat or cold.
- 9.13 Should any part of the exposed surface present a rough uneven or imperfect appearance when the shuttering is removed, it shall be picked out to such depth and refilled and properly re-surfaced or entirely redone as per directions of Engineer or his Representative at the cost of the Contractor.
- 9.14 On removal of the forms and before the skin has had time to harden, all faces of the concrete inside or outside, to be kept exposed shall be rubbed over with carborundum stone and washed with cement to remove all marks, projections hollows or any other defect. No extra payment shall be made for this work.
- 9.15 All exposed surfaces and lines of the concrete work are to be true and fair without cracks, bends, windings and distortions of all kinds without any extra charges by the Contractor.

#### 10. PROTECTION AND CURING

All exposed concrete shall be cured. Curing shall be accomplished by preventing loss of moisture, rapid temperature change and mechanical injury or injury from rain or flowing water for a period of at least ten days. Curing shall be started as soon as the concrete has hardened sufficiently for the surface not to be marked. Curing shall be done either by continuous sprinkling of water on the surface or by covering with sand, hessian, canvas or other approved fabric mats that shall be kept continually wet. If required and so directed by the Engineer or his Representative, formed surfaces with form in position shall also be cured by keeping all form continually wet.

Minimum period of curing for any concrete shall be ten days or more as directed by the Engineer. All concrete pours and concreted structures shall be clearly marked with non-washable paints to indicate the date of placing concrete. During hot weather curing shall be done even at nights.

## 6.2 MATERIAL REQUIREMENTS

### 6.2.1 PRECAST CONCRETE UNITS

These units shall be cast to the dimensions shown on the drawings. Structural concrete shall be Class-A in accordance with Section "Concrete". Reinforcement shall be used as per design drawings. The precast units shall be cured in accordance with AASHTO M 170. Water absorption of individual cores taken from such units shall not exceed seven (7) percent.

A sufficient number of cylinders shall be cast to permit compression tests at seven (7) and twenty-eight (28) days, and to allow for at least two cylinders for each test. If the strength requirement is met at seven (7) days, the units will be certified for use fourteen (14) days from date to casting. If the strength requirements are not met at 28 days, all units made from that batch will be rejected.

Cracks in units, honeycombed or patched areas in excess of two hundred 200 square centimetres (31.00 inch<sup>2</sup>), excessive water absorption, and failure to meet strength requirements will be cause for rejection.

### 6.2.2 STEEL REINFORCEMENT

Steel reinforcement shall be in accordance with the requirements in Section "Steel Reinforcement".

### 6.2.3 FRAMES, GRATES AND COVERS, AND LADDER RUNGS

Metal units shall conform to the dimensions shown on the Drawings and to the following requirements for the designated materials.

Gray iron castings shall conform to the requirements of AASHTO M 105. Strength class shall be optional unless otherwise specified.

Carbon steel casting shall conform to the requirements of AASHTO M 103. Grade shall be optional unless otherwise specified.

Structural steel shall conform to the requirements of AASHTO M 198 or ASTM A 283, Grade B or better.

Grey iron items shall conform to AASHTO M 105.

Galvanizing, where specified for these units, shall conform to the requirements of AASHTO M 111.

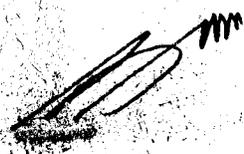
Malleable iron castings shall conform to the requirements of AASHTO M 106. Grade shall be optional unless otherwise specified.

### 6.2.4 MORTAR

Mortar shall be composed of one part Portland cement and two parts of fine aggregate, by volume unless otherwise specified, and sufficient water to make the mortar of such consistency that it can be handled easily and spread with a trowel. Aggregate for mortar shall conform to the requirements prescribed under "Concrete" in Section "Concrete".

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- b) Splices of runs of PVC water stops, shall be performed by heating the abutting surfaces.
- i) A thermostatical, 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.
- j) After splicing, a remolding iron, with ribs and corrugations to match the pattern of the water stop, shall be used to reform the ribs at the splice. The continuity, of the characteristic components of the cross-section, of the water stop design (ribs, tabular center axis, protrusions, and the like) shall be maintained across the splice.

#### 4. MEASUREMENT

- a) Measurement, for PVC water stops, will be made in the specified units of length, of the water stops, of specified type and size, acceptably placed, on the basis of the dimensions, in accordance with the Drawings or directions of the Engineer.
- b) No allowance will be made, in the above computed lengths, for the laps and splices.

#### 5. RATE AND PAYMENT

- a) Payment, for, PVC water stops, of specified type and size, will be made for the quantity of water stops, measured in accordance with Article 4, at the unit rates, tendered in the priced Bill of Quantities.
- b) The unit rates tendered, for all items of concrete, shall be deemed to be inclusive of, but not limited to the following:
  - i) Providing all materials including splicing, sealing, jointing and filler materials
  - ii) All operations related with transportation, involved in the process
  - iii) All operations related with storage of materials
  - iv) All sorts of wastages
  - v) All operations including installing, splicing, sealing, jointing and securing water stops; laying of sealants and fillers in expansion joints; and protection, maintenance and repairs, of the water stops
  - vi) Carrying out all sampling and testing
  - vii) All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.

### SECTION - 11

#### 3. MANHOLES / VALVE CHAMBER

##### 3.1 DESCRIPTION

The work shall consist of the turning and erecting pre-cast or cast in situ concrete manholes/valve chamber of sizes shown in drawings with the necessary frames and covers constructed in accordance with these specifications and the specifications for the other work items involved and in conformity with the dimensions, lines, elevations and design shown in the Drawings.

### 6.2.5 CONCRETE

In case of cast in situ concrete manholes/valve chamber, concrete shall be of Class A unless otherwise shown on the Drawings or as directed by the Engineer, and shall conform to the requirements prescribed for that particular class of concrete in section "Concrete". Forms of approved quality shall be used to give reasonable fair finish from inside, while rough form work may be allowed for outside finish. All other specifications shall be followed as prescribed in Section "Concrete".

## 5.3 CONSTRUCTION REQUIREMENTS

### 6.3.1 EXCAVATION

Excavation shall conform to the requirements under Section "Structural Excavation and Backfill".

### 6.3.2 BACKFILL

Granular backfill as specified in Section "Structural Excavation and Backfill" is required by the Drawings, or is specified in writing by the Engineer.

### 6.3.3 CONCRETE

Concrete construction shall conform to the requirements under Section "Concrete".

### 6.3.4 STEEL REINFORCEMENT

Bending and fixing of steel shall conform to the requirements under Section "Steel Reinforcement".

### 6.3.5 PRECAST CONCRETE UNITS

Precast concrete units shall be erected in the positions shown on the Drawings, or as required by the Engineer.

During erection of the units outside of the manhole/valve chamber shall be finished smooth and the joints flushed full with mortar.

### 6.3.6 CONNECTIONS

Sections of connection pipe shall be incorporated into the construction and placed at the elevation, direction and grade required. The lower ends of the pipe shall be flush with the inner faces of the walls.

### 6.3.7 METAL FRAMES

Metal frames shall be set on full mortar beds or otherwise secured as shown on the Drawings and the frames, covers, and gratings shall be accurately set true to the line and elevation required to fit the adjoining surface as approved by the Engineer.

### 6.3.8 CLEANING

Upon completion each manhole/valve chamber shall be thoroughly cleared of any accumulation of silt, debris, or foreign matter of any kind and shall be kept clear of such accumulations until final acceptance of the work.

CONTRACTOR

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D.  
Shaher

6.4 MEASUREMENT AND PAYMENT

6.4.1 MEASUREMENT

The quantities to be paid for shall be the number of concrete manholes / valve chamber, complete with frames and covers and all other relevant components, in position and accepted by the Engineer as described in the Bill of quantities.

6.4.2 PAYMENT

The quantities measured as provided above shall be paid for at the contract unit price respectively, for each of the pay items listed below that is shown in the Bill of Quantities, which prices and payment shall be full compensation for furnishing and placing all materials, and for all other costs necessary or usual to the proper completion of the work prescribed in this item.

Excavation and backfill shall be measured and paid for as specified under Chapter "Structural Excavation and Backfill".

Granular backfill, which is in place and accepted shall be measured and paid for as specified in Section "Structural Excavation and Backfill".

A handwritten signature in black ink, appearing to be 'S. M.', is located in the lower right quadrant of the page. The signature is stylized and somewhat illegible.



No: WB-11/DAD/P.C/2015/4-W/ 6600  
OFFICE OF THE CHIEF ENGINEER  
SUKKUR BARRAGE LEFT BANK REGION  
SUKKUR DATED 08 DECEMBER, 2015.

Phone # 071-9310192

Fax # 071-5805163

## NOTIFICATION

A Procurement Committee consisting of the following officers is hereby constituted for opening of Bids / Tenders for the ADP & RRIDS works for the year 2015-16 in Dad Division Shaheed Benazirabad of Rohri Canal Circle, Hyderabad.

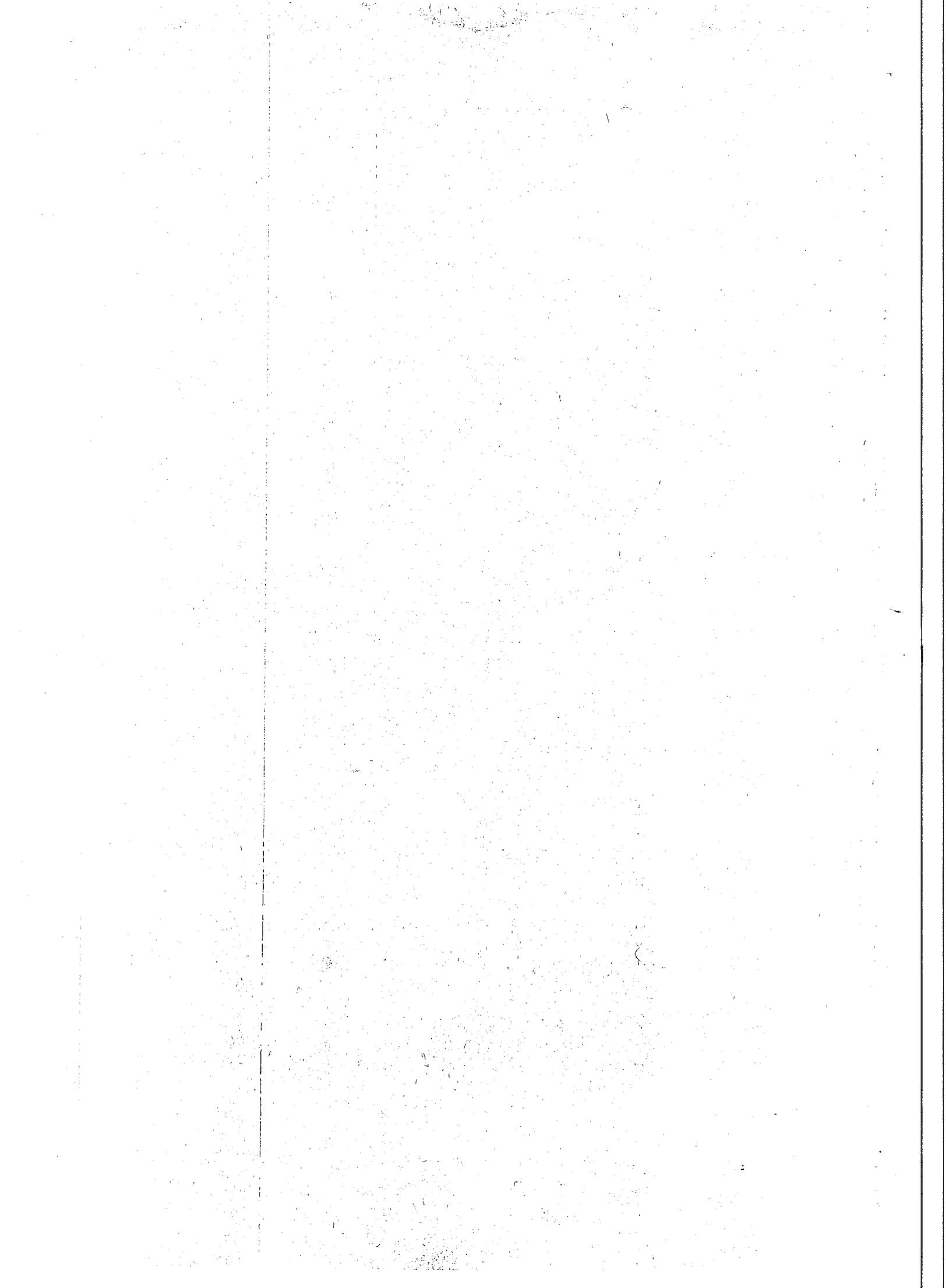
- |    |  |          |
|----|--|----------|
| 1. | Superintending Engineer,<br>Rohri Canal Circle Hyderabad.            | CHAIRMAN |
| 2. | Executive Engineer,<br>Dad Division Shaheed Benazirabad.             | MEMBER   |
| 3. | Executive Engineer<br>Nasrat Division Shaheed Benazirabad.           | MEMBER   |
| 4. | Executive Engineer<br>Highways Division Shaheed Benazirabad.         | MEMBER   |
| 5. | Divisional Accounts Officer,<br>Dad Division<br>Shaheed Benazirabad. | MEMBER   |

WALI MUHAMMAD NAICE  
CHIEF ENGINEER

Copy forwarded to :-

1. The Secretary to Government of Sindh, Litigation Department Karachi for favour of kind information.
2. The Superintending Engineer, Rohri Canal Circle Hyderabad.
3. The Executive Engineer Dad Division Shaheed Benazirabad.
4. The Executive Engineer, Nasrat Division Shaheed Benazirabad.
5. The Executive Engineer Highways Division Shaheed Benazirabad.
6. The Divisional Accounts Officer, Dad Division Shaheed Benazirabad.

MMAD



(Annexure A-I)

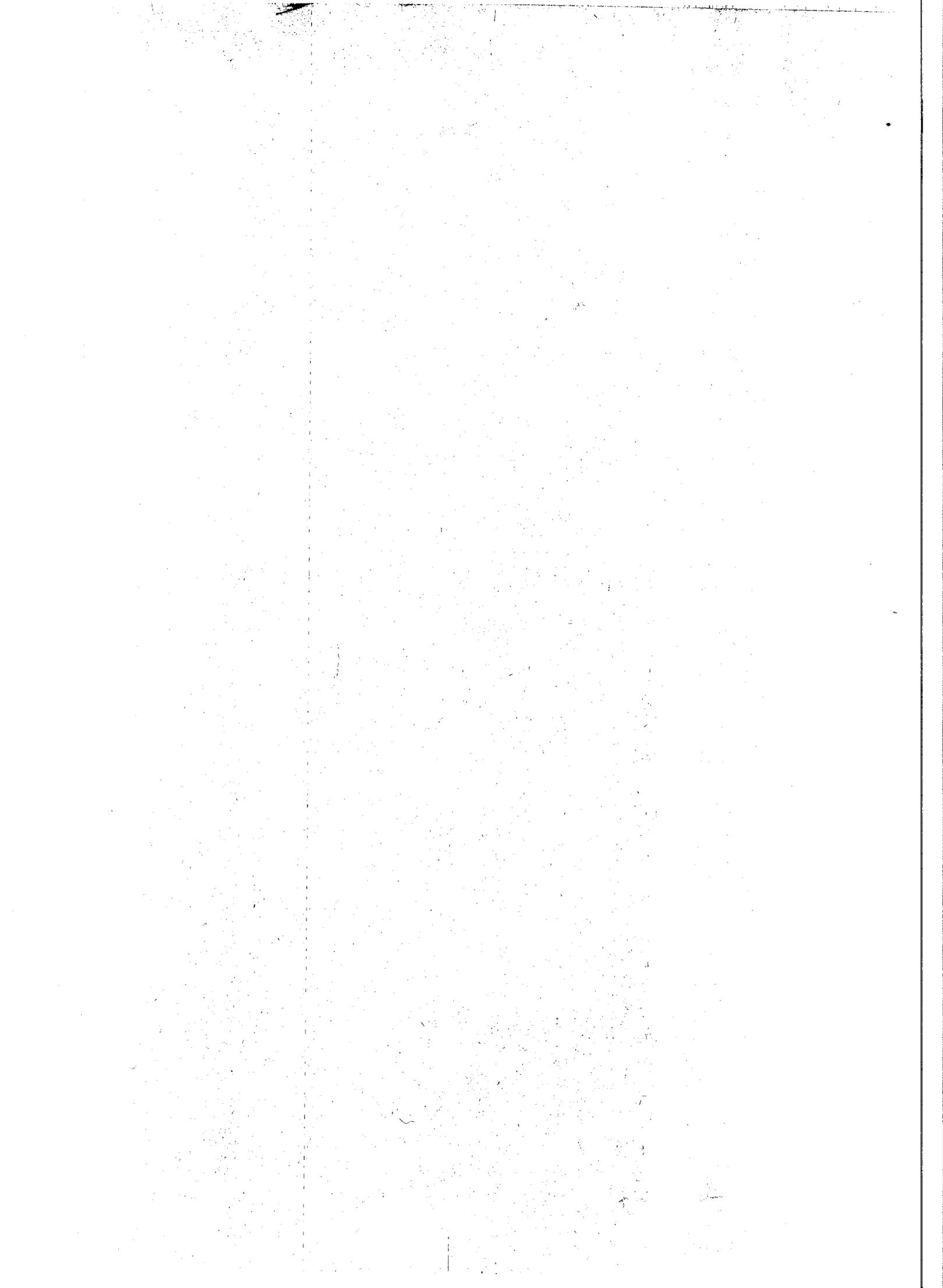
## PROCUREMENT PLAN (Development / Capital)

Serial No.	ADP No.	Name of scheme & Estimate Cost	Allocated Funds	Cost of ongoing works (Expenditure already incurred)	Funds earmarked for ongoing works	Cost of New Works (components)	Funds for works (c-e)	Nature of Procurement	Method of Procurement	Anticipated/Actual Date of Advertisement	Anticipated/Actual Date of Start	Anticipated/Actual Date of Completion
	a	b	c	d	e	f	g	h	i	j	k	l
01		Restoration of Duro Fall Regulator @ RD. 523 Down Stream of Rohri Main Canal.	25.00	Nil	Nil	25.00	25.00	National competitive bidding procedure	Single stage one envelop procedure	03/02/2016	02/2016	02/2016

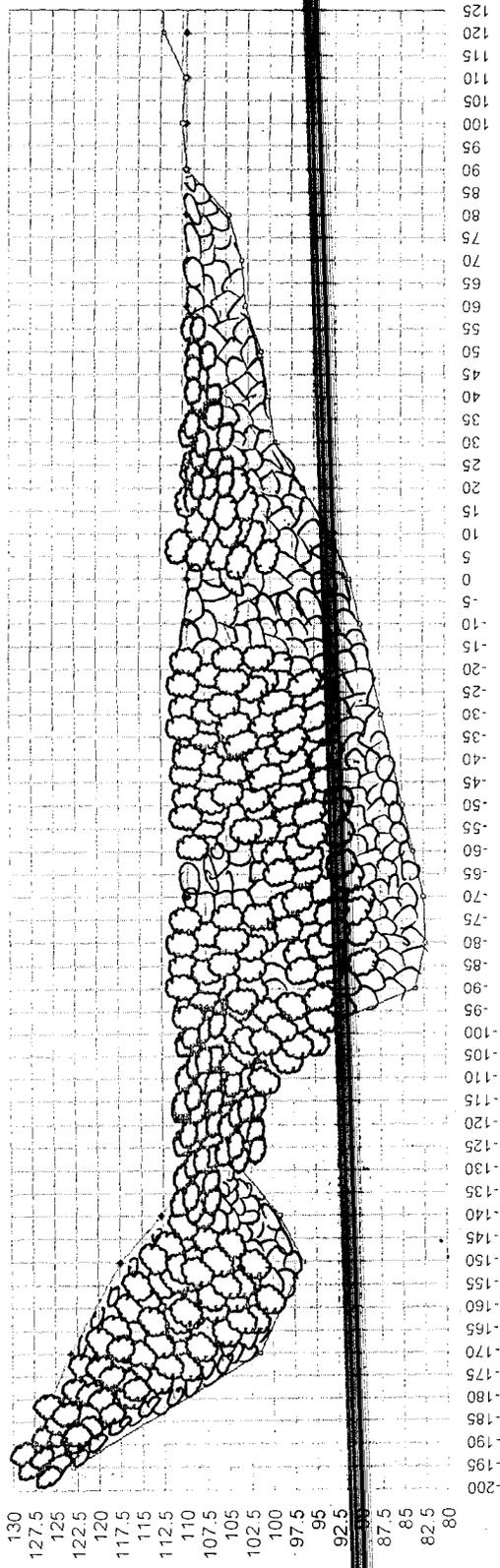
SINDH PUBLIC PROCUREMENT REGULATORY AUTHORITY

Guidelines: Regulations For Procurement of Works





X-SECTION OF STONE DUMPING CAVITY D/S DORO FALL @ DIST- 200+00



Prop: RL	Off set	Exis: RL	Off set	D-of-Fill
		123	-195.00	5.96
		101.5	-170.00	21.75
		96.5	-150.00	20.95
		99.2	-140.00	13.55
		103.5	-130.00	6
		101.9	-120.00	7.6
		99.2	-110.00	10.3
		96.2	-100.00	13.3
		83.5	-90.00	26
		82.3	-80.00	27.2
		82.5	-70.00	27
		83.7	-60.00	25.8
		84.9	-50.00	24.6
		86.1	-40.00	23.4
		87.3	-30.00	22.2
		88.5	-20.00	21
		89.7	-10.00	19.8
		90.9	0.00	18.6
		93.1	10.00	16.4
		96.3	20.00	13.2
		99.5	30.00	10
		100.2	40.00	9.3
		101	50.00	8.5
		102.8	60.00	6.7
		103.2	70.00	5.3
		104.7	80.00	4.8
		109.5	90.00	0
		110	100.00	-0.5
		109.7	110.00	-0.2
		112.2	120.00	-2.7
		112.5	130.00	-3

  
 ASSISTANT ENGINEER  
 QAZI AHMED SUB DIVISION-I

  
 SUB ENGINEER

