Sindh Madressatul Islam University

DEVELOPMENT OF SINDH MADRESSATUL ISLAM UNIVERSITY (SMIU) CAMPUS AT EDUCATION CITY MALIR, KARACHI (Water Supply System including Tube Wells)

Tender Document

Volume-I

Conditions of Contract

EA Consulting Pvt Ltd

ARCHITECTURE | ENGINEERING | PROJECT MANAGEMENT

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INVITATION
FOR
BIDS

SINDH MADRESSATUL ISLAM UNIVERSITY
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NO. SMIU/PC/MC/ Pack-3 (RW)/Tend/2025/06 **Karachi, Dated: 7th. January-2025**

TENDER NOTICE

Sindh Madressatul Islam University, Karachi invites e-bids through E-Pak Acquisition & Disposal System (EPADS) on standard bidding documents from interested contractors/firms registered in the required PEC category and specialization as mentioned in column (7) below for the following works. The tender shall be based on the single stage – one envelope procedure under Rule No 46 (1) of SPPRA-Rules 2010 (amended-uptodate). Bidding documents can be viewed/downloaded from https://portalsindh.eprocure.gov.pk/#/: and also available and viewed from SMI, University's website: www.smiu.edu.pk

S. No.	Name of work	Estimated Cost	Bid security	Tender Fee	Time of completion	PEC category & specialization
(1)	(2)	(3)	(4)	(5)	(6)	(7)
01.	Development of Sindh Madressatul Islam University (SMIU) Campus at Education City Malir, Karachi (Water supply system including tube wells).	Rs. 24.318 (M)	2% of Bid Price	Rs.10,000/-	09 Months	C-6 and above with specialization code CE09

Electronic Bids should be submitted through EPAD only. Interested bidders are required to get registered themselves on EPAD system in the link https://sindh.eprocure.gov.pk/#/supplier/registration for submission of electronic bids.

1- The bids prepared in accordance with the instruction given in the bidding document must be submitted on EPADS only **by Tuesday, 28th. January-2025, by 02-30 PM**. The original instrument of tender fee and **bid security 2% of the bid price in shape of Call Deposit/Pay order/Demand Draft/Bank Guarantee issued by any scheduled bank of Pakistan** in favour of Sindh Madressatul Islam University Karachi. must reach the Procurement agency in sealed envelope prior to the deadline for the opening of the e-bids. The bids will be **opened on the same day at 03-00 PM** before Procurement Committee, representative of consultant and the bidders or their authorized representatives who wish to be present, in the conference room No. 2, SMIU, main city campus Aiwan-e- Tijarat Road Behind Habib Bank Plaza, Karachi.

2- **Eligibility Criteria:**

a. Valid registration with Pakistan Engineering Council (PEC) in prescribed category and the relevant field of specialization of work.
b. Registration with income tax department (NTN certificates) with activated status in Federal Board of Revenue.
c. Registration certificate of Sindh Revenue Board Government of Sindh STN Certificate.
d. Experience and past performance for each work:

Experience in similar nature of work(s) executed during the last five years:

i. At least one similar nature of work having minimum cost 80% of the estimated cost of the work: **OR**

ii. At least two similar natures of works each having minimum cost 50% of the estimated cost.

e. **Financial: -**

Average Annual Financial Turn over not less than equivalent cost of the scheme/project during last five years.

f. List of machinery and equipment available.

g. An affidavit certificate that the firm at present is not black listed by Government/ Semi Government / Autonomous / Private bodies and that the firm has not been involved in any litigation and arbitration with Government/ Semi Government / Autonomous / Private bodies.

h. In case of joint ventures, same conditions to be fulfilled by both the firms.

i. Affidavit with effect that all the documents/ particulars information furnished are true correct.

j. All documents from Sr. No. "a" to "i" mentioned in the eligibility Criteria of this NIT will be examined at the time of opening of tender.

3- Bid Validity Period is 90 days.

4- Conditional bid and bid **without earnest money** shall not be considered.

5- Procuring Agency reserves the right to reject all or any bids subject to the relevant provisions of SPPRA Rules-2010 (amended uptodate).

6- In case any unforeseen situation resulting in closure of office on the date of opening or if Government declares holiday, the tender shall be submitted/opened on the next working day at the same time and venue.

Project Coordinator
SMIU Malir Campus, Karachi.
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Email: sldodani@smiu.edu.pk
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INSTRUCTIONS TO BIDDERS

INSTRUCTIONS TO BIDDERS

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

A. GENERAL

IB.1 Scope of Bid

1.1 The Employer as defined in the **Bidding Data** hereinafter called "the Employer" wishes to receive bids for theconstruction and completion of works as described in these Bidding Documents, and summarized in the **Bidding Data** hereinafter referred to as the "Works".

1.2 The successful Bidder will be expected to complete the Works within the time specified in the **Bidding Data**.

IB.2 Source of Funds

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

IB.3 Eligible Bidders

3.1 This Invitation for Bids is open to all Bidders meeting the following requirements at the time of submission of Bids and thereafter:

(a) Duly prequalified for this bidding process;

(b) Duly licensed by the Pakistan Engineering Council (PEC) in the category relevant to the value of the Works in the relevant field of specialization.

However, a Foreign Constructor can submit provisional license with its Bid but the Foreign Constructor will be required to submit standard license after award of Contract and before start of work.

Foreign Constructor shall not be eligible to participatein bidding individually. Foreign Constructor shall enter into joint venture with Pakistani Constructor registered with the Pakistan Engineering Council in equivalent/compatible category and submit the joint venture agreement to the Employer before participating in bidding in accordance with PEC Construction and

Operation of Engineering Works Bye-laws, 1987;

(c) Must be on Active Taxpayer List of the Federal Board of Revenue and provincial revenue authority/ board where applicable; and

(d) All partners constituting the Bidder including proposed subcontractors do not appear in the list of debarred/ blacklisted firms and individuals on the websites of PEC and Federal & Provincial Procurement Regulatory Authorities and have not been declared debarred/ blacklisted by foreign country, internationalorganizations or other foreign institutions.

IB.4	**Eligible Materials, Equipment and Services**	4.1	All materials, equipment and services to be supplied under this Contract shall have their origin in eligible countries described under paragraph 4.4 hereunder.
		4.2	For purpose of this Clause, "origin" means the place where the Goods are mined, grown or produced or from where the ancillary services are supplied. Goods are produced when, through manufacturing, processing or substantial and major assembling of components, a commercially recognized product results that is substantially different in basic characteristics or in purpose or utility from its components.
		4.3	The origin of Goods and Services is distinct from the nationality of the Bidder.
		4.4	Eligible countries to participate in this bidding process are those which have been notified by Ministry of Interior, Government of Pakistan as Business-Friendly Countries (BVL); information can be accessed through following link: http://www.dgip.gov.pk/Files/Visa%20Categories.aspx#L
IB.5	**One Bid per Bidder**	5.1	Each Bidder shall submit only one Bid either by himself, or as a partner in a joint venture. A Bidder who submits or participates in more than one Bid (other than alternatives pursuant to Clause IB.17) will be disqualified.
IB.6	**Site Visit**	6.1	The Bidders are advised to visit and examine the Site of Works and its surroundings and obtain for themselves on their own responsibility all information that may be necessary for preparing the Bid and entering into a contract for construction of the Works. All cost in this respect shall be at the Bidder's own expense.
		6.2	The Bidders and any of their personnel or agents will be granted permission by the Employer to enter upon his premises and lands for the purpose of such inspection, but only upon the express condition that the Bidders, their personnel and agents, will release and indemnify the Employer, his personnel and agents from and against all liability in respect thereof and will be responsible for death or personal injury, loss of or damage to property and any other loss, damage, costs and expenses incurred as a result of such inspection.

B. BIDDING DOCUMENTS

IB.7	**Contents of Bidding Documents**	7.1	The Bidding Documents, in addition to Invitation for Bids, are those stated below and should be read in conjunction with any Addenda issued in accordance with Clause IB.9:

1. Instructions to Bidders;
2. Bidding Data;
3. Evaluation Criteria and Qualification Updating Forms;
4. General Conditions (GC);
5. Particular Conditions (PC):
   - Part A - Contract Data;
   - Part B - Special Provisions;
6. Specifications (SP):
   - Part A - Specific Provisions;
   - Part B - Technical Provisions;
7. Letter of Bid;
8. Schedules to Bid;
9. Standard Forms:
   - (i) Form of Bid Security;
   - (ii) Letter of Acceptance;
   - (iii) Form of Contract Agreement;
   - (iv) Form of Performance Security;
   - (v) DAAB Agreement;
   - (vi) Form of Mobilization Advance Guarantee;
10. Drawings.

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

IB.8 Clarification of Bidding Documents, Pre-Bid Meeting

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

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

8.3 The Employer may, on his own or at the request of any prospective Bidder(s), hold a pre-bid meeting to clarify issues and to answer any questions on matters related to the Bidding Documents. The date, time and venue of pre-bid meeting, if convened, are as stipulated in the **Bidding Data**. All prospective Bidders or their authorized representatives shall be invited to attend such a pre-bid meeting.

8.4 The Bidders are requested to submit questions, if any, in writing so as to reach the Employer not later than three (3) days before the proposed pre-bid meeting.

8.5 Minutes of the pre-bid meeting, including the text of the questions raised and the replies given, will be transmitted without delay to all purchasers of the Bidding Documents. Any modification of the Bidding Documents listed in Sub-Clause IB.7.1 hereof which may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of an Addendum pursuant to Clause IB.9 and not through the minutes of the pre-bid meeting.

8.6 Absence at the pre-bid meeting will not be a cause for disqualification of a Bidder.

IB.9 Amendment of Bidding Documents

9.1 At any time prior to the deadline for submission of bids, the Employer may, for any reason, whether at his own initiative or in response to a clarification requested by a prospective Bidder, modify the Bidding Documents by issuing addendum.

9.2 Any addendum thus issued shall be part of the Bidding Documents listed in Sub-Clause IB.7.1 hereof and shall be communicated in writing to all purchasers of the Bidding Documents. Prospective Bidders shall acknowledge receipt ofeach addendum in writing to the Employer.

9.3 Such addendum shall be issued not later than number of days prior to the deadline for submission of bids, specified in the **Bidding Data**. To afford prospective Bidders reasonable timein which to take an addendum into account in preparing their bids, the Employer may extend the deadline for submission ofbids in accordance with Clause IB.20.

C. PREPARATION OF BIDS

IB.10 Cost of Bidding

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

IB.11 Language of Bid

11.1 The Bid and all correspondence and documents related to the Bid exchanged by a Bidder and the Employer shall be in the Bid language stipulated in the **Bidding Data** and Particular Conditions of Contract. Supporting documents and printed literature furnished by the Bidders may be in any other language provided the same are accompanied by duly certified translation of the relevant parts in the Bid language, in which case, for purposes of evaluation of the bid, the translation in Bid language shall prevail.

IB.12 Documents Comprising the Bid

12.1 Each Bidder shall:

(a) submit duly filled in, signed and stamped Letter of Bid and completed Schedules to Bid as required, including
priced Bill of Quantities, in accordance with ClauseIB.18 hereof;

(b) submit Bid Security in accordance with Clause IB.16 hereof;

(c) submit alternative proposal, if permissible in accordance with Clause IB.17;

(d) Submit a written power of attorney authorizing the signatory of the Bid to act for and on behalf of the Bidder. The name and position held by each person signing the authorization must be typed or printed below the signature;

(e) submit the Qualification Updating Forms duly filled in, signed and stamped along with requisite attachments, to establish that the Bidder continues to meet the Eligibility and Qualification Criteria set out in the Pre- Qualification Documents and as provided in the Section"Evaluation Criteria and Qualification Updating Forms";

(f) furnish a technical proposal taking into account the various Schedules to Bid, especially the following:

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

12.2 Bids submitted by a joint venture of two (2) or more firms specified in **Bidding Data**, shall comply with the following requirements:

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

(b) one of the joint venture partners shall be nominated as being in-charge; and this authorization shall be evidenced by submitting a power of attorney signed by legally authorized signatories of all the joint venture partners;

(c) the partner-in-charge shall always be duly authorized to deal with the Employer regarding all matters related with and/or incidental to the execution of Works as per the terms and Conditions of Contract and in this regard to incur any and all liabilities, receive instructions, give binding undertakings and receive payments on behalf ofthe joint venture;

(d) all partners of the joint venture shall at all times and under all circumstances be liable jointly and severally for the execution of the Contract in accordance with the

Contract terms and a statement to this effect shall be included in the authorization mentioned under Sub- Para(b) above as well as in the Letter of Bid and in the Form of Contract Agreement (in case of a successful bid); and

(e) a copy of the agreement entered into by the joint venture partners shall be submitted with the bid stating the conditions under which it will function, its period of duration, the persons authorized to represent and obligate it and which persons will be directly responsible for due performance of the Contract and can give valid receipts on behalf of the joint venture, the proportionate participation and corresponding duties & responsibilities of the several firms forming the joint venture, and any other information necessary to permit a full appraisal of its functioning. No amendments/ modifications whatsoever in the joint venture agreement shall be agreed to between the joint venture partners without prior written consent of the Employer.

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

IB.13 Bid Prices

13.1 The price and discount if any quoted by the Bidders in the Letter of Bid and in the Bill of Quantity shall conform to the requirement specified below:

13.2 The Bidder shall quote any discounts and the methodology for their application.

13.3 If bids are being invited for individual lots (contracts) or for any combination of lots, the Bidders can offer discounts for the individual lots (contracts) as well as for award of more than one Contract and shall specify in their bid.

13.4 Unless stated otherwise in the Bidding Documents, the Contract shall be for the whole of the Works as described in Sub-Clause IB.1.1 hereof, based on the unit rates and/or prices.

13.5 The Bidders shall fill in rates and prices for all items of the Works described in the Bill of Quantities. Items against which no rate or price is entered by a Bidder will not be paid for by the Employer when executed and shall be deemed covered by rates and prices for other items in the Bill of Quantities.

13.6 All duties, taxes and other levies payable by the Contractor under the Contract, or for any other cause, as on the date 28 days prior to the deadline for submission of bids shall be included in the rates and prices and the total Bid Price
submitted by a Bidder.

Additional/reduced duties, taxes and levies due to subsequent additions or changes in legislation shall be reimbursed/ deducted as per Sub Clause 13.6 [*Adjustment for Changes in Laws*] of the Conditions of Contract.

13.7 The rates and prices quoted by the Bidders are subject to adjustment during the performance of the Contract inaccordance with the provisions of Sub-Clause 13.7 [*Adjustments for Changes in Cost*] of the General Conditions of Contract. The Bidders shall furnish the prescribed information for the price adjustment formulae in Schedule-A to Bid, and shall submit with their bids such other requisite supporting information if required under the said Schedule.

Not Applicable

IB.14 Currencies of Bid and Payment

14.1 The unit rates and the prices shall be quoted by the Bidder entirely in Pak Rupee and shall be paid accordingly in same currency.

A Bidder expecting to incur expenditures in other currencies for inputs to the Works supplied from outside the Employer's country (referred to as the "Foreign Currency Requirements") shall indicate in Table III of Schedule-A to Bid the proportion of the Bid Price (excluding Provisional Sums) needed by him for the payment of such Foreign Currency Requirements, in such case the unit rates and the prices shall be quoted by the Bidder in Equivalent PKR.

Not Applicable

14.2 The rates of exchange to be used by the Bidder for currency conversion shall be the TT Selling Rates published or authorized by the State Bank of Pakistan prevailing on the date twenty-eight (28) days prior to the deadline for submission of bids. Such rates shall be notified by the Employer not later than fourteen (14) days prior to the deadline for submission of Bids.

Not Applicable

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

IB.15 Bid Validity

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

15.2 In exceptional circumstances, prior to expiry of the original bid validity period, the Employer may request that the Bidders extend the period of validity for a specified additional period which normally may not be more than the original bid validity period. The request and the responses thereto shall be made in writing. A Bidder may refuse this request of the Employer without his Bid Security being forfeited. A Bidder agreeing to the request will not be required or permitted to modify his bid, but will be required to extend the validity of his Bid Security for the period of the extension, and in compliance with Clause IB.16 in all respects.

IB.16 Bid Security

16.1 Each Bidder shall furnish, as part of his bid, a Bid Security in original form in the amount stipulated in the **Bidding Data** in PKR.

16.2 The Bid Security shall be in the form of Call Deposit Receipt (CDR) / Pay Order issued by a Scheduled Bank in Pakistan in favor of the Employer valid for a period 14 days beyond the Bid Validity date.

Bid Price (In Eq. million PKR)	Minimum Rating of Insurance Companies
Up to 1000	A (+)
1001 to no limit	AA

Not Applicable

16.3 Any Bid not accompanied by an acceptable Bid Security shall be rejected by the Employer as non-responsive.

16.4 The Bid Securities of the Bidders except the lowest three will be returned by the Employer within twenty-eight (28) days from the opening of Bids, provided a Bidder request for the return of its Bid Security, or upon the expiry of original validity of Bid Security or as extended, whichever is earlier.

16.5 The Bid Security of the lowest three Bidders including the successful Bidder will be returned when the successful Bidder has furnished the required Performance Security.

16.6 The Bid Security may be forfeited:

(a) if the Bidder withdraws his bid except as provided in Sub Clause IB.22.1;

(b) if the Bidder does not accept the correction of his Bid Price pursuant to Sub Clause IB.28.2 hereof; or

(c) in the case of successful Bidder, fails to furnish the required Performance Security.

16.7 In case of annulment, all Bids submitted and specially, Bid securities, shall be returned to the Bidders within 14 days of annulment.

IB.17 Alternative Proposals by Bidder

17.1 Unless otherwise specified in the **Bidding Data**, alternative proposal(s) shall not be considered.

17.2 Should any Bidder consider that he can offer any advantages to the Employer by a modification to the designs, specifications or other conditions, he may, in addition to his Bid to be submitted in strict compliance with the Bidding Documents, submit any alternative proposal(s) containing (a)

relevant design calculations; (b) technical specifications; (c) proposed construction methodology; and (d) any otherrelevant details/conditions, provided always that the total sumentered on the Letter of Bid shall be that which represents complete compliance with the Bidding Documents.

17.3 Alternative proposal(s), if any, of the Bidder having submitted most advantageous Bid only may be considered by the Employer as the basis for the award of Contract to such Bidder.

IB.18 Format and Signing of Bid

18.1 Bidders are particularly directed that the amount entered on the Letter of Bid shall be for performing the Contract strictly in accordance with the Bidding Documents.

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

18.3 No alteration is to be made in the Letter of Bid nor in the Schedules thereto except in filling up the blanks as directed.If any such alterations be made or if these instructions be not fully complied with, the Bid may be rejected.

18.4 Each Bidder shall prepare by filling in the forms completely and without alterations one (1) original and number of copies, specified in the **Bidding Data**, of the documents comprising the Bid as described in Clause IB.12 and clearly mark them "ORIGINAL" and 'COPY" as appropriate. In the event of discrepancy between them, the original shall prevail.

The Bidder shall also provide complete searchable PDF versions as well as Word, Excel etc., versions of the Bid if so required in the **Bidding Data**.

Not Applicable

18.5 The original of the Bid shall be typed or written in indelible ink and shall be signed by a person or persons duly authorizedto sign on behalf of the Bidder pursuant to Sub-Clause IB.12.1(d) hereof. All pages of the Bid shall be initialed and stamped by the person or persons signing the bid.

18.6 The Bid shall contain no alterations, omissions or additions, except to comply with instructions issued by the Employer, or as are necessary to correct errors made by the Bidder, in which case such corrections shall be initialed by the person or persons signing the Bid.

18.7 Bidders shall indicate in the space provided in the Letter of Bid their full and proper addresses at which notices may be legally served on them and to which all correspondence in connection with their bids and the Contract is to be sent.

18.8 Bidders should retain a copy of the Bidding Documents and the Bid as their file copy.

18.9 All documents executed outside Pakistan required to be submitted with the Bid must be certified by Pakistan Embassy in the respective country(ies).

Not Applicable

D. SUBMISSION OF BIDS

IB.19 Sealing and Marking of Bids

19.1 Each Bidder shall submit his Bid as under:

(a) ORIGINAL and each copy of the Bid shall be separately sealed and put in separate envelopes and marked as such.

(b) The envelopes containing the ORIGINAL and copies will be put in one sealed envelope and addressed /identified as given in Sub Clause IB.19.2 hereof.

19.2 The inner and outer envelopes shall:

(a) be addressed to the Employer at the address provided in the **Bidding Data**;

(b) bear the specific identification of this bidding process as specified 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**.

Not Applicable

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

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

IB.20 Deadline for Submission of Bids

20.1 (a) Bids must be received by the Employer at the address specified no later than the time and date stipulated in the **Bidding Data**.

(b) Bids with charges payable will not be accepted, nor will arrangements be undertaken to collect the bids from any delivery point other than that specified above. Bidders shall bear all expenses incurred in the preparation and delivery of Bids. No claims will be entertained for refund of such expenses.

(c) Where delivery of a Bid is by mail and the Bidder wishes to receive an acknowledgment of receipt of such Bid, he shall make a request for such acknowledgment in a separate letter attached to but not included in the sealed Bid envelope.

Not Applicable

(d) Upon request, acknowledgment of receipt of Bids will be provided to those making delivery in person or by messenger.

20.2 The Employer may, at his discretion, extend the deadline for submission of Bids by issuing an amendment in accordance with Clause IB.9, in which case all rights and obligations of the Employer and the Bidders previously subject to the original deadline will thereafter be subject to the deadline as extended.

IB.21 Late Bids

21.1 (a) Any Bid received by the Employer after the deadline for submission of bids prescribed in Clause IB.20 shall be declared late, rejected and returned unopened to such Bidder.

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

Not Applicable

IB.22 Modification, Substitution and Withdrawal of Bids

22.1 Any Bidder may modify, substitute or withdraw his Bid after Bid submission provided that the modification, substitution or written notice of withdrawal is received by the Employerprior to the deadline for submission of bids.

22.2 The modification, substitution, or notice for withdrawal ofany Bid shall be prepared, sealed, marked and delivered in accordance with the provisions of Clause IB.19 with the outerand inner envelopes additionally marked "MODIFICATION", "SUBSTITUTION" or 'WITHDRAWAL" as appropriate.

Not Applicable

22.3 No Bid may be modified by a Bidder after the deadline for submission of Bids except in accordance with Sub Clauses IB.22.1 and 28.2.

22.4 Withdrawal of a Bid during the interval between the deadline for submission of Bids and the expiration of the period of Bid validity specified in the Letter of Bid may result in forfeiture of the Bid security in pursuance to Clause IB.16.

E. BID OPENING AND EVALUATION

IB.23 Bid Opening

23.1 The Employer will open the Bids ~~including withdrawals, substitution and modifications made pursuant to Clause IB.22~~, in the presence of Bidders' representatives who choose to attend, at the time, date and location stipulated in the **Bidding Data**. The Bidders' representatives who are present shall sign a register evidencing their attendance.

23.2 Envelopes marked "MODIFICATION", "SUBSTITUTION" or "WITHDRAWAL" shall be opened and read out first. Bids for which an acceptable notice of withdrawal has been submitted pursuant to Clause IB.22 shall not be opened. Only bids that are opened and read out at Bid opening shall be considered further.

Not Applicable

23.3 The Bidder's name, total Bid Price and price of any alternative proposal(s), any discounts, Bid modifications, substitution and withdrawals, the presence or absence of Bid security, and such other details as the Employer may consider appropriate, will be announced by the Employer at the opening of Bids. Only discounts and alternative proposals

read out at Bid opening shall be considered for evaluation.The Letter of Bid and the Summary Bill of Quantities are to be initialed by representative(s) of the Employer attending Bid opening. The Employer shall neither discuss the merits ofany Bid nor reject any Bid (except for late Bids, in accordance with Sub-Clause IB 21.1).

23.4 The Employer 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

24.1 Information relating to the examination, clarification, evaluation and comparison of Bids and recommendations for the award of Contract shall not be disclosed to Bidders or any other person not officially concerned with such process before the announcement of the result of Bid evaluation in the form of final evaluation report giving justification for acceptance or rejection of Bids which shall be done at least fifteen (15) days prior to award of Contract. The announcement to all Bidders will include table(s) comprising read out prices, discounted prices, price adjustments made, final evaluated prices andrecommendations against all the Bids evaluated. Any effort by a Bidder to influence the Employer's processing of Bids or Contract award decisions may result in the rejection of such Bidder's Bid. Whereas any Bidder feeling aggrieved may lodge a written complaint not later than five (5) days after the announcement of the final evaluation report.

IB.25 Clarification of Bids

25.1 To assist in the examination, evaluation and comparison of Bids, the Employer may, at his discretion, ask any Bidder for clarification of his Bid, including breakdowns of unit rates and lump sum prices. Any clarification submitted by a Bidder that is not in response to a request by the Employer shall not be considered. The request for clarification and the response shall be in writing. No change in the price or substance of the Bid shall be sought, offered or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Bids in accordance with Clause IB.28.

25.2 The Employer may, at his discretion, ask any Bidder for confirmation/submission of missing information to clarify its Bid. However, the Employer does not have an obligation to request any additional information or clarification with respect to missing or deficient information in a Bid. The Employer may reject any Bid as non-responsive if found materially incomplete, obscure, irregular or omitting any material information required to be submitted in accordance with the Bidding Documents.

25.3 If a Bidder does not provide clarifications of its Bid by the date and time set reasonably (not less than seven (7) days) in the Employer's request for clarification, the Employer may proceed with the evaluation based on the information submitted in the Bid without waiting for the Bidder's response.

IB.26 Examination ofBids and Determination of Responsiveness

26.1 Prior to the comparison of Bids, the Employer will determine whether each Bid is substantially responsive to the requirements of the Bidding Documents.

26.2 The Employer's determination of a Bid's responsiveness is to be based on the contents of the Bid itself, as defined in Sub- Clause IB.12.

26.3 A substantially responsive Bid is one which meets the requirements of the Bidding Documents, without material deviation, reservation or omission. A material deviation, reservation or omission is one that,

(a) if accepted, would:

(i) affect in any substantial way the scope, quality or performance of the Works; or

(ii) limit in any substantial way, inconsistent with the Bidding Documents, the Employer's rights or the Bidder's obligations under the proposed Contract; or

(b) if rectified, would unfairly affect the competitive position of other Bidders presenting substantially responsive Bids.

26.4 During the evaluation of Bids, the following definitions apply:

(a) "Deviation" is a departure from the requirements specified in the Bidding Documents;

(b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Documents; and

(c) "Omission" is the failure to submit part or all of theinformation or documentation required in the BiddingDocuments.

26.5 The Employer shall examine the technical aspects of the Bid submitted in accordance with Sub-Clause IB.12.1(f), in particular, to confirm that all requirements stated in Specifications have been met without any material deviation, reservation or omission.

26.6 If a Bid is not substantially responsive to the requirements of the Bidding Documents, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the non-conforming deviation, reservation or omission.

IB.27 Nonmaterial Nonconformities

27.1 Provided that a Bid is substantially responsive, the Employer may waive any nonconformities in the Bid.

27.2 Provided that a Bid is substantially responsive, the Employer may request that the Bidder submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities in the Bid related to documentation requirements. Requesting information or

documentation on such nonconformities shall not be relatedto any aspect of the price of the Bid. Failure of the Bidder to comply with the request may result in the rejection of its Bid.

27.3 Provided that a Bid is substantially responsive, the Employer shall rectify quantifiable nonmaterial nonconformities related to the Bid Price. To this effect, the Bid Price shall be adjusted, for comparison purposes only, to reflect the price of a missing or non-conforming item or component, by adding the average price of the item or component quoted by other lowest two evaluated substantially responsive Bidders. If the price of the item or component cannot be derived from the price of other substantially responsive Bids, the Employer shall use a suitable CSR, adjusted to the date 28 days earlier to the Bid submission date or its best assessment.

IB.28 Correction of Arithmetic Errors

28.1 Bids determined to be substantially responsive will be checked by the Employer for any arithmetic errors. Errorswill be corrected by the Employer as follows:

(a) where there is a discrepancy between the amounts in figures and in words, the amount in words will govern.

(b) where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern, unless in the opinion of the Employer there is an obviously gross misplacement of the decimal point in the unit rate, in which case the line item total as quoted will govern and the unit rate will be corrected.

(c) if there is an error in a total corresponding to the addition or subtraction of sub-totals, the sub-totals shall prevail and the total shall be corrected.

28.2 The amount stated in the Letter of Bid will be adjusted by the Employer in accordance with the above procedure for the correction of errors and with the concurrence of the Bidder, shall be considered as binding upon the Bidder. If the Bidder does not accept the corrected Bid Price, his Bid will be rejected, and the Bid security shall be forfeited in accordance with Sub Clause IB.16.6(b) hereof.

IB.29 Evaluation and Comparison of Bids

29.1 The Employer will evaluate and compare only the Bids determined to be substantially responsive in accordance with Clause IB.26. The Employer shall use the criteria and methodologies listed in this Clause. No other evaluation criteria or methodologies shall be permitted.

29.2 In evaluating and comparing the Bids, the Employer will determine for each Bid the evaluated Bid Price by adjusting the Bid Price as follows:

(a) making any correction for arithmetic errors pursuant to Clause IB.28;

(b) price adjustment due to discounts offered in accordance with Sub-Clause IB.23.3;

(c) excluding Provisional Sums and the provision, if any, for contingencies in the Summary Bill of Quantities, but including competitively priced daywork;

(d) making an appropriate price adjustment for any quantifiable non material non conformities in accordance with Sub-Clause IB.27.3; and

(e) the additional evaluation factors are specified in Section Evaluation Criteria and Qualification Updating Forms.

29.3 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 Bids' comparison.

Not Applicable

IB.30 Abnormally Low Bids

30.1 If the Bid Price of the successful Bidder is more than 15% below the lower of the Employer's estimate of the cost of work to be performed under the Contract or average of other lowest two evaluated substantially responsive Bids, the Employer may require the Bidder to produce detailed price analyses for any or all items of the Bill of Quantities to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, the Employer may require an additional Performance Security by 10% of the difference of the Bid Price as determined hereinabove up to issuance of Taking Over Certificate at the expense of the successful Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract. The Bids having Bid Price lower than 25% shall be liable to be rejected.

IB.31 Unbalanced or Front Loaded Bids

31.1 If the Bid of the successful Bidder is seriously unbalanced (Front Loaded) in relation to the average of other evaluated substantially responsive Bids, the Employer during execution of contract may pay against measured quantities of significantly higher quoted line item(s) rate(s) with respect to same line item(s) rate(s) determined from the average of otherlowest two evaluated substantially responsive Bids as instructed by the Engineer. The balance line item(s) rate(s) may be paid against the same measured quantities at the time of issuance of Taking Over Certificate or as instructed by the Engineer.

F. AWARD OF CONTRACT

IB.32 Award Criteria

32.1 Subject to Clauses IB.33 and IB.39, the Employer will award the Contract to the Bidder who's Bid has been determined as most advantageous Bid (substantially responsive to requirements of the Bidding Documents with the lowest evaluated Bid Price).

IB.33 Employer's Right to Annul the Bidding Process

33.1 Notwithstanding Clause IB.32, the Employer reserves the right to annul the bidding process and reject all Bids, at any time prior to award of Contract, without thereby incurring any liability to the affected Bidders or any obligation.

The Employer shall upon request communicate to any Bidder who submitted a Bid, the grounds for its rejection of all Bids but is not required to justify those grounds. Rejection of all Bids shall be notified to all Bidders promptly.

IB.34 Notification ofAward

34.1 Prior to expiration of the period of Bid validity prescribed by the Employer, the Employer will notify the successful Bidder in writing ("Letter of Acceptance") that his Bid has been accepted. This letter shall name the sum which the Employer will pay the Contractor in consideration of the execution and completion of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Conditions of Contract called the "Accepted Contract Amount").

The Letter of Acceptance will also state the remedies with respect to Sub-Clauses IB.30 & IB.31 if applicable.

34.2 No negotiation with the Bidder having submitted most advantageous Bid or any other Bidder shall be permitted, however, Employer may have clarification meetings before issuing Letter of Acceptance to get clarified any item in the Bid evaluation report.

34.3 The Letter of Acceptance/ notification of award and its acknowledgement/acceptance by the Bidder will constitute the formation of the Contract, binding the Employer and the Bidder till signing of the formal Contract Agreement.

34.4 Upon furnishing by the successful Bidder of a Performance Security, the Employer will promptly notify the other Biddersthat their Bids have been unsuccessful and return their Bid securities in accordance with Sub-Clause IB.16.5.

IB.35 Performance Security

35.1 The successful Bidder shall furnish to the Employer a Performance Security in the form and the amount stipulated in the Conditions of Contract and additional Performance Security if applicable under IB.30 as stated in the Letter of Acceptance, within a period of 28 days after the receipt of Letter of Acceptance.

35.2 Failure of the successful Bidder to comply with the requirements of Sub Clause IB.35.1 or Clauses IB.36 or IB.37 shall constitute sufficient grounds for the annulment of the award, forfeiture of the Bid security and to award the Contract to the Bidder having submitted next advantageous Bid.

IB.36 Signing of Contract Agreement

36.1 Within 14 days from the date of furnishing of acceptablePerformance Security under the Conditions of Contract, the Employer will notify the successful Bidder to depute its representative with appropriate Power of Attorney to sign the Contract Agreement in the form provided in the Bidding
Documents, incorporating all agreements between the parties.

36.2 The formal Agreement between the Employer and the successful Bidder shall be executed within 14 days of the receipt of the above stated notification by the successful Bidder from the Employer.

IB.37 Integrity Pact

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

IB.38 Instructions not Part of Contract

38.1 Bids shall be prepared and submitted in accordance with the Instructions to Bidders which are provided to assist the Bidders in preparing Bids but do not constitute part of the Contract.

IB.39 Corrupt and Fraudulent Practices

39.1 The Employer will reject a Bid if it determines that the Bidder recommended for award, or any of its personnel, or its agents,or its sub-contractors, service providers, suppliers and/or their employees, has, directly or indirectly, engaged in corrupt,fraudulent, collusive, coercive, or obstructive practices in competing for the contract under this bidding.

39.2 The Employer will blacklist and hence forthwith debar a Constructor or individual, at any time, in accordance with the prevailing Public Procurement Rules 2004.

BIDDING DATA

BD-2

BIDDING DATA

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

IB Clause Reference	Bidding Data
1.1	**Name and address of the Procuring Agency:** Sindh Madressatul Islam University, Aiwan-e-Tijarat Road, Behind Habib Bank Plaza, Karachi
1.1	**Name of the Project and Summary of the Works:** Development of Sindh Madressatul Islam University (SMIU) Campus at Education City Malir, Karachi (Water Supply System including Tube Wells)
1.2	**Time for Completion for the Works**: 270 days (09 Months)
2.1	**Name of the Borrower/Source of Financing/Funding Agency:** Federal Government (HEC) PSDP funds.
3.1	Foreign Constructors are not allowed
8.1	**Time limit for clarification:** Seven (7) calender days prior to the Date of Opening of Tender.
8.3	**Pre-bidding Meeting:** Pre-bid meeting shall be held at Conference Room, SMIU Malir Campus, Education City Malir, Karachi on **Monday, 20th January 2025** at 11:30 A.M.
9.3	**Number of Days:** Five (05)
11.1	**Bid Language**: English
14.1	Bidders to quote entirely in Pak. Rupees
15.1	**Period of Bid validity:** Bid shall be valid for 90 days from the date of opening of bid.
16.1	**Amount of Bid Security:** Bid Security in form of Call Deposit / Pay Order/ Demand Draft/ Bank Guarantee issued by a Scheduled Bank in Pakistan, of the amount at **2% of the Bid Price** in favor of Sindh Madressatul Islam University which shall remain Valid for a period of 28 days beyond the validity period of bids mentioned in para 15.1 above. **List of Insurance Companies:** *(Not Applicable)*
17.1	**Alternative Proposal(s)** by the Bidder shall not be considered.
18.4	**Number of copies of the Bid to be completed and returned:** Each Bidder shall prepare by filling in the forms completely and without alterations. The bid, properly filled in, must be submitted **ONLY through e-Pak Acquisition & Disposal System (EPADS)** at or before deadline mentioned in the invitation to bid.

19.1	**Submission of Bids:** The original Technical and Financial bid, properly filled in, must be submitted **ONLY through e-Pak Acquisition & Disposal System (EPADS)** at or before **02:30 P.M on Tuesday 28th January-2025**. The bids will be opened promptly thereafter in public and in the presence of bidders' representatives who choose to attend in the opening at the Conference Room No. 02, first floor Main building at Sindh Madressatul Islam University, Aiwan-e- Tijarat Road Behind Habib Bank Plaza, Karachi.
19.2 (a)	**Procuring Agency's address for the purpose of submission:** Conference Room No. 2, First Floor, Main Building, Sindh Madressatul Islam University, Aiwan-i-Tijarat Road, Behind Habib Bank Plaza, Karachi.
19.2 (b)	**Name of the Contract:** Development of Sindh Madressatul Islam University (SMIU) Campus at Education City Malir, Karachi (Water Supply System including Tube Wells)
19.2 (c)	**Time and date for Bid Opening:** Bids shall be opened at **03:00 P.M on Tuesday 28th January-2025** in the **Conference Room No. 02, first floor Main building at Sindh Madressatul Islam University, Aiwan-e- Tijarat Road Behind Habib Bank Plaza, Karachi**
19.5	The Bidder shall submit with its **Technical Bid** the following documents (a) Original Bid Security as per 16.1 and 16.2 (b) Conditions of Contract (c) Specification- (Part A – Specific Provisions) (d) Proposed Construction Schedule (appendix –C-1) (e) Method of Performing the Work (appendix –D-1) (f) Availability of Critical Equipment (appendix –E-1 to 3) (g) Construction Camp and Housing Facilities (appendix –I-1) (h) List of Sub-contractors (as required) (appendix –G-1) (i) Organization Chart for Supervisory Staff (appendix –F-1) (j) Integrity Pact (appendix –J-1) The Bidder shall submit with its **Financial (Price) Bid** the following documents: (l) Letter of Price Bid (m) Bill of Quantities (n) Estimated Progress Payments (appendix –H-1)
20.1 (A)	**Deadline for submission of Bids:** Bids shall be submitted **ONLY through e-Pak Acquisition & Disposal System (EPADS)** not later than **02:30 P.M on Tuesday 28th January-2025.**
23.1	**Venue, time, and date of opening:** Bids shall be opened at **03:00 P.M on Tuesday 28th January-2025** in the **Conference Room No. 02, first floor Main building at Sindh Madressatul Islam University, Aiwan-e- Tijarat Road Behind Habib Bank Plaza, Karachi**

EVALUATION CRITERIA AND QUALIFICATION UPDATING FORMS

EVALUATION CRITERIA AND QUALIFICATION UPDATING FORMS

B. General

This Section contains Eligibility and Qualification Criteria that the Employer shall use to evaluate Bids and qualify Bidders in accordance with Clauses IB.26 of Instructions to Bidders.The Bidder shall provide all the information requested in the relevant forms contained in Bidder's Qualification Updating Forms provided herein.

The information provided in the forms shall be substantiated with valid documentary evidences otherwise the requirement will not be considered as complied.

Wherever a Bidder is required to state a monetary amount, Bidders shall indicate the PKR equivalent using the rate of exchange determined as follows:

- For financial data - Exchange rate prevailing on the last day of the respective calendar year (inwhich the amounts for that year is to be converted) was originally established.

Exchange rates shall be taken from the publicly available source identified in the Sub-ClauseIB.14.2. Any error in determining the exchange rates in the Bid may be corrected by the Employer.

C. Domestic Preference

A margin of preference of 7.5% (seven and a half percent) shall be granted to domestic Bidders (in case of JV, all partners are Pakistani Constructors), in accordance with and subject to the following provisions:

(c) The Bidders applying for such preference shall provide, as part of the data for qualification, such information, including details of ownership, as shall be required to determine whether, according to the classification established by the Employer, a Bidder qualifies for a domestic preference.

(d) After Bids have been received and reviewed by the Employer, responsive Bids shallbe classified into the following groups:

- **Group A: Bids offered by domestic Bidders eligible for the preference.**
- **Group B: Bids offered by other Bidders.**

All evaluated Bids in each group shall, as a first evaluation step, be compared to determine the lowest Bid, and the lowest evaluated Bids in each group shall be further compared with each other. If, as a result of this comparison, a Bid from Group A is the lowest, it shall be selected for the award. If a Bid from Group B is the lowest, as a second evaluation step, all Bids from Group B shall then be further compared with the lowest evaluated Bid from Group A. For the purpose of this further comparison only, an amount equal to 7.5% (seven and a half percent) of the respective Bid Price corrected for arithmetical errors, including unconditional discounts and excluding Provisional Sums and the cost of dayworks, if any, shall beadded to the evaluated price offered in each Bid from Group B. If the Bid from Group A is the lowest, it shall be selected for award. If not, the lowest evaluatedBid from Group B based on the first evaluation step shall be selected.

D. Evaluation Criteria

1. The Bidders must meet all the mandatory criteria

1.1 Mandatory Provisions/Eligibility

#	Description	Yes/No
(i)	**Registration with PEC**: Bidders must possess valid registration certificate of PEC in the category **C-6** or Above Single Entity: Must Meet Joint Venture: Must Meet	If "Yes" the applicant will be Eligible for further evaluation for qualification.
(ii)	**Registration with Revenue Board**: Bidders must possess valid registration certificate from FBR and Sindh Revenue Board. Single Entity: Must Meet Joint Venture: Must Meet	If "Yes" where applicable the applicant will be Eligible for further evaluation for qualification

2. Evaluation/Qualification Criteria:

#	Category	Weightage/Marks
(i)	Financial Soundness	30
(ii)	Work Experience	40
(iii)	Key Personnel	15
(iv)	Plant & Equipment	15
	Total	**100**

For Technical Qualification, Passing Marks 65 out of 100. Additionally, each applicant has to score a minimum of 50% in each category.

Similarly, for firms in Joint Venture (J.V) to qualify, following are minimum qualification requirements:-

i) Lead partner shall have to score a minimum of 65% of all qualifying criteria given above.
ii) Each of the partners in J.V shall score not less than 40% of all qualifying criteria given above.

2.1 Financial Soundness:

Sr. No.	Description	Maximum Marks
i)	Available Bank Credit Line (100 Million or Above) Provide Original Bank Credit Line Letter duly certified by regional Branch of Bank.	5
ii)	Average Working Capital in last 5 years (150 Million or above) Provide Firm Audited Financial Reports for the last 5 years.	10
iii)	Average Annual Financial Turnover in last 5 year – (25 Million or above) Provide Firm Audited Financial Reports for the last 5 years.	5
iv)	Litigation History where decision went against the Firm. (Affidavit on Rs.100 Stamp Paper) In case of JV both partners must meet the criteria	5
v)	Blacklisting from any Agency (Affidavit on Rs.100 Stamp Paper) In case of JV both partners must meet the criteria	5
	SUB-TOTAL:	**30**

2.1 Work Experience:

SR. NO.	DESCRIPTION	MAXIMUM	POINTS
a)	**Similar nature of works Completed in last 5 years:** 1 Project (20 Million or above) = 5 Points Or 2 Projects (15 Million or above) = 5 Points (Provide Work Orders / Completion Certificate)	**20**	**5**
b)	**Similar nature of works in Hand:** 1 Project (20 Million or above) = 5 Points Or 2 Projects (15 Million or above) = 5 Points (Provide Work Orders)	**15**	**5**
d)	**Status of enlistment with Government Organizations and other agencies.** 1 Enlistment x 1 Point	**5**	**1**
	SUB-TOTAL:	**40**	

2.2 Key Personnel:

SR. NO.	DESCRIPTION	MAXIMUM	POINTS
i)	**Engineers Registered with PEC** a. B.Sc Engr (Civil) with 5+ years' experience (2 marks for one engineer) b. B.Sc Engr (Civil) with 3+ years' experience (1 mark for one engineer) Marks for Experience less than specified will be considered on proportionate basis for PE (Between 6-9 years) & for RE (between 1-4 years)	**9**	2 1
ii)	**Diploma Engineers in Employment of the Firm** a. Site Supervisor (DAE Civil) with 5+ years' experience (1 mark for one DAE Civil) b. Surveyor (DAE Civil) with 3+ years' experience (1 mark for one DAE Civil) Marks for experience less than specified years will be considered on proportionate basis.	**6**	1 1
	SUB-TOTAL:	**15**	

Note:

1. Bidders are supposed to possess Qualification Certificates i.e PEC Certificate and Diploma Certificates with their CV.

2.3 Plant & Equipment:

S.NO	Equipment Type & Characteristics	Min. Nr. required	POINTS
1	Drilling Rig	01 No	2
2	Bull Dozer (D6, D8)	01 No	2
3	Front End Loader (3CM)	01 No	2
4	Excavator (0.3CM)	02 No	2
5	Concrete Mixer Machine (One Bag Capacity)	02 No	2
6	Generator (100KVA)	01 No	1
7	Plate Compactors	02 No	1
8	Water Browser	02 No	2
9	Motor Grader(140 – 165 HP)	01 No	1
SUB-TOTAL:			**15**

Note:

1. The marks mentioned in above table are for owned equipment.
2. Total equipment available with the bidder is to be listed along with its current mobilization on on-going projects. The Bidder shall provide further details of proposed items of equipment using the relevant Form provided hereunder.
3. The bidder must submit ownership documents for equipment own by it.
4. For Leased/Rental equipment, the bidder must submit lease/rental agreement(s). For leased/rental equipment bidder will get 50% marks.

Bidders Qualification Updating Forms

To establish its qualifications to perform the contract in accordance with Section (EvaluationCriteria and Qualification Updating Forms) the Bidder shall provide the information requested in the corresponding Information Sheets included hereunder.

Form ELI -1.1

Bidder Information Form

Date: _____
Bid Reference No. (if any) and title: _____
Page_____of_____ pages

Bidder's name
In case of Joint Venture (JV), name of each member:
Bidder's country of registration: *[indicate country of Constitution]*
Bidder's year of incorporation:
Bidder's legal address [in country of registration]:
Bidder's authorized representative information Name:_____ Address:_____ Telephone/Fax numbers: _____ E-mail address: _____
1. Attached are copies of original documents, in case of JV, JV agreement, in accordance with Sub-Clause IB 3.1.

Form ELI -1.2

Bidder's JV Information Form
(to be completed for each member of Bidder's JV)

Date: _____
Bid Reference No. (if any) and title: _____
Page_____ of_____pages

Bidder's JV name:
JV member's name:
JV member's country of registration:
JV member's year of constitution:
JV member's legal address in country of constitution:
JV member's authorized representative information Name:_____ Address:_____ Telephone/Fax numbers: _____ E-mail address: _____

Form CON – 1

Pending

Litigation

Bidder's Name: _____
Date: _____
JV Member's Name_____
Bid Reference No. (if any) and title: _____
Page_____of_____pages

Pending Litigation, in accordance with Eligibility and Qualification Criteria			
5	No pending litigation in accordance with Eligibility and Qualification Criteria, Sub-Factor 2.1.		
6	Pending litigation in accordance with Eligibility and Qualification Criteria, Sub-Factor 2.1 asindicated below.		
Year of dispute	**Amount in dispute (currency)**	**Contract Identification**	**Total Contract Amount (currency), Eq. PKR (exchange rate)**
		Contract Identification: _____ Name of Employer: _____ Address of Employer: _____ Matter in dispute: _____ Party who initiated the dispute: Status of dispute: _____	
		Contract Identification: Name of Employer: Address of Employer: Matter in dispute: Party who initiated the dispute: Status of dispute:	

Form FIN – 3.1:

Financial Situation and Performance

Bidder's Name: _____
Date: _____
JV Member's Name_____
Bid Reference No. (if any) and title: _____
Page_____of_____pages

7 **Financial data**

Type of Financial informationin (currency)	**Historic information for last year, (amount in currency, currency, exchange rate*, Eq. PKR)**
Statement of Financial Position (Information from Balance Sheet)	
Total Assets (TA)	
Total Liabilities (TL)	
Total Equity/Net Worth (NW)	
Current Assets (CA)	
Current Liabilities (CL)	
Working Capital (WC)	
Information from Income Statement	
Total Revenue (TR)	
Profits Before Taxes (PBT)	
Cash Flow Information	
Cash Flow from OperatingActivities	

*Refer to IB 14.2 for the exchange rate

8 **Financial documents**

The Bidder and its parties shall provide copies of financial statements for last year pursuant toEligibility and Qualification Criteria, Sub-factor 3.1. The financial statements shall:

8.1 reflect the financial situation of the Bidder or in case of JV member, and not an affiliated entity (such as parent company or group member).

8.2 be independently audited or certified in accordance with local legislation.

8.3 be complete, including all notes to the financial statements.

8.4 correspond to accounting periods already completed and audited.

11. Attached are copies of financial statements[1] for the last year required above; and complying withthe requirements

[1] If the most recent set of financial statements is for a period earlier than 12 months from the date of bid, thereason for this should be justified.

Form FIN – 3.2:

Financial Resources

Specify proposed sources of financing, such as liquid assets, unencumbered real assets, lines of credit, and other financial means, net of current commitments, available to meet the total construction cash flow demands of the subject contract or contracts as specified in Eligibility and Qualification Criteria.

No.	**Source of financing**	**Amount (Eq. PKR)**
1		
2		
3		

Form FIN – 3.3:

Current Contract Commitments / Works in Progress

Bidders and each member to a JV should provide information on their current commitments onall contracts that have been awarded, or for which a letter of intent or acceptance has been received, or for contracts approaching completion, but for which an unqualified, full completion certificate has yet to be issued.

Current Contract Commitments					
No.	**Name of Contract**	**Employer's Contact Address, Tel, Fax**	**Value of Outstanding Work [Current Eq. PKR]**	**Estimated Completion Date**	**Average Monthly Invoicing Over Last Six Months [Eq. PKR /month)]**
1					
2					
3					
4					
5					

LETTER OF BID AND SCHEDULES TO BID

LETTER OF BID

Bid Reference No. _____
[Name of Contract/ Works]

To: _____

_____

Gentleman,

9 Having examined the Bidding Documents including Instructions to Bidders, Bidding Data, Conditions of Contract, Specifications, Schedules to Bid including Bill of Quantities, Drawings and Addenda Nos._____for the execution ofthe above-named Works, we, the undersigned, offer to execute and complete such Worksand remedy any defects therein in conformity with the said Bidding Documents and

Addenda for the sum of Equivalent PKR_____(Eq. Pak Rupees _____) or such other sum as may be ascertained in accordance with the said conditions.

10 We meet the eligibility requirements in accordance with IB.3.

11 We, including any Subcontractors for any part of the Contract, are not debarred/ blacklisted by the Employer, any Government/Semi Government/Public Department in Pakistan or foreign country, international organizations or other foreign institutions.

12 Our subcontractors or suppliers for any part of the Contract, if any, shall have nationalities from eligible countries, in accordance with IB.4.4.

13 We understand that all the Schedules attached hereto form part of this Bid.

14 As security for due performance of the undertakings and obligations of this Bid, we submit

herewith a Bid Security in the amount of PKR_____(Pak. Rupees. _____) drawn in your favour or made payable to you and valid for a period of_____days beginning from the date Bids are opened.

15 We undertake, if our Bid is accepted, to commence the Works and to complete the whole of the Works comprised in the Contract within the time stated in Contract Data.

16 We agree to abide by this Bid for the period of____days, inclusive of 14 days beyond Bid validity period (as mentioned at Sr. No. 6 above) and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

17 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.

18 We do hereby declare that the Bid is made without any collusion, comparison of figures or arrangement with any other Bidder for the Works.

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

20 We undertake that all the information and documents submitted with the Bid are genuine, and in case of incorrect information of fake documents we shall be liable for punitive action under the Applicable Law.

Dated this_____day of_____20_____

Signature: _____

in the capacity of_____duly authorized to sign Bids for and on behalf of

_____

(Name of Bidder in Block Capitals)
(Seal)

Address:_____

_____

_____

Witness:

Signature:_____

Name: _____

Address. _____

_____

Occupation_____

A-1
Schedule-A to Bid

SCHEDULE OF ADJUSTMENT DATA

Schedule of Cost Indexation

[The Employer is to engage a professional with experience in construction costs and the inflationary effect on construction costs when preparing the contents of the Schedule of Cost Indexation. In the case of very large and/or complex works contracts, it may be necessary to specify several families of price adjustment formulae corresponding to the different works involved.]

[The formulae for price adjustment shall be of the following general type:]

Pn= a + b Ln / Lo + c En/ Eo + d Mn/Mo + ...

where:

"Pn" is the adjustment multiplier to be applied to the estimated Contract value in the relevant currency of the work carried out in period "n", this period being a month;

"a" is a fixed coefficient, stated in the relevant table of adjustment data, representing the non-adjustable portion in contractual payments;

"b", "c", "d", ... are coefficients representing the estimated proportion of each cost element related to the execution of the Works as stated in the relevant table of adjustment data; such tabulated cost elements may be indicative of resources such as labour, equipment and materials;

"Ln", "En", "Mn", are the current cost indices or reference prices for period "n", expressed in the relevant currency of payment, each of which is applicable to the relevant tabulated cost element on the date 49 days prior to the last day of the period (to which the particularPayment Certificate relates); and

"Lo", "Eo", "Mo", are the base cost indices or reference prices, expressed in the relevant currency of payment, each of which is applicable to the relevant tabulated cost element on the Base Date.

The weightings (coefficients) for each of the factors of cost stated in the following table(s) of adjustment data shall only be adjusted if they have been rendered unreasonable, unbalanced or inapplicable, as a result of Variation(s).

If the currency in which the Contract price is expressed is different from the currency of the country of origin of the indices, a correction factor will be applied to avoid incorrect adjustments of the Contract price. The correction factor shall be: Z_0 / Z_1, where,

Z_0 = the number of units of currency of the origin of the indices which equal to one unit of the currency of the Contract Price on the Base date, and

Z_1 = the number of units of currency of the origin of the indices which equal to one unit of the currency of the Contract Price on the Date of Adjustment.

A-2
Schedule-A to Bid

SCHEDULE OF ADJUSTMENT DATA

Table I. Local Currency (LC) For Bill Nos._____

[In the Table below, the Bidder shall (a) indicate amount of local currency payment, and the Employer shall (b) enter the Index description and source of indices for the different elements of cost, and (c) derive weightings for local currency payment including nonadjustable fixed portion. PEC Standard Procedure and Formula for Price Adjustment (Second Edition), May, 2022 as amended time to time shall be applied for preparation of the following Table.]

Not Applicable

Cost Element	Description	Weightages	Applicable index
1	**2**	**3**	**4**
(i)	Fixed Portion	0.30	
(ii)	Local Labour**		
(iii)	Cement – in bags		
(iv)	Reinforcing Steel		
(v)	High Speed Diesel (HSD)		
(vi)	Bitumen		
(vii)	Aggregate		
	Total	**1.00**	

BILL OF QUANTITIES

9 **Preamble:**

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

9.4 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 as given in the priced Bill of Quantities, where applicable, and otherwise at such rates and prices as the Engineer may fix as per the Contract.

9.5 The rates and prices as given in the priced Bill of Quantities shall, except insofar as it is otherwise provided under the Contract include all costs of Contractor's plant, labour, supervision, materials, execution, insurance, profit, taxes and duties, together with all general risks, liabilities and obligations set out or implied in the Contract. Furthermore, all duties, taxes and other levies payable by the Contractor under the Contract, or for any other cause, as on the date 28 days prior to deadline for submission of Bids, shall be included in the rates and prices and the total Bid Price submitted by the Bidder.

9.6 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.

9.7 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, or the same shall be determined by the Engineer in accordance with Clause 13, General Conditions.

9.8 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 Bill of Quantities.

9.9 Provisional sums included and so designated in the Bill of Quantities shall be expended inwhole or in part at the direction and discretion of the Engineer in accordance with Sub- Clause 13.4 of General Conditions of Contract.

9.10 The following abbreviations for units have been used in Bill of Quantities:

Units		**Abbreviations**
Cubic Meter	=	cum
Square Meter	=	sqm
Kilogram	=	kg
Provisional Sum	=	PS
Lump-Sum	=	LS

C-1
Schedule-C to Bid

CONSTRUCTION SCHEDULE

Pursuant to Sub-Clause 8.3 of the General Conditions, the whole of the Works, and each Section (if any), shall be completed within the Time for Completion for the Works or Section (as the case may be) stated as hereunder and mentioned in Contract Data:

Description	Time for Completion (days)
a) Whole Works	
b) Section A	
c) Section B	
d) _____	
e) _____	

[The Bidder shall provide, the Construction Schedule in the bar chart (CPM, PERT or any other to be specified herein) showing the sequence of work items and the period of time during which he proposes to complete each work item in such a manner that his proposed programme for completion of the whole of the Works and Sections of the Works may meet Employer's completion targets in days noted above and counted from the Commencement Date (Attach sheets as required for the specified form of Construction Schedule)]

D-1
Schedule-D to Bid

METHOD OF PERFORMING THE WORK

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

(d) Organization Chart:

Shall indicate head office and field office personnel involved in management and supervision, engineering, equipment maintenance and purchasing.

(e) Mobilization:

In Pakistan, the type of facilities including personnel accommodation, office accommodation, provision for maintenance and for storage, communications, security and other services to be used.

(f) Method of executing the Works:

The procedures for installation of equipment and machinery and transportation of equipment and materials to the site.]

E-1
Schedule-E to Bid

LIST OF MAJOR EQUIPMENT

[The Bidder will provide on Sheet E-2 of this Schedule *a list of all major equipment and related items, under separate heading for items owned, to be purchased or to be arranged on lease by him to carry out the Works. The information shall include make, type, capacity, and anticipated period of utilization for all equipment.*

The Bidder shall provide adequate information to demonstrate clearly that it has the capability to meet the requirements for the key equipment listed in Sheet E-3.]

E-2
Schedule-E to Bid

LIST OF MAJOR EQUIPMENT

Owned, Purchased or Leased

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

E-3
Schedule-E to Bid

LIST OF MAJOR EQUIPMENT

Equipment details

Item of equipment		
Equipment information	Name of manufacturer	Model and power rating
	Capacity	Year of manufacture
Current status	Current location	
	Details of current commitments	
Source	Indicate source of the equipment □ Owned □ Rented □ Leased □ Specially manufactured	
The following information shall not be applicable for equipment owned by the Bidder		
Owner	Name of owner	
	Address of owner	
	Telephone	Contact name and title
	Fax	Telex
Agreements	Details of rental / lease / manufacture agreements specific to the project	

[This Table shall be used for each item of Equipment separately]

F-1
Schedule-F to Bid

ORGANIZATION CHART FOR
THE
SUPERVISORY STAFF AND LABOUR

G-1
Schedule-G to Bid

LIST OF SUBCONTRACTORS

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

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

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

H-1
Schedule-H to Bid

ESTIMATED PROGRESS PAYMENTS

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

Quarter	Amounts (1,000 PKR)
1	2
1st	
2nd	
3rd	
4th	
5th	
6th	
7th	
8th	
9th	
Bid Price	

I-1
Schedule-I to Bid

CONSTRUCTION CAMP AND HOUSING FACILITIES

[The Bidder in accordance with Clause 6 of the Conditions of Contract shall provide description of his construction camp's facilities and staff housing requirements.

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

(g) Site Preparation (clearing, land preparation, etc.).

(h) Provision of Services.

- ***Electrical power (expected power load, etc.).***
- ***Water (required amount and system proposed).***
- ***Sanitation (sewage disposal system, etc.)***

(i) Construction of Facilities

- ***Contractor's Office. Workshop and Work Areas (areas required and proposed layout, type ofconstruction of buildings, etc.).***
- ***Warehouses and Storage Areas (area required, type of construction and layout).***
- ***Housing and Staff Facilities (Plans for housing for proposed staff, layout, type of construction,etc.).***

(j) Construction Equipment Assembly and Preparation (detailed plans for carrying out this activity).

(k) Other Items Proposed (Security services, etc.)]

Note:

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

J-1
Schedule-J to Bid

INTEGRITY PACT

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

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

…… [Name of Bidder/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 Pakistan (GoP) or any administrative subdivision or agency thereof or any other entity owned or controlled by GoP through any corrupt business practice.

Without limiting the generality of the foregoing, [Name of Bidder/ 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 feeor otherwise, with the object of obtaining or inducing the procurement of a contract, right, interest, privilege or other obligation or benefit in whatsoever form from GoP, except that which has been expressly declared pursuant hereto.

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

[Name of Bidder/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 GoP under any law, contract or other instrument, be voidable at the option of GoP.

Notwithstanding any rights and remedies exercised by GoP in this regard, [name of Bidder/Contractor] agrees to indemnify GoP for any loss or damage incurred by it on account of itscorrupt business practices and further pay compensation to GoP in an amount equivalent to ten timethe sum of any commission, gratification, bribe, finder's fee or kickback given by [name of Bidder/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 GoP.

Name of Employer: ……
Signature: ……
[Seal]

Name of Bidder/Contractor: ……
Signature: …….
[Seal]

STANDARD FORMS

BS-1

FORM OF BID SECURITY

Security Executed on _____
(Date)

Expiry on _____
(Date)

Name of Surety with Address: _____

_____

Name of Principal (Bidder) with Address _____

_____

Penal Sum of Security PKR_____(Pak Rupees _____
_____)

Bid Reference No. _____

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

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Bidder has submitted the accompanying Bid dated_____for _____
_____(*Particulars of Bid*) to the said Employer; and

13 **WHEREAS, the Employer has required as a condition for considering said Bid that the Bidder furnishes a Bid Security in the above said sum to the Employer, conditioned as under: that the Bid Security shall remain in force for a period fourteen (14) days beyond the Bid Validity date i.e., upto 90 days .**

14 **that the Bid Securities of the Bidders except the lowest three will be returned by the Employer within twenty eight (28) days from the opening of Bids, provided a Bidder request for the return of its Bid Security, or on the expiry of original validity of Bid Security or as extended, whichever is earlier;**

15 **that the Bid Security of the lowest three Bidders comprising the successful Bidder will be returned when the successful Bidder has furnished the required Performance Security; and**

16 **that in the event of failure of the successful Bidder to furnish the required Performance Security, the entire said sum be paid immediately to the said Employer pursuant to IB.16 and IB.35 of the Instructions to Bidders for the successful Bidder's failure to perform.**

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

BS-2

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

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

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

SURETY
(Schedule Bank/Insurance Company)

WITNESS:

Signature _____

16.2 Name _____

Title _____

_____
Corporate Secretary (Seal)

Corporate Guarantor (Seal)

2. _____

_____
Name, Title & Address

PS-1

FORM OF PERFORMANCE SECURITY

Guarantee No._____
Executed on _____
Expiry date _____

[Letter by the Guarantor to the Employer]

Name of Guarantor with address: _____

_____

Name of Principal (Contractor) with address:_____

_____

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

_____

Letter of Acceptance No._____Dated _____

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

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has accepted theEmployer'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 thesaid Documents and any extensions thereof that may be granted by the Employer, with or withoutnotice 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 theGuarantor being hereby waived, then, this obligation to be void; otherwise to remain in full force andvirtue till all requirements of Clause11, Defects After Taking Over, 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 anyliability attaching to us under this Guarantee that the claim for payment in writing shall be received byus within the validity period of this Guarantee, failing which we shall be discharged of our liability, ifany, under this Guarantee.

We,_____ (the Guarantor), waiving all objections and defense under the Contract, do hereby irrevocably and independently guarantee to payto the Employer without delay upon the Employer's first written demand without cavil or arguments

and without requiring the Employer to prove or to show grounds or reasons for such demand any sumor sums up to the amount stated above, against the Employer's written declaration that the Principalhas refused or failed to perform the obligations under the Contract which payment will be effected bythe Guarantor to Employer's designated Bank & Account Number.

PROVIDED ALSO THAT the Employer shall decide, whether the Principal (Contractor) has dulyperformed his obligations under the Contract or has defaulted in fulfilling said obligations and theGuarantor shall pay without objection any sum or sums up to the amount stated above upon first written demand from the Employer forthwith and without any reference to the Principal or any otherperson.

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

Guarantor
(Schedule Bank/ Insurance Company)

WITNESS:

Signature _____

1. _____

Name _____

_____

Title _____

Corporate Secretary (Seal)

Corporate Guarantor (Seal)

2. _____

_____

Name, Title & Address

LOA-1

Letter of Acceptance

[Letterhead paper of the Employer]

NAME OF CONTRACT:_____

CONTRACT NUMBER:_____

TO :_____

Date:_____

Your Reference:_____

Our Reference:_____

We thank you for your Bid dated _____ for the execution and completion of the Works comprising the above-named Contract and remedying of defects therein,all in conformity with the terms and conditions contained in the Contract.

We have pleasure in accepting your Bid for the Accepted Contract Amount of:

_____
[currency and amount in figures]

_____
[currency and amount in words]

In consideration of you properly and truly performing the Contract, we agree to pay you the Accepted Contract Amount or such other sums to which you may become entitled under the terms of the Contract, at such times and as prescribed by the Contract.

We acknowledge that this Letter of Acceptance creates a binding Contract between us, and we undertake to fulfil all our obligations and duties in accordance with the terms of this Contract.

Signature:_____

Signed by: _____

For and on behalf of:_____

Date:_____

CA-1

FORM OF CONTRACT AGREEMENT

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

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

NOW this Agreement witnessed as follows:

14 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.

15 The following documents, in the order of priority, after incorporating addenda, if any, except those parts relating to Instructions to Bidders shall be deemed to form and be read and construedas part of this Agreement:

15.1 This Contract Agreement;

15.2 The Letter of Acceptance;

15.3 The Letter of Bid;

15.4 The Particular Conditions Part A - Contract Data;

15.5 The Particular Conditions Part B - Special Provisions;

15.6 The General Conditions;

15.7 The Specifications Part A - Specific Provisions;

15.8 The Specifications Part B - Technical Provisions;

15.9 The Drawings;

15.10 The Completed Schedules to Bid including Schedule of Prices;

15.11 the JV Undertaking (if the Contractor is a JV); and

15.12 *[Employer to insert any other documents forming part of the Contract*]

The addenda/corrigenda, if any, (Excluding part relating to Instructions to Bidders alongwith Bidding Data) shall be deemed to have been incorporated at the appropriate places in the "Documents forming the Contract".

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

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

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

Signature of Contactor	Signature of Employer
(Seal)	(Seal)

Signed, Sealed and Delivered in the presence of:

Witness	Witness
(Name, Title and Address)	(Name, Title and Address)

DAAB Agreement **DAAB-1**

[*All italicised text and any text within square brackets (except sub-clause headings) in this form of agreement is for use in preparing the form and should be deleted from the final product*].

Name and details of the Contract _____

_____

This Agreement made the _____ day of _____ [*month*], _____ [*year*], between

Name and contact details of the Employer _____ (name)

_____ (*address*)

_____ (*telephone*)

_____ (*email / other contact details*);

Name and contact details of the Contractor _____ (name)

_____ (*address*)

_____ (*telephone*)

_____ (*email / other contact details*);

Name and contact details of the DAAB Member _____ (name)

_____ (*address*)

_____ (*telephone*)

_____ (*email / other contact details*);

("**DAAB Agreement**")

Whereas:

16 the Employer and the Contractor have entered (or intend to enter) into the Contract;

17 under the Contract, the "DAAB" or "Dispute Avoidance/Adjudication Board" means the sole member or three members (as stated in the Contract Data of the Contract) so named in the Contract, or appointed under Sub-Clause 21.1 [*Constitution of the DAAB*] orSub-Clause 21.2 [*Failure to Appoint DAAB Members*] of the Conditions of Contract;

18 the Employer and the Contractor desire jointly to appoint the above-named DAAB Member to act on the DAAB as:

18.1 the sole member of the DAAB, and where this is the case, all references to the "Other Members" do not apply; or

18.2 one of three members / chairman [*delete the one which is not applicable*] of the DAAB and, where this is the case, the other two persons are:

_____ *(name)*	_____ *(name)*
_____ *(address)*	_____ *(address)*
_____*(telephone)*	_____*(telephone)*
_____*(email/ other contact details)*	_____ *(email/ other contact details)*

the "**Other Members**"; and

19 the DAAB Member accepts this appointment.

The Employer, Contractor and DAAB Member jointly agree as follows:

17 The conditions of this DAAB Agreement comprise:

17.2 Clause 21 [*Disputes and Arbitration*] of the Conditions of Contract, and any other provisions of the Contract that are applicable to the DAAB's Activities; and

17.3 the "General Conditions of Dispute Avoidance/Adjudication Agreement", which is appended to the General Conditions of the "Conditions of Contract for Construction"Second Edition 2017 published by FIDIC ("GCs"), as amended and/or added to by the following provisions.

18 [Details of amendments to the GCs, if any. For example:

In the procedural rules annexed to the GCs, Rule _ is deleted and replaced by: " … "]

19 The DAAB Member shall be paid in accordance with Clause 9 of the GCs. The currencyof payment shall be ___.

In respect of Sub-Clauses 9.1 and 9.2 of the GCs, the amounts of the DAAB Member'smonthly fee and daily fee shall be:

monthly fee_____per month, and

daily fee of_____per day

(or as otherwise set under Sub-Clause 9.3 of the GCs).

20 In consideration of the above fees, and other payments to be made to the DAAB Member in accordance with the GCs, the DAAB Member undertakes to act as DAAB Member in accordance with the terms of this DAAB Agreement.

21 The Employer and the Contractor shall be jointly and severally liable for the DAAB Member's fees and other payments to be made to the DAAB Member in accordance with the GCs.

22 This DAAB Agreement shall be governed by the law of _____(if not stated, the law that governs the Contract under Sub-Clause 1.4 of the Conditions of Contract).

DAAB-3

SIGNED by:_____	SIGNED by:_____	SIGNED by:_____
Print name:_____	Print name:_____	DAAB Member
Title:_____	Title:_____	Title:_____
for and on behalf of the Employer	for and on behalf of the Contractor	
in the presence of	in the presence of	in the presence of
Witness:_____	Witness:_____	Witness:_____
Name:_____	Name:_____	Name:_____
Address:_____	Address:_____	Address:_____
_____	_____	_____
Date:_____	Date:_____	Date:_____

MG-1

FORM OF MOBILIZATION ADVANCE GUARANTEE/ BOND

Guarantee No._____ Date _____

WHEREAS_____(hereinafter called the 'Employer')

has entered into a Contract for _____
(Particulars of Contract)
with_____(hereinafter called the "Contractor').

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

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

AND WHEREAS, _____

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

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

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

This Guarantee shall remain in force until the advance is fully adjusted against payments from theInterim Payment Certificates of the Contractor or until_____whicheveris earlier. *(Date)*

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

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 abovementioned date the advance payment is not fully adjusted.

Guarantor
(*Scheduled Bank/ Insurance Company*)

WITNESS:

Signature _____

1. _____

Name _____

_____

Title _____

Corporate Secretary (Seal)

Corporate Guarantor (Seal)

2. _____

_____

Name, Title & Address

CONDITIONS OF CONTRACT

CONDITIONS OF CONTRACT

The Conditions of Contract comprise two parts:

18 General Conditions
19 Particular Conditions

General Conditions

These Conditions are the "General Conditions" which form part of the "FIDIC Conditions of Contractfor Construction for Building and Engineering Works Designed by the Employer Second Edition (2017 Red book, Reprinted 2022 with amendments)" published by:

International Federation of Consulting Engineers
(Fédération Internationale des Ingénieurs – Conseils) – (FIDIC)
World Trade Center II - Geneva Airport
P. O. Box 311
CH-1215 Geneva 15
Switzerland
Email: fidic@fidic.org, fidic.pub@fidic.org
Website: https://fidic.org/bookshop

The successful Bidder after award of Works shall have to provide two (02) copies of above said "General Conditions" for incorporation in the Contract.

Particular Conditions

(*Mandatory Provisions not to be amended/substituted except as instructed/permitted by PEC in writing*)

The Particular Conditions (PC) complement the General Conditions (GC) to specify dates, contractual requirements, and special circumstances related to the Works. The PC consists of twoparts, Part A - Contract Data and Part B - Special Provisions. The provisions to be found in the Special Provisions (Particular Conditions - Part B) take precedence over the equivalent provisions found under the same Sub-Clause number(s) in the General Conditions, and the provisions of the Contract Data (Particular Conditions - Part A) take precedence over the Special Provisions (Particular Conditions - Part B).

Part A - Contract Data

Sub-Clause	Data to be Given	Data
1.1.27	Defects Notification Period (DNP):	365 days
1.1.31	Employer's name and address:	**Sindh Madressatul Islam University, Aiwan-e-Tijarat Road, Behind Habib Bank Plaza, Karachi**
1.1.35	Engineer's name and address:	*EA Consulting Pvt Ltd.* AL-9، 15th Lane Khayaban-e-Hilal, D.H.A. Phase 7 Defence Housing Authority, Karachi, Sindh 75500
1.1.84	Time for Completion:	270 days for whole of the Works
1.3(d)	address of Employer for communications:	**Sindh Madressatul Islam University, Aiwan-e-Tijarat Road, Behind Habib Bank Plaza, Karachi**
	address of Engineer for communications:	*EA Consulting Pvt Ltd.* AL-9، 15th Lane Khayaban-e-Hilal, D.H.A. Phase 7 Defence Housing Authority, Karachi, Sindh 75500
	address of Contractor for communications:	_____ *[insert Contractor's address at the time of signing of the Contract]*
1.4	Contract shall be governed by the law of:	Islamic Republic of Pakistan
	ruling language:	English
	language for communications:	English

Sub-Clause	Data to be Given	Data
1.8	number of additional paper copies of Contractor's Documents:	Only via EPADS
2.1	after receiving the Letter of Acceptance, the Contractor shall be given right of access to all or part of the Site within:	Immediately after issuance of Notice to Commencement
2.4	Employer's financial arrangements	**Federal Government (HEC) PSDP funds.**
3.2 (e)(ii)	Engineer's Duties and Authority	Variation resulting in an increase of the Accepted Contract Amount in excess of one percent (1%) subject toaccumulative Variations not exceeding five percent (5%) of the Accepted Contract Amount
4.2	Performance Security (as percentage of the Accepted Contract Amount in Currencies)	Five percent (05%) To be submitted within 14 Calendar days from the Letter of Acceptance (LOA), in the form of irrevocable Bank Guarantee / Pay Order / Demand Draft from any scheduled bank of Pakistan.
4.2.1	List of Insurance Companies	1. _____ 2. _____ 3. _____ ***[Not Applicable]***
4.7.2	period for notification of errors in the itemsof reference	Twenty Eight (28) days
4.19	period of payment for temporary utilities	each month
4.20	number of additional paper copies of progress reports	***02 Nos. Copies***
5.1(a)	maximum allowable accumulated value of work subcontracted (as a percentage of the Accepted Contract Amount)	NOT APPLICABLE

Sub-Clause	Data to be Given	Data
5.1(b)	parts of the Works for which subcontracting is not permitted	NOT APPLICABLE
6.5	Normal working hours on the Site	*08 hours and 6 working days in a week*
8.3	number of additional paper copies of programmes	*03 Copies*
8.8 & 14.15(b)	Delay Damages payable for each day of delay	0.075% Of the Contract Value for each day of delay in completion of the works upto a maximum of 10% of the Contract Price stated in the Letter of Acceptance.
8.8	maximum amount of Delay Damages	Ten percent (10%) of the Accepted Contract Amount
8.14	Applicability of Incentives for Early Completion	**No**
12.3	Percentage profit	Ten percent (10%)
13.4.(b)(ii)	percentage rate to be applied to Provisional Sums for overhead charges and profit	Twenty Five percent (25%)
14.2	total Advance Payment	Not Applicable
14.2.1	List of Insurance Companies	1. _____ 2. _____ 3. _____ *Not Applicable*

Sub-Clause	Data to be Given	Data
14.2.3	percentage deductions for the repayment of the Advance Payment	Deduction shall be made at the amortization rate of 17.5 % of the value of the Works executed of each IPC as provided in paragraph (i) of Sub-Clause GCC 14.3, starting from 2nd IPC provided that the advance payment shall be completely repaid prior to the time when 90% of the Accepted Contract Amount less Provisional Sums has been certified for payment. It may be more than 17.5% in the last installment to ensure full repayment.
14.3	period of Interim payment	Monthly Basis
14.3(b)	number of additional paper copies of Statements	*Original plus one hard copy, plus one electronic*
14.3 (iii)	percentage of retention	Five percent (5%) of the Amount of Interim / Running payments.
14.3 (iii)	limit of Retention Money (as a percentage of the Contract Price)	Five percent (5%)
14.5(b)(i)	Plant and Materials for payment when shipped	Not Applicable
14.5(c)(i)	Plant and Materials for payment when delivered to the Site	Not Applicable
14.6.2	minimum amount of Interim Payment Certificate (IPC)	*As per monthly work done*
14.7(a)	period of payment of Advance Payment to the Contractor	Not Applicable
14.7b(i)	period for the Employer to make interim payments to the Contractor under Sub-Clause 14.6 [Interim Payment]	28 days
-	Stamp Duty	The formal agreement between Procurement Agency and the Successful Bidder shall be duly stamped at the rate of 0.35% of the Bid Price (updated from time to time) as stated in the Letter of Acceptance.

Sub-Clause	Data to be Given	Data
14.7b(ii)	period for the Employer to make interim payments to the Contractor under Sub-Clause 14.13 (Final Payment)	28 days
14.7(c)	period for the Employer to make final payment to the Contractor	56 days
14.8	financing charges for delayed payment	Not Applicable
14.11.1(b)	number of additional paper copies of draft Final Statements	*3 Copies*
14.15	currencies of payment of Contract Price	Pak Rupees
14.15(a)(i)	Proportions or amounts of Local and Foreign currencies	Not Applicable
14.15(c)	currencies and proportions for payment of Delay Damages	Not Applicable
14.15(f)	rates of exchange	Not Applicable
17.2(d)	forces of nature, the risks of which are allocated to the Contractor	Nil
19.1	permitted deductible limits: 19 insurance required for the Works 20 insurance required for Goods 21 insurance required forliability for breach of professional duty 22 insurance required against liability for fitness for purpose (if any is required) 23 insurance required for injury to persons and damage to property 24 insurance required for injury to employees 25 other insurances required by Laws and by local practice	 Ten percent (10%) of loss amount on each & every loss Nil Nil Nil Nil Nil Nil

Sub-Clause	Data to be Given	Data
19.1	Periods for submission of insurance: 23 evidence of insurance 24 relevant policies	Not later than the Commencement Date Within twenty eight (28) day from the Commencement Date
19.2.1(b)	additional amount to be insured (as a percentage of the replacement value)	15% of the replacement value (Accepted Contract Amount)
19.2.2	extent of insurance required for Goods amount of insurance required for Goods	from Ex-Works (i.e., works, factory, warehouse, etc) to delivery at the Site Full replacement value
19.2.3(a)	amount of insurance required for liability for breach of professional duty	Full replacement value of the Works to be designed by the Contractor
19.2.3(b)	insurance required against liability for fitness for purpose	Yes
19.2.3	period of insurance required for liability for breach of professional duty	Until the date of issuance of Performance Certificate
19.2.4	amount of insurance required for injury to persons and damage to property	Injury to person and Fatal case: in accordance with Workmen Compensation Act Damage to Property: _____ [*Employer to insert amount(s) as per his assessment of the adjoining property(ies) other than the Works*] without limit to the number of incidents
19.2.6	other insurances required by Laws and by local practice	All insurances as applicable, to the extent of execution of the project, under Federal and Provincial laws of Islamic Republic of Pakistan
21.1	time for appointment of the DAAB	Within 28 days from the Commencement Date. In case the Accepted Contract Amount is lesser than PKR one (01) billion, appointment of the DAAB shall be made when Dispute arises between the Parties.

Sub-Clause	Data to be Given	Data
21.1	the DAAB shall comprise	_____ *[insert either "a sole Member" or "Three Members"]* *[For a Contract estimated to costabove PKR 2.5 billion, the DAAB shall comprise of three members. For a Contract estimated to cost between PKR 1 billion and PKR 2.5 billion, the DAAB may comprise of three members or a sole member. For a Contract estimated to cost less than PKR 1 billion, a sole member isrecommended.]*
21.1	List of proposed members of DAAB 24 proposed by Employer 25 proposed by Contractor	*[to be inserted at the time of signing of the Contract]* 1._____ 2._____ 3._____ 1._____ 2._____ 3._____
21.2	Appointing entity (official) for DAAB members	Chairman Pakistan Engineering Council (PEC) from the list of PEC approved arbitrators published at its website
21.6	Rules of Arbitration	PEC Rules of Conciliation and Arbitration or Pakistan Arbitration Act of 1940, if the former is inactive. The place of Arbitration shall be in the Employer's country: _____ *[Insert name of city]*

Particular Conditions

Part B - Special Provisions

1.1 Definitions

1.1.76 "Specification"

Following is added at the end:

"and consists of two parts i.e.,

i) "Part A - Specific Provisions"; and

ii) "Part B - Technical Provisions"."

1.2 Interpretation

"and" is deleted from the end of sub-paragraph (i) and added at the end of sub-paragraph (j).

Sub-paragraph (k) is added:

"(k) The word "tender" is synonymous with "bid" the word tenderer with "bidder", the words "tender documents" with "bidding documents" and "Schedule of Prices" with "Bill of Quantities", as applicable."

1.5 Priority of Documents

The documents listed at (a) through (k) of this Sub-Clause are deleted and substituted with the following:

(a) the Contract Agreement;
(b) the Letter of Acceptance;
(c) the Letter of Bid;
(d) the Particular Conditions Part A - Contract Data;
(e) the Particular Conditions Part B - Special Provisions;
(f) the General Conditions;
(g) the Specification Part A - Specific Provisions;
(h) the Specification Part B - Technical Provisions;
(i) the Drawings;
(j) the completed Schedules to Bid including Bill of Quantities;
(k) the JV Undertaking (if the Contractor is a JV); and
(l) any other documents forming part of the Contract.

The addenda/corrigenda, if any, shall be deemed to have been incorporated at the appropriate places in the documents forming the Contract.

1.6 Contract Agreement

In the last line of the 1st paragraph the text "shall be borne by the Employer" is substituted by "shall be reimbursed by the Employer to the Contractor".

3.1 The Engineer

In sub-paragraph (a) the text "as defined in the Pakistan Engineering Council Act, 1975 (Act No. V of 1976)" are added after the words "professional engineer".

3.2 Engineer's Duties and Authority

The Engineer shall obtain the consent in writing of the Employer before taking action under the following Sub-Clauses of these Conditions:

(a) Consenting to the subcontracting of any part of the Works

under Sub-Clause 5.1 [Subcontractors]

(b) Any action under Sub-Clauses 8.9 [Employer's Suspension] and 8.12 [Prolonged Suspension]

(c) Issuance of "Taking Over Certificate" under Sub-Clause 10.1 [Taking Over the Works and Sections].

(d) Issuing the "Performance Certificate" under Sub-Clause 11.9 [Performance Certificate].

(e) Sub-Clause 13.1 [Right to Vary]: instructing a Variation, except;

  (i) in an emergency situation as determined by the Engineer, or

  (ii) if such a Variation would increase the Accepted Contract Amount by less than the percentage specified in the Contract Data.

(f) Sub-Clause 13.3 [Variation Procedure]: approving a proposal for Variation submitted by the Contractor in accordance with Sub-Clause 13.3.2 [Variation by Request for Proposal] or 13.2 [Value Engineering].

(g) Certifying release of second half of the Retention Money under Sub-Clause 14.9 [Release of Retention Money].

(h) Issuing Final Payment Certificate under Sub-Clause 14.13 [Issue of FPC].

Any such requirement shall not be applied to any action by the Engineer under Sub-Clause 3.7 [Agreement or Determination], as stated in Sub-Clause 3.2 [Engineer's Duties and Authority] of the General Conditions.

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 the Works or of 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.

Following is added after the words "the Employer's consent is required" in 4th paragraph:

"stating that the Employer's consent has been obtained for that specified authority"

4.2 Performance Security

4.2.1 Contractor's Obligations

The entity issuing the Performance Security and its form shall be as under:

The Performance Security shall be, at the option of the Contractor, issued in the prescribed form included in the Bidding Documents, by a Scheduled Bank in Pakistan.

In case of Joint Venture, the Performance Security shall be in the name of the Joint Venture or in the name of Lead/either firm of the JV or in ratio of shares of the individual JV partners.

Following paragraph is added at the end of this Sub-Clause:

"The amount of Performance Security shall be reduced to 50% following issue of the Taking-Over Certificate for the whole of the Works under Clause 10 of Conditions of Contract."

4.3 Contractor's Representative

In second paragraph the text "professional engineer as defined in the Pakistan Engineering Council Act, 1975 (Act No. V of 1976) (having temporary licence in case of foreign engineer under Section 12 of the Pakistan Engineering Council Act, 1975 (Act No. V of 1976)" are added after the words "qualified, experienced".

In the 3rd paragraph the words "28 days" are substituted by "14 days". In 2nd line of 4th paragraph the text "or appoint a replacement" is substituted by "except appointment of a suitable temporary replacement is deployed at the Site"

4.4 Contractor's Documents

4.4.2 As-Built Records

First paragraph is deleted and the text in the last paragraph is substituted with the following:

"The Contractor shall furnish to the Engineer 6 copies, one reproducible and one electronic copy (provided the Engineer has made available to the Contractor editable form of the Drawings) of all Drawings amended to conform to the Works as built. In case the Engineer does not make available to the Contractor editable form of the Drawings, the Contractor shall furnish to the Engineer as-built data for incorporation in the Drawings. Upon receipt of PDF versions of the as-built drawings prepared by the Engineer, the Contractor shall furnish to the Engineer 6 copies and one reproducible of these Drawings.

The price of such Drawings shall be deemed to be included in the Contract Price."

Following Sub-Clause is added:

4.4.4 Shop Drawings

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

Review and approval by the Engineer shall not exceed 21 days and be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory and the Engineer's review or approval shall not relieve the Contractor of any of his responsibilities under the Contract.

4.8 Health and Safety Obligations

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

In the event of work being carried out outside the normal working hours and 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.

4.20 Progress Reports

At the end of sub-paragraph (g) the word "and" is deleted and at the end of sub-paragraph (h) the full stop (.) is replaced with ";", and the following new sub-paragraphs are added as:

(i) planned programme for the execution of the Works for next 56 days to enable the Engineer to determine its programme of inspection and testing;

(j) monthly summery of daily job record indicating weather conditions, deployment of Contractor's Equipment, labour employment, local material procurement and material import, if any; and

(k) salient contractual and project information.

5.1 Subcontractors

Add the following text at the end of paragraph (ii):

"under Schedule to Bid"

The following is added at the end of the last paragraph of Sub-Clause 5.1:

"All subcontracts relating to the Works shall include provisions which entitle the Employer to require the subcontract to be assigned to the Employer under sub-paragraph (a) of Sub-Clause 15.2.3 [*After Termination*].

The Contractor shall give reasonable opportunity to contractors from Islamic Republic of Pakistan for subcontracts for the Works, and endeavour to employ such contractors as Subcontractors."

5.2 Nominated Subcontractors

5.2.2 Objection to Nomination

In sub-paragraph (c), "and" is deleted from the end of (i);

"." at the end of (ii) is replaced with: ", and".

The following is then added as (iii):

"(iii) be paid only if and when the Contractor has received from the Employer payments for sums due under the Subcontract referred to under Sub-Clause 5.2.3 [*Payment to nominated Subcontractors*]."

6.1 Engagement of Staff and Labour

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

"The Contractor shall, to the extent practicable and reasonable, employ staff (not less than 50%) and labour (not less than 85%) with appropriate qualifications and experience from sources within the Islamic Republic of Pakistan."

6.7 Health and Safety of Personnel

The existing text is substituted with the following:

"In order to provide for the safety, health and welfare of persons, and for prevention of damage of any kind, all operations for the purposes of or in connection with the Contract shall be carried out in compliance with the Safety Requirements of the Government of Pakistan with such modifications thereto as the Engineer may authorize or direct and the Contractor shall take or cause to be taken such further measures and comply with such further requirements as the Engineer may determine to be reasonably necessary for such purpose. The Contractor shall also provide all other medical services and appoint a health and safety officer at Site if stated in the Specifications. In case of any fatality or serious accident, the Contractor shall, in addition, notify the Engineer immediately by the quickest available means."

6.8 Contractor's Superintendence

Insert at the end of sub-paragraph (a) of this Sub-Clause:

"or, if not, the Contractor shall make competent interpreters available during all working hours, in a number sufficient for those persons to properly perform their superintendence duties"

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

"The Contractor's authorized representative and his other engineers working at site shall possess valid registration with the Pakistan Engineering Council.

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

6.12 Key Personnel

The following is inserted at the end of the last paragraph:

"If any of the Key Personnel are not fluent in this language, the Contractor shall make competent interpreters available during all working hours in a number deemed sufficient by the Engineer."

The following Sub-Clauses 6.13 to 6.26 are added at the end of Sub-Clause 6.12:

6.13 Foreign Personnel

The Contractor may bring in to the Country any foreign personnel who are necessary for the execution of the Works to the extent allowed by the applicable Laws. The Contractor shall ensure that these personnel are provided with the required

residence visas and work permits. The Employer will, if requested by the Contractor, use all reasonable endeavours in a timely and expeditious manner to assist the Contractor in obtaining any local, state, national, or government permission required for bringing in the Contractor's personnel.

The Contractor shall be responsible for the return of these personnel to the place where they were recruited or to their domicile. In the event of the death in the Country of any of these personnel or members of their families, the Contractor shall similarly be responsible for making the appropriate arrangements for their return or burial.

6.14 Supply of Foodstuffs The Contractor shall arrange for the provision of a sufficient supply of suitable food as may be stated in the Specification at reasonable prices for the Contractor's Personnel for the purposes of or in connection with the Contract.

6.15 Supply of Water The Contractor shall, having regard to local conditions, provide on the Site an adequate supply of drinking and other water for the use of the Contractor's Personnel.

6.16 Measures against Insect and Pest Nuisance The Contractor shall at all times take the necessary precautions to protect the Contractor's Personnel employed on the Site from insect and pest nuisance, and to reduce the danger to their health. The Contractor shall comply with all the regulations of the local health authorities, including use of appropriate insecticide.

6.17 Alcoholic Liquor or Drugs The Contractor shall not, otherwise than in accordance with the Laws of the Country, import, sell, give, barter or otherwise dispose of any alcoholic liquor or drugs, or permit or allow importation, sale, gift, barter or disposal thereto by Contractor's Personnel.

6.18 Arms and Ammunition The Contractor shall not give, barter, or otherwise dispose of, to any person, any arms or ammunition of any kind, or allow Contractor's Personnel to do so.

6.19 Festivals and Religious Customs The Contractor shall respect the Country's recognized festivals, days of rest and religious or other customs.

6.20 Funeral Arrangements The Contractor shall be responsible, to the extent required by local regulations, for making any funeral arrangements for any of its local employees who may die while engaged upon the Works.

6.21 Forced Labour The Contractor, including its Subcontractors, shall not employ or engage forced labour which consists of any work or service, not voluntarily performed, that is exacted from an individual under threat of force or penalty, and includes any kind of involuntary or compulsory labour, such as indentured labour, bonded labour or similar labour-contracting arrangements.

6.22 Child Labour The Contractor, including its Subcontractors, shall not employ or engage child labour in accordance with relevant law(s) in force in Islamic Republic of Pakistan.

6.23 Employment Records of Workers

The Contractor shall keep complete and accurate records of the employment of labour at the Site. The records shall include the names, ages, genders, hours worked and wages paid to all workers. These records shall be summarized on a monthly basis and submitted to the Engineer. These records shall be included in the details to be submitted by the Contractor under Sub-Clause 6.10 [*Contractor's Records*].

6.24 Workers' Organizations

The Contractor shall comply with the relevant labour laws of Pakistan which recognize workers' rights to form and to join workers' organizations/Trade Union of their choosing and to bargain collectively without interference.

6.25 Non-Discrimination and Equal Opportunity

The Contractor shall not make decisions relating to the employment or treatment of Contractor's Personnel on the basis of personal characteristics unrelated to inherent job requirements. The Contractor shall base the employment of Contractor's Personnel on the principle of equal opportunity and fair treatment, and shall not discriminate with respect to any aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, job assignment, promotion, termination of employment or retirement, and disciplinary practices.

Special measures of protection or assistance to remedy past discrimination or selection for a particular job based on the inherent requirements of the job shall not be deemed discrimination. The Contractor shall provide protection and assistance as necessary to ensure nondiscrimination and equal opportunity, including for specific groups such as women, persons with disabilities, migrant workers and children (of working age in accordance with Sub-Clause 6.22).

6.26 Epidemics

In the event of any out-break of illness of 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 overcoming the same.

7.7 Ownership of Plant and Materials

The following is added before the first paragraph:

"Except as otherwise provided in the Contract,"

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

"No Plant and/or Materials that is the property of the Employer shall be removed from the Site. If it becomes necessary to:

(i) remove any item of such Plant from the Site for the purposes of repair, the Contractor shall give a Notice, with reasons, to the Engineer requesting consent to remove the defective or damaged item off the Site. This Notice shall clearly identify the item of defective or damaged Plant, and shall give details of: the defect or damage to be repaired; the place to which defective or damaged item of Plant is to be taken for repair; the transportation to be used (and insurance cover for such transportation); the proposed

inspections and testing off the Site; and the planned duration required before the repaired item of Plant shall be returned to the Site. The Contractor shall also provide any further details that the Employer may reasonably require; or

(ii) replace any item(s) of such Plant and/or Materials, the Contractor shall give a Notice, with reasons, to the Engineer clearly identifying the item(s) of Plant and/or Materials to be replaced, and giving details of the due date of delivery to the Site of the replacement item(s).

Where any item of Plant and/or Materials has become the property of the Employer under this Sub-Clause before it has been delivered to the Site, the Contractor shall ensure that such an item is not moved except for its delivery to the Site.

The Contractor shall indemnify and hold the Employer harmless against and from the consequences of any defect in title or encumbrance or charge (except any reasonable restriction arising from the intellectual property rights of the manufacturer or producer) on any item of Plant and/or Materials that has become the property of the Employer under this Sub-Clause."

The following Sub-Clause 7.9 is added after Sub Clause 7.8:

7.9 Use of Pakistani Materials and Services

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

8.1 Commencement of Works

The following is added before the first paragraph:

"After signing of the Contract Agreement by both Parties," and thereafter the word "The" is replaced with the word "the".

8.5 Extension of Time for Completion

The following is added after paragraph (c):

"for last five years".

The following Sub-Clause 8.14 is added after Sub-Clause 8.13:

8.14 Incentives For Early Completion

If Contract Data does not state applicability of incentives for early completion, this Sub-Clause shall not apply.

The Contractor shall be entitled subject to Sub-Clause 20.2 [*Claims for Payment and/or EOT*] to bonus payment if the Works and/or each Section is completed earlier than the Time for Completion for the Works or Section (as the case may be). The amount of bonus for early completion of the Works and/or each Section shall be upto a limit and at a rate to 50% of the relevant limit and rate of delay damages prescribed in Contract Data and shall be paid for every day which shall elapse between the relevant Date of Completion of the Works or Section and the relevant Time for Completion. For the purposes of calculating any bonus payment, the applicable Time for Completion stated in the Contract Data is fixed and no adjustments of this time by reason of granting an EOT will be allowed.

The following Sub-Clause 11.12 is added after Sub-Clause 11.11:

11.12 Supervisory Assistance During DNP

If provided under the Schedule of Prices, the Contractor shall provide supervisory assistance to the Employer during the DNP for the Works. Such supervisory assistance shall be as described in the Specification for the purpose of supporting the Employer's operation and maintenance of the Plant for the period specified in the Schedule of Prices after the Date of Completion.

12.2 Method of Measurement

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

"Summary of measured quantity for payment shall be delineated item-wise under four heads namely; "Schedule of Prices Quantity", "Quantity Executed To-date", "Quantity Certified Previously" and "Net Quantity Executed under this Certificate".

12.3 Valuation of the Works

The following text is added at the end of fifth paragraph of the Sub-Clause:

"Sum of overhead charges and profit for sub-paragraph (a) shall be Twenty Five percent (25%)".

13.4 Provisional Sums

The following paragraph is inserted as the penultimate paragraph:

"The Provisional Sum shall be used to cover the Employer's share of the DAAB members' fees and expenses, in accordance with Clause 21. No prior instruction of the Engineer shall be required with respect to the work of the DAAB. The Contractor shall submit the DAAB members' invoices and the satisfactory evidence of having paid 100% of such invoices as part of the substantiation of those Statements submitted under Sub-Clause 14.3.

13.6 Adjustments for Changes in Laws

The following paragraphs are added at the end of the Sub- Clause:

"Notwithstanding the foregoing, the Contractor shall not be entitled to an extension of time if the relevant delay has already been taken into account in the determination of a previous extension of time and such Cost shall not be separately paid if the same shall already have been taken into account in the indexing of any inputs to the Table of Adjustment Data in accordance with the provisions of Sub-Clause 13.7 [*Adjustments for Changes in Cost*]."

14.1 The Contract Price

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

"Notwithstanding the provisions of subparagraph (b), Contractor's Equipment, including essential spare parts, 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 initial importation, provided the Contractor shall post with the customs authorities at the port of entry an approved re-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 the event the Contractor's Equipment is not re-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 re-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 re-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 re-exported; and (b) on the initial imported value of the 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."

[The Employer may change or delete this Sub-Clause as per Project requirements]

14.2 Advance Payment

14.2.1 Advance Payment Guarantee

The entity issuing the Advance Payment Guarantee and its form shall be as under:

The Advance Payment Guarantee shall be in the form of Guarantee issued by a Scheduled Bank in Pakistan. In case of Joint Venture, the Advance Payment Guarantee(s) shall be in the name of the Joint Venture or in the name of Lead/either firm of the JV or in ratio of shares of the individual JV partners.

14.2(a) Secured Advance on Materials

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

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

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

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

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

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

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

(b) The recovery of Secured Advance paid to the Contractor under the above provisions shall be effected from the monthly payments on actual consumption basis.

14.6 Issue of IPC

14.6.1 The IPC

In the first line of the 1st paragraph the words "28 days" are substituted by "14 days".

14.7 Payment

The words "or through crossed cheque in favour of the Contractor or JV partners. The Payment to JV partners shall be made at the request of the Joint Ventures in the ratio of their shares specified by them" are added at the end of the Sub-Clause.

14.8 Delayed Payment

In the first paragraph, third line, the words "compounded monthly" are deleted.

The text of 2nd paragraph is deleted and substituted with the following:

"The Employer shall pay to the Contractor compensation at the rate stated in the Contract Data."

15.2 Termination for Contractor's Default

15.2.1 Notice

Following text is added at the end of sub-paragraph (h) of this Sub-Clause:

"For the purposes of this Contract, corrupt and fraudulent practices have been defined in Public Procurement Rules 2004."

15.2.3 After Termination

The word "and" at the end of sub-paragraph (ii) of paragraph (b) is deleted the following paragraph is added after sub-paragraph (iii):

"(iv) all Employer-Supplied Materials and/or Employer's Equipment made available to the Contractor in accordance with Sub-Clause 2.6 *[Employer-Supplied Materials and Employer's Equipment],* and"

15.4 Payment after Termination

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

"The Employer shall be entitled to sell any of the Contractor's Equipment, Temporary Works and unused materials and apply the proceeds of sale towards payment of any debt due from the Contractor to the Employer under this Clause including any outstanding payments to the Subcontractors.

16.2 Termination by Contractor

16.2.1 Notice

The sub-paragraph (j) is deleted in its entirety.

At the end of sub-paragraph (i) "; or" is replaced with "." and at the end of sub-paragraph (h) ";" is replaced with "; or".

In sub-paragraph (f) "84 days" are replaced with "180 days" and text "for reasons not attributable to the Contractor" is added at the end.

16.3 Contractor's Obligations After Termination

Sub-paragraph (c) is deleted and replaced with:

"(c) deliver to the Engineer all Employer-Supplied Materials and/or Employer's Equipment made available to the Contractor in accordance with Sub-Clause 2.6 *[Employer-Supplied Materials and Employer's Equipment];* and

(d) remove all other Goods from the Site, except as necessary for safety, and leave the Site."

17.1 Responsibility for Care of the Works

After the two instances of "Goods" in the last paragraph, the words "Employer-Supplied Materials and/or Employer's Equipment" are added.

The following Sub-Clause 17.7 is added after Sub-Clause 17.6:

17.7 Use of Employer's Accommodation/ Facilities

The Contractor shall take full responsibility for the care of the items of the Employer's facilities and/or accommodation, if any, as detailed in the Specification, from the date of use and/or occupation by the Contractor until the date on which such use and/or occupation is re-vested in the Employer.

If any loss or damage happens to any of the above items during a time while the Contractor is responsible for its care, arising from any cause other than a cause for which the Employer is responsible or liable, the Contractor shall promptly rectify the loss or damage at the Contractor's risk and cost.

18.1 Exceptional Events

The words "or disorder" are replaced with " disorder or sabotage" in sub-paragraph (c) of the Clause.

18.4 Consequences of an Exceptional Event

The following is added at the end of sub-paragraph (b) after deleting the ".":

", including the costs of rectifying or replacing the Works and/or Goods damaged or destroyed by Exceptional Events, to the extent they are not indemnified through the insurance policy referred to in Sub-Clause 19.2 [*Insurance to be provided by the Contractor*]."

18.5 Optional Termination

In sub-paragraph (c), the words "and necessarily" are added after the words "was reasonably".

19.1 General Requirements

Following text is added at the end of first paragraph:

"The Contractor shall immediately after the date of the Letter of Acceptance submit the draft of insurance policies for the Employer's consent."

Following text is added at the end of third paragraph:

"The Contractor shall, within the respective periods stated in the Contract Data submit to the Engineer and the Employer a) evidence that the insurances described in this Clause have been effected, and b) copies of policies of the insurances described in Sub-Clauses 19.2.1, 19.2.4 and 19.2.5."

19.2 Insurance to be provided by the Contractor

19.2.5 Injury to employees

The words "sickness, disease" are deleted in the third line of first paragraph.

The following Sub-Clause is added after Sub-Clause 19.2.6:

19.2.7 Insurance Company

"The Contractor shall be obliged to place all insurances described in this Clause with insurers listed in the Contract Data and rated by PACRA/VIS of rating as provided in Table below:

Accepted Contract Amount (In Eq. million PKR)	Minimum Rating of Insurance Companies
Up to 1000	A (+)
1001 to no limit	AA

21.6 Arbitration

The word "international" is deleted in the sixth line of first paragraph. The text of sub-paragraph (a) is substituted with the following:

"the Dispute shall be finally settled under the Rules of Arbitration, specified in the Contract Data;"

The following Clauses are added after Clause 21

22 Custom Duty

[*Employer may incorporate provisions where applicable. However, in order to make the bid more balanced, the payment of Customs Duties should be the responsibility of the Employer.]*

23 Taxes

The Contractor, Subcontractors and their employees shall be liable to pay income tax, withholding tax, super tax and other taxes on income arising out of the Contract. The rates and prices as stated in the contract shall be deemed to cover all such taxes.

24 Integrity Part

If it is found and established at any stage that the Contractor or any of his Subcontractors, agents or servants have violated or involved in violation of the Integrity Pact signed by the Contractor then the Employer shall be entitled to :

(a) recover from the Contractor an amount equivalent to ten times the sum of any commission, gratification, bribe, finder's fee or kickback given by the Contractor or any of his Subcontractors, agent or servants;

(b) terminate the Contract; and

(c) recover from the Contractor any loss or damage to the Employer as a result of such termination or of any other corrupt business practices of the Contractor or any of his Subcontractors, agent or servants.

The termination under sub-paragraph (b) of this Sub-Clause shall proceed in the manner prescribed under Sub-Clause 15.1 to 15.4 and the payment under Sub-Clause 15.4 shall be made after having deducted the amounts due to the Employer under sub-paragraph (a) and (c) of this Sub-Clause.

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DEVELOPMENT OF SINDH MADRESSATUL ISLAM UNIVERSITY (SMIU) CAMPUS AT EDUCATION CITY MALIR, KARACHI (Water Supply System including Tube Wells)

Tender Document

Volume-II

Technical Specifications

EA Consulting Pvt Ltd

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1 EXCAVATION

1.1 EXCAVATION – GENERAL

The Contractor shall remove the whole of the vegetation, top soil, concrete, flagging, paving, and 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 of at once and not left on the surface within the site.

The major work for excavation involved in borrows pits indicated on drawings or otherwise proposed by the Contractor. The Contractor shall carryout 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 whether 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.

The Contractor is to examine the Site and to familiarize himself with the nature of the ground. Claims due to lack of knowledge of site condition will not be entertained. The Contractor shall not install pipelines, manholes or commence any permanent works until the Engineer has inspected and accepted the excavation, trenches and preparation of formation level. The Contractor shall submit for the Engineer's approval the proposed support of excavations where required and trenches at least 2 weeks prior to the commencement of any excavation work. The contractor shall excavate further if on reaching the specified levels, the inspected exposed ground, or part of the ground is considered naturally unstable by the Engineer or became unacceptable due to exposure to weather conditions or due to flooding or have become puddle, soft or loose during the progress of work.

Replace the further excavation with concrete or with such materials as the Engineer may direct.

1.2 EXCAVATION – PIPELINES

1.2.1 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.

1.2.2 The quantity of excavation shall be the volume of materials removed from below the original surface of the ground, or from the final level attained after cut, to the limits of excavation specified or shown on the drawings. For soft and unstable soils, the Contractor shall provide adequate side supports or may take any other measures to prevent soil from collapsing. The cost of supply of all material, plant and labor necessary for site clearance, excavation, side support, over break, 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. Sides of 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.

1.2.3 Any excavation done in excess of specified width due to any reason whatsoever shall not be paid.

1.2.4 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.

1.2.5 The length of the trench shall be measured along the centreline of the trench and the depth shall be measured vertically for original ground level, or level attained after Cut to the average bed level

1.2.6 Excavated material that is not required or is, in the opinion of the Engineer, unsuitable for re-use in the work shall be disposed to an approved location. The contractor shall give the Engineer adequate notice of his intention of spoil. Subject to any specific requirement of the contract the disposal of excavated material within the site shall be at the contractor's discretion but shall be so arranged as to be acceptable to the Engineer.

1.2.7 The contractor shall ensure that no excavated material, which is suitable for and is required for re-use in the works, is disposed of outside the site without written approval of the Engineer.

1.2.8 The Contractor shall stockpile materials on site as approved by the Engineer. Surface water shall be directed away from stockpile site to prevent erosion or deterioration of materials. Any excavated material stored on site for backfilling or any other purpose shall be deposited and compacted in such a manner that will avoid damage or inconvenience. Embankments and stockpiles shall be sloped to angle of repose or less until shored.

1.3 DEWATERING

Where dewatering is required, the Contractor shall provide qualified and experienced crew to perform the dewatering operation, or furnish the services of a dewatering subcontractor approved by the Engineer to design and operate the dewatering works.

The Contractor shall control the grading in the vicinity of site of work in order to prevent any water from running into the excavated areas. He shall keep dry all pits and trenches during construction and all de- watering and pumping out whether due to ground water seepage or otherwise, shall be included in the rates as quoted by the Contractor for dewatering. The method employed in all cases shall be approved and agreed by the Engineer or his Representative.

Any data if provided by soil reports are for the Contractor's guidance only and it shall be the Contractor's sole responsibility to obtain further details

required by him for preparing his tender. No claim shall be entertained for additional costs or extension of time that may result from lack of information.

The Contractor shall provide such drainage outlet ditches or canals as may be necessary to affect proper drainage before rain is expected. Such drainage ditches or canals for protection of work during construction and their maintenance and clearing to make them continuously effective during the work shall not be separately, but shall be deemed to be included in other items of work.

The Contractor shall also provide, fix maintain and operate such engines, pumps, hoses, chutes and other appliances as the necessary to keep the accumulated water at a level required and as directed by the Engineer. The Contractor shall not remove any dewatering systems without the Engineer's acceptance.

The measurement and payment of dewatering shall be made separately according to the units mentioned in bill of quantities.

1.4 PROTECTION OF UTILITY SERVICE

1.4.1 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. All trench excavation and other work carried out within the limits of any roadway shall be completed as rapidly as possible and not more than half the width of the carriage way shall be obstructed at one time. Cutting of asphalt or concrete paving shall be carried out by saw to achieve neat edge at the cut. Cutting by compressor and breakers is not permitted. The alignment of the cut shall be straight. In case deviations occur then the cutting shall be repeated until the edge of the cut is acceptable to the Engineer.

1.4.2 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.

1.4.3 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.

1.5 MEASUREMENT AND PAYMENT

The measurement and payment for different categories of earth excavation inclusive of disposal of surplus earth 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 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 slopes duly 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.

Payment for dewatering shall be made separately in accordance with BOQ.

1.5.1 Measurement

Measurement, for excavations of trenches, for pipelines, of specified purpose, will be made in the specified units, of theoretical volume of unclassified excavation, acceptably carried out, on the basis of the dimensions, for the neat excavation finish lines, in accordance with the Drawings or directions of the Engineer.

1. Any excavation carried out outside the limits, shown on Drawings or otherwise specified or directed by the Engineer, shall not be measured and shall not be paid for.

2. Maximum widths of trenches, allowed for measurement and payment, for disposal line, will be 2.1 meters.

1.5.2 Payment

Payment for excavations of trenches, for pipelines, of specified purpose, will be made for the respective quantities of these items, measured in according to the above measurement, at the unit rates, tendered in the priced Bill of Quantities.

Rate: The unit rates tendered, for excavations of trenches, for pipelines, of specified purpose, shall be deemed to be inclusive of, but not limited to the following:

a. All operations related with transportation, involved in the process.
b. All operations related with storage of materials.
c. All sorts of wastages.
d. All operations including:

i. Excavation
ii. Protection, preservation and maintenance of excavations
iii. Stock piling of excavated materials, suitable for backfilling
iv. Disposal of surplus and/or unsuitable excavated material and filth and garbage
v. Maintenance, protection and repairs, of the works
   a) Design, provision, construction, maintenance and removal of all the requisite temporary works like bridges and detours for the traffic.
   b) Design, provision, construction, maintenance and removal of the requisite public protection and warning works like suitable barricades, flood lights, warning lights, signs and similar items.
   c) Protection of existing adjacent facilities like pavements, structures and utilities.
   d) Making good all damages
   e) Obtaining soil data and information
   f) Carrying out all sampling and testing
   g) All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.

2 BACKFILLING

2.1 GENERAL BACKFILLING

The work covered by this section of the specifications consists of furnishing all plants, equipment, appliances, labour and materials in performing all operations in connection with 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.

2.2 FILL, BACKFILLING AND RESTORING OF GROUND TO ORIGINAL CONDITION

Fill where required 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 rammers 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.

The Contractor shall verify that pipeline & chambers has been inspected. The Contractor shall identify and cut out soft areas of sub-grade not capable of compaction in place and shall backfill with approved fill and compact to density equal to or greater than requirements for sub sequent fill material.

The back filling of the trench shall be allowed after the effluent 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 AASHTO Standard.

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

2.3 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.

2.4 COMPACTION

Fill and/or backfill shall be compacted to a density of not less than 95% of the maximum density at optimum moisture as determined by 110 AASHTO 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.

2.5 REMOVAL OF EXCESS AND UNDESIRABLE MATERIALS

- Excess and undesirable material from excavation not require for fill or backfill shall be disposed of, removed and/or deposited and levelled on the site where directed by the Engineer. Earth suitable and meant for backfill if required shall be stored at site in a manner not to interfere with the progress of construction works in progress.
- The Contractor shall keep all excavated soil sprinkled with water during the excavation work so as to prevent any dust nuisance.

- All surplus soil arising out of the work shall be carried away to approved site within a week, deposited and spread as directed by the Engineer.
- The Contractor shall carry out the cutting of existing bituminous road as required for excavation for carrying out the work to the full depth of hard crust of any existing thickness. The stone metal soling etc. shall be separately stacked along the side of excavation for possible reuse.

2.6 EXECUTION

The Contractor shall commence backfilling of excavations as soon as practicable after the permanent works have been tested, inspected and accepted by the Engineer. Backfilling shall not be carried out without the consent of the Engineer. After compaction the surface shall be levelled longitudinally and transversely and rolled to achieve a uniformly compacted and even surface free from undulations, soft spots and depressions all within the accepted tolerances. Suitable material for backfilling shall be deposited and compacted in layers not exceeding 150mm thickness (measured before compaction) if compacted by hand. If compaction is carried out by mechanical means, the thickness of layers depends on the type of equipment employed and shall be approved by the Engineer. Supports if provided shall be carefully removed as the filling proceeds but the removal of such supports shall not relieve the Contractor of his responsibility for the safety and stability of the Works. Tranches shall be carefully backfilled and compact by hand the trench with selected excavated material free from large stones etc. to the following minimum levels above the crown of the pipe. Optimum moisture content of backfill materials shall be maintained to attain required compaction density.

2.7 MATERIAL

The soil material used for backfilling shall be as approved by the Engineer. The soil material shall be uniform, readily compactable soil and shall exclude material from swamps, marshes, vegetable matter, timber or similar material liable to decomposition, material susceptible to spontaneous combustion. Clay or soils having a plasticity index >9% or a liquid limit > 49% shall not be used. Proctor tests shall be carried out on the material to be used for backfilling prior to start of Backfill Operations in order to establish the Optimum Moisture Content and maximum compaction.

2.8 MEASUREMENT AND PAYMENT

2.8.1 Measurement

Measurement, for backfilling of trenches for pipe lines and inlet chamber will be made in the specified units, of theoretical volume of unclassified excavation, acceptably carried out, on the basis of the dimensions, for the neat excavation finish lines, in accordance with the Drawings or directions of the Engineer.

2.8.2 Payment

Payment for backfilling of trenches for pipe lines and inlet chamber will be made for the respective quantities of these items, measured in according to the above measurement, at the unit rates, tendered in the priced Bill of Quantities.

Rate: The unit rates tendered backfilling of trenches for pipe lines and; inlet chamber shall be deemed to be inclusive of, but not limited to the following:

a. All operations related with transportation, involved in the process
b. All operations related with storage of materials
c. All sorts of wastages
d. All operations including:
    i) Back-filling including placing, watering and compaction, of the back-filling materials
    ii) Final grading and levelling

3 PORTLAND CEMENT, AGGREGATES & WATER

3.1 PORTLAND CEMENT

3.1.1 General Requirements

a. Portland Cement shall be indigenous stuff unless otherwise approved by the Engineer.

b. Unless otherwise permitted, cement from not more than two plants shall be used and in general, the product of only one plant shall be used in any particular section of the work.

3.1.2 Specification

These specifications cover five types of Portland cement, as follows:

No.	Applicable Specifications		Application
	ASTM	BS	
a.	C150 (Type I)	BS 12	Ordinary Portland Cement: For use in general concrete construction when the special properties specified for Type II, III, IV and V are not required.
b.	C150 (Type II)	BS 1370	Moderate Heat Portland Cement: For use in general concrete construction exposed to moderate sulfate action, or when moderate heat of hydration is required.
c.	C150 (Type III)	BS 12	Rapid Hardening Portland Cement: For use when high early strength is required.
d.	C150 (Type IV)	BS 1370	Low Heat Portland Cement: For use when low heat of hydration is required.
e.	C150 (Type V)	BS 4027	Sulfate Resisting Portland Cement: For use when high sulfate resistance is required.

3.1.3 Packing and Marking

a. Cement shall be furnished in sacks or in bulk form, as approved by the Engineer.

b. Cement in sacks shall be delivered in strong, well made, paper or cloth bags, each plainly marked with the manufacturer's name, brand, type of cement and the weight of cement contained therein, except that, in the case of Type-I cement, the type need not be identified.

c. A bag shall contain 50 Kg. net.

d. When the cement is delivered in bulk; this information shall be contained in the shipping invoice, accompanying the shipment.

3.1.4 Inspection

The Contractor shall facilitate the Engineer, in all respects, for careful sampling and inspection, either at the mill or at the site of work, as may be specified by the Engineer. The following periods, in days, from the time of sampling shall be allowed for completion of testing.

- 1-day test 6
- 3-day test 8
- 7-day test 12
- 28-day test 33

3.1.5 Rejection

a. Cement may be rejected if it fails to meet any of the requirements of these specifications.
b. Cement remaining in bulk storage at the mill, prior to shipment, for a period greater than six months after completion to the tests, may be tested and may be rejected if it fails to conform to any of the requirements of these specifications.
c. Packages varying more than 3% from the weight marked thereon may be rejected and if the average weight of packages in any consignment as determined by weighing fifty packages taken at random, is less than that marked on the packages, the entire consignment may be rejected.
d. Packages received in broken or damaged condition shall be rejected or may be accepted only as fractional packages as determined by the Engineer.
e. Cement that is found to be adversely affected by moisture, as determined by the Engineer, shall be rejected.

3.1.6 Method of Sampling and Testing

a. The sampling and testing of Portland cement shall be in accordance with relevant BS or ASTM standard specifications.
b. Contractor shall carry out all tests on Portland cement, at his own cost, if required by the Engineer.

3.1.7 Transportation of Cement

Transportation of the cement from the mill to the site stores and to the point of use shall be accomplished in such a manner that the cement is completely protected from exposure to moisture.

3.1.8 Storage

a. Cement shall be stored in dry, weather tight and properly ventilated structures. All storage facilities shall be subject to approval and shall be such as to permit easy access for inspection and identification of each consignment.
b. The sacks should be stacked closely on a damp proof floor or on timber planks, raised by a minimum of 12" (300 mm), from the ground, with air space below. There should be similar air space between the stacks and walls.
c. To avoid bursting of bags and setting under pressure, the height of the stacks shall be limited 8 bags.
d. Adequate storage capacity shall be furnished to provide sufficient cement to meet the peak needs of the project.
e. Cement storage facilities shall be emptied and cleaned by the Contractor when so directed, however, the interval between required cleaning normally will not be less than four months.

3.1.9 Usage

a. The Contractor shall use cement in the approximate chronological order in which it is received at the site. All empty sacks shall be promptly disposed of as approved by the Engineer.
b. No cement stored through a monsoon, or for a period of more than six months, should be used, unless tests have been applied and cement found up to the requisite standard.

c. Suitable, accurate scales shall be provided by the Contractor for weighing the cement in stores and elsewhere on the work, if required, and he shall also furnish all necessary test weights.

3.1.10 Delivery and Usage Record

Accurate records of delivery of cement and its use in the works shall be kept by the Contractor. Copies of these records shall be supplied to the Engineer in such a form as he may require.

3.2 AGGREGATE

3.2.1 General Requirements

a. Aggregates for normal concrete shall conform to the requirements of ASTM Designation C 33 "Specifications for Concrete Aggregates".
b. In case the Contractor prefers to use aggregate from a source other than that approved by the Engineer; following tests shall be carried out, at the Contractor's cost, to determine suitability of the material for the intended use:
   i. Mechanical properties
   ii. Porosity
   iii. Organic impurities
   iv. Clay and Silt Contents
   v. Abrasion and Soundness Tests
   vi. Alkali Reactivity Potential
   vii. Water soluble Chloride Contents
c. The nominal maximum size of the aggregate shall not be larger than one fifth of the narrowest dimension of the finished wall or slab, or larger than three fourth of the minimum clear spacing between the reinforcing steel and embedment.

3.2.2 Nature of Aggregate

a) Fine Aggregate: The use of natural sand or a combination of natural and manufactured sands may be permitted, provided that the fine aggregate meets the applicable requirements of the specifications herein, for particular use intended.

b) Coarse Aggregate: Except where otherwise specified, coarse aggregate shall consist have crushed natural stone.

3.2.3 Source

The Contractor shall obtain concrete aggregate from deposits of natural sand and gravel or shall procure crushed aggregate from approved quarries, which produce aggregates meeting with the Specifications contained herein.

3.2.4 Sampling and Testing

a. The Contractor shall provide facilities, as may be necessary, for the ready collection of representative test samples, of the aggregates, to determine compliance with specifications.
b. The Engineer will obtain and test such samples, at the expense of the Contractor, using appropriate standard test methods, selected by the Engineer.
c. Testing of concrete aggregates by the Engineer shall not relieve the Contractor of his responsibility to maintain, control and ensure the production, stockpiling and handling of both fine and coarse aggregates, in accordance with these Specifications.

3.2.5 Aggregate Processing

a. General: All aggregates, as delivered to the mixer, shall consist of clean, hard, dense and durable and uncoated particles.
b. Light Weight Elements: Light weight elements, like chalk, clay and organic matter shall be separated by vibro-floatation process. Where required, fines shall be removed from the coarse aggregate by adequate washing.
c. Soft Particles
    i. The Contractor in planning his aggregate processing operations shall make necessary provisions, as regards methods and equipment, to ensure effective elimination of soft particles from all aggregates.
    ii. The percentage of soft particles present in the processed coarse aggregate shall not exceed 3 percent by weight, when determined in accordance with the applicable requirements of ASTM Designation C235 "Standard Method of Test for Scratch

Hardness of Coarse Aggregate Particles" or other standard test method, selected by the Engineer.

iii. Test Samples shall be representative of the each size group of processed coarse aggregate, as specified in Article 5.6, obtained according to the ASTM Methods D 75.

3.2.6 Grading Requirements

Compliance with the aggregate grading and uniformity requirements will be determined at the mixer. The aggregates, as delivered to the mixers, shall conform to the following specific grading requirements:

3.2.6.1 Fine Aggregates

- The grading of fine aggregate shall conform to the following requirements:

U.S. Standard Sieve Mesh	Percent Passing
0.375" (9.50 mm)	100
No.4 (4.75 mm)	95-100
No.8 (2.37 mm)	80-100
No.16 (1.18 mm)	50-85
No.30 (0.60 mm)	25-60
No.50 (0.30 mm)	10-30
No.100 (0.15 mm)	2-10

- Fineness modulus shall range between 1.9 and 2.78.
- The sand equivalent value, as determined by ASTM Designation D 2419, "Standard Test Method for Sand Equivalence Value of Soils and Fine Aggregate", shall not be less than 75.

3.2.6.2 Coarse Aggregate:

- The grading of the coarse aggregate, within the separated size groups, shall conform to the following requirements:

US Standard Sieve Size (Nominal Size)	**Percent by Weight Finer than Each Laboratory Sieve**			
	1/4"(6.25 mm) to No. 4 Group	**3/4"(19 mm) to No. 4 Group**	**1"(25 mm) to No. 4 Group**	**1.5"(37.5 mm) to No. 4 Group**

2.00" (50.00 mm)	-	-	-	100
1.50" (37.50 mm)	-	-	100	95-100
1.00" (25.00 mm)	-	100	95-100	-
0.75" (19.00 mm)	100	90-100	-	35-70
0.50" (12.50 mm)	90-100	-	25-60	-
0.375" (9.50 mm)	40-70	20-55	-	10-30
No. 4 (4.75 mm)	0-15	0-10	0-10	0-5
No. 8 (2.37 mm)	0-5	0-5	0-5	-

3.2.6.3 Particle Shape

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

3.2.7 Deleterious Substances

3.2.7.1 Fine Aggregate:

The maximum percentages of deleterious substances, in the fine aggregate, as delivered to the mixer, shall not exceed the following values, with sum of the percentages of all deleterious substances not to exceed 5 percent, by weight.

Substances	Percent of Weight
Material passing No. 200 sieve	3
Shale	1
Total of other deleterious substances including mica, chloride, coated grains and soft flaky particles	3

3.2.7.2 Coarse Aggregate:

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

Deleterious Substances	Percent of Weight
Material passing No. 200 sieve	1
Shale	1
Clay lumps	0.5
Other deleterious substances	1

3.2.8 Storage

a. Aggregate shall be stored, at the site, in such a manner as to prevent its deterioration or the inclusion of foreign matter.
b. Aggregate, which has deteriorated or which has been contaminated, shall not be used for concrete.
c. All methods employed by the Contractor for loading, unloading, handling and stock-piling aggregates shall be subject to the approval of the Engineer, at all times.

d. Sufficient aggregate shall be maintained at the site, at all times, to assure continuous placement and completion of any lift of concrete started.

3.2.9 Moisture Control

a. All fine aggregate and smallest size group of the coarse aggregate shall remain in free draining storage at the site for at least 72 hours, immediately prior to use.
b. The free moisture content of the fine aggregate and of the smallest size group of coarse aggregate, as delivered to the mixer, shall be controlled so as not to exceed 4% and 1% respectively, expressed as percent by weight, of the dry aggregates; unless higher limits are allowed by the Engineer.
c. In addition to the limits on the maximum amounts of free moisture in aggregate, the moisture content shall be controlled so that, for each size, the variation in the free moisture will not be more than 0.5 percent, during any one hour of mixing plant operation.
d. Coarse aggregates, with other sizes, as delivered to the mixers, shall have the least amount and least variation, of the free moisture contents, practicable under the job conditions.
e. Under no conditions shall the aggregate be delivered to the mixed plant being dripping wet.
f. The Contractor shall carry out such tests, at his own expense, as the Engineer may deem necessary, to determine the free moisture content of aggregate.

3.3 WATER

Water for mixing mortar shall be clean and free of mud, oil and injurious amounts of organic materials or the deleterious substances. Potable water shall be used.

3.3.1 Source

Water, for all construction purposes, shall be obtained from an approved source.

3.3.2 Quality

a) The water shall be clean and free from clay, silt and injurious amounts of oil, acid, alkali, salt, organic matter, or other deleterious

substance, likely to cause efflorescence or interfere with setting of mortars or otherwise be harmful to the work.

b) Water fit for drinking purpose shall be accepted as suitable for all construction purposes.

c) The water shall conform to the requirements of BS 3148, as to its suitability, for construction. It shall meet the following chemical requirements. All requisite water testing, in this regard, shall be carried out at the Contractor's Cost.

Substances	Permissible Levels
Chlorides	≤ 3000 mg/l
Sulfates	≤ 2000 mg/l
Impurities	≤ 2000 mg/l
pH Value	5 to 10

3.3.3 Storage

Water shall be stored in watertight tanks or containers, adequately protected from the admixture of dust and other foreign matter.

4 STEEL REINFORCEMENT

4.1 DESCRIPTION

The work, to be covered under this Section, shall include furnish, testing, cutting, bending and placing all steel reinforcement, as indicated on the Drawings or otherwise required.

4.2 MATERIALS REQUIREMENT

4.2.1 General

No steel shall be incorporated in the Work, without prior approval of the Engineer. All reinforcement shall be free from loose rust, scales and oil, grease or other coating, which might destroy or reduce its bond with the concrete.

4.2.2 Specifications

Concrete reinforcement bars shall be of following specifications, as shown in the Drawings and/or specified in Bill of Quantities:

a. Cold worked steel bars, conforming to BS 4461.
b. Grade 40 and Grade 60 steel bars, conforming to ASTM 615.
c. Hot rolled mild steel round bars, complying with BS 4449, with guaranteed yield strength of not less than 36000 psi.

4.2.3 Testing

The Contractor shall provide all measuring and testing facilities to ascertain quality, weight and quantity of steel, at his own expense and shall furnish manufacturers certificate, stating chemical composition of steel, if so directed by the Engineer.

4.3 BAR BENDING SCHEDULE

Where instructed by the Engineer, bar bending schedules, for the concrete reinforcement, shall be prepared, from the Drawings, by the Contractor, at his expense, and submitted, to the Engineer, for approval.

4.4 CUTTING AND BENDING

- Steel reinforcement may be mill or field cut and bent.
- All bending shall be in accordance with standard approved practices and methods.

- When bending is required, it shall be performed prior to embedding the bars in the concrete. In all such cases, the bars shall be cold bend.
- Bending or straightening of bars, partially, embedded in set concrete, shall not be permitted, except in isolated cases, where corrective action or a field change is required and is specifically approved by the Engineer.
- Bending hot at a cherry-red heat (not exceeding 840 degree centigrade) will be allowed for mild steel bars. Bars bent hot should not be cooled by quenching.

4.5 PLACING AND POSITIONING

- Reinforcement shall be placed and maintained, within the specified tolerance of its position, as shown on the Drawings.
- Welding of bars shall not be permitted, for assembly of reinforcement, unless authorized by the Engineer.
- The use of reinforcement, for the transmission of current, for welding will not be permitted.
- Where tying wires or clips are used, care should be taken to ensure that the projecting ends do not encroach into the concrete cover.
- All reinforcement shall be secured in place by use of metal or concrete supports, spacers, or tiles, as approved by the Engineer. Such supports shall be of sufficient strength to maintain the reinforcement in place, throughout the concreting operation.
- The supports shall be used in such a manner that they will not be exposed or contribute, in any way, to the discoloration or deterioration of the concrete.
- Concrete supports shall be manufactured of the same concrete mix, as used in the structure to be concreted.

4.6 RELATION OF BARS TO CONSTRUCTION SURFACES

The cover of all main reinforcement shall be as specified or shown on the Drawings. The actual concrete cover, to all steel, at any point, shall not be less than the required nominal cover by more than 3mm (1/8 inches).

4.7 SPLICING

Except as otherwise shown on the Drawings or directed by the Engineer, all splices, lengths of laps, splice locations, placement and embedment of reinforcement shall conform to the applicable requirements of American Concrete Institute 318, "Building Code Requirements for Reinforced

Concrete". If welded splices are proposed, welder of approved qualification and experience shall be employed, after obtaining approval of Engineer. Sufficient number of butt welds shall be tested, to failure, in each lot, to maintain a check on the quality, at the cost of the Contractor.

4.8 TOLERANCES

Following tolerances shall be observed:

4.8.1 Fabricating Tolerances

i.	Sheared length	+ 25 mm (1.00")
ii.	Depth of truss bars	+ 13 mm (0.50")
iii.	Outer dimensions of stirrups, ties, and spirals	+ 6 mm (0.25")
iv.	All other bends	+ 25 mm (1.00")

4.8.2 Placing Tolerances

i.	Clear distance to formed surface	+ 6 mm (0.25")
ii.	Minimum spacing between bars	- 6 mm (0.25")
iii.	Top bars in slabs and beams	
Members depth 200mm (8") or less		+ 6 mm (0.25")
Members depth 200 mm to 600 mm (8" to 24")		+ 13 mm (0.50")
iv.	Lengthwise of Members	+ 50 mm (2.00")

Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits or embedded items, subject to approval of the Engineer.

4.9 EMBEDMENT ITEMS

- Before placing concrete, care shall be taken to determine that all embedded items are properly placed and are firmly and securely fastened in place as indicated on the Drawings or as instructed by the Engineer.
- Embedded Items shall be free of oil and other foreign matter.

- The embedding of wood or other foreign materials in concrete is prohibited.
- All reinforcement, including dowels, remaining exposed in the work shall be suitably protected until embedded in concrete.

4.10 MEASUREMENT

- Measurement, for concrete reinforcement, will be made in the specified units of weight, of reinforcing steel, of specified quality, acceptably placed, on the basis of the lengths of bars, actually installed, in accordance with the Drawings or bar schedules or as directed.
- Following unit weights will be used for converting the length of bars, of different sizes, to determine the weight of concrete reinforcement, for the purpose of measurement:

Bar Designation	Unit Weight Kg/m (lb/ft.)	Bar Size (mm)	Unit Weight kg/m
# 2	0.249 (0.167)	8	0.395
# 3	0.560 (0.376)	10	0.616
# 4	0.994 (0.668)	12	0.888
# 5	1.553 (1.043)	16	1.579
# 6	2.236 (1.502)	20	2.467
# 7	3.043 (2.044)	22	2.984
# 8	3.975 (2.670)	25	3.854
# 9	5.061 (3.400)	28	4.834
# 10	6.406 (4.303)	32	6.313
# 11	7.909 (5.313)	36	7.990
# 14	11.388 (7.650)		
# 18	20.246 (13.60)		

- Overlaps, unless clearly shown in the Drawings or approved by Engineer, for the purpose of payment, shall not be measured and allowed.

4.11 RATE AND PAYMENT

- Payment for concrete reinforcement, of specified quality, will be made for the weight of reinforcement, computed in accordance with Article 10, at the unit rates, tendered in the priced Bill of Quantities.
- Contractor shall provide lengths of reinforcement, which are greater than those shown on the drawings or directed by the Engineer, no payment for extra lengths shall be made.
- The Contractor shall not claim for the difference in the actual weights of bars and their standard weights given in the Article 10.
- The unit rates tendered, for all items of reinforcement, shall be deemed to be inclusive of, but not limited to the following:

i. Providing reinforcement bars
ii. Providing M.S. binding wire and concrete, metal and plastic chairs, spacers and hangers, necessary to support the reinforcement.
iii. All sorts of transportation involved in the process
iv. All sorts of wastages
v. All operations including cleaning, cutting, bending, placing and fixing, in position, of reinforcement; binding with wire; and placing supports and spacers
vi. Preparing bar bending schedules
vii. Carrying out all sampling and testing
viii. All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.

5 BEDDING AND PIPE LAYING

5.1 SCOPE OF WORK

The work covered by this section of the specifications consists of providing Pipes and laying including furnishing of all plants, equipment, appliances labor and materials in performing all operations in connection with construction of water works.

5.2 ALIGNMENT AND GRADE

The Contractor shall follow the alignment and grade as given in the drawings approved by the Engineer.

5.3 PIPE LAYING

- All pipes shall be examined for defects before lowering in the trench. Defective or damaged pipes shall not be used. Pipes shall be handled carefully so as not to damage them in any way. Wide slings shall be used. The pipe shall be laid as per instruction of the manufacture and directions given below.
- Each pipe immediately before being laid shall be carefully brushed out and tested for soundless. Each pipe shall be laid accurately to line and levels so that except where horizontal and vertical deflection is required as per drawings or directions of the Engineer, the finished pipeline shall be in a straight-line both in horizontal and vertical planes. Pipes shall be laid upon an even bed of well compacted bed of granular material as shown in the drawing and specified for the full length of each pipe, extending for the full width of the trench and with sufficient material at the sides to permit the pipes being marked on the bed and firmly supported to true line and level. Sufficient space should be left to enable the field joints, tested and inspected but the Contractor shall ensure that at least three quarters of the pipe length is fully supported. After the pipeline has been tested and approved by the Engineer or his representative, the space left out at the joints should be carefully filled with granular or concrete bedding. Each pipe shall be laid in such a manner as to prevent the in-grass of sand, mud or other deleterious materials. The open ends of pipes shall be suitably protected at the end of each day's work or whenever a pipe end is left unattended, to prevent any foreign matter gaining access to the pipes.

5.4 BEDDING FOR PIPELINES

5.4.1 DESCRIPTION

This work shall consist of furnishing and placing all types of bedding, of specified materials, under and around pipes, in water, wastewater and rainwater pipelines, in accordance with these specifications and to the lines, grades and cross-sections shown on the Drawings and/or as directed by the Engineer.

5.4.2 MATERIALS REQUIREMENTS

- Materials for bedding shall be from an approved source.
- The materials, for bedding, shall be free from clay, salt, alkali, organic matter, shale, loam, soft flaky particles and other deleterious substances.
- It shall be stacked at the place designated by the Engineer and kept free from the admixture of deleterious materials.

5.4.3 CONSTRUCTION REQUIREMENTS

The material for bedding shall be placed to the specified thickness and shape and compacted by rammers of approved weight.

5.5 MEASUREMENT & PAYMENT

5.5.1 Measurement

Except where otherwise specified in the Bill of Quantities, measurement of bedding, for pipelines, will be made in the specified units of volume, of these materials, of specified quality, acceptably placed, on the basis of the dimensions, for the neat finish lines, in accordance with the Drawings or directions of the Engineer.

5.5.2 Payment

Payment for various types of bedding, for pipelines, of specified materials and quality, will be made for their respective quantities, measured in accordance with Article 4, at the unit rates, tendered in the priced Bill of Quantities.

5.5.3 Rate

The unit rates tendered, for various types of bedding, for pipelines, shall be deemed to be inclusive of, but not limited to the following:

a. Providing all materials
b. All sorts of transportation involved in the process
c. All sorts of wastages
d. All operations including stacking, cleaning, laying and compacting of bedding materials; and maintenance, protection and repairs, of the work
e. Carrying out all sampling and testing
f. All other operations, procedures and requirements necessary to complete the work in accordance with these specifications.

6 CONCRETE SURROUND FOR PIPES

- The pipes shall be encased in reinforced cement concrete of nominal mix 1:2:4 at Nullah or road crossings as per directions of the Engineer. The minimum thickness for the concrete surround shall be as shown in the drawings.
- The pipes shall be laid on a reinforced cement concrete bed of nominal mix 1:2:4 at locations where directed by the Engineer. The concrete shall be laid on well-compacted and levelled bed.
- The material used in the concrete, method used in mixing, laying and curing etc. of the concrete shall be as described under the section 5 "Concrete". The reinforcement steel has confirmed to the requirements given to Section 6 of reinforcement steel.

6.1 CONCRETE THRUST BLOCKS / ANCHORAGES

- Concrete thrust blocks and cradles shall be constructed of 1:2:4 cement concrete with strength of 3000 psi or as directed by the Engineer. Concrete thrust blocks of adequate sizes shown in drawing or directed by the Engineer shall be provided at all tees and bends.
- Thrust blocks shall be poured against proper formwork or against undisturbed earth where possible and approved by the Engineer. The concrete shall be cured for minimum 7 days by keeping the surface wet. All forms shall be removed prior to backfilling.

6.2 MEASUREMENT

Pipes shall be measured in linear meter, their lengths the net length of the pipe as laid, after deduction of the length of overlap at any joint to be made

with the pipe. Plain ended pipe shall be measured and paid by effective length as laid.

6.3 PAYMENT

Payment shall be made for the acceptably completed pipeline, granular bedding, pipe encasement and concrete thrust block laid in accordance with the specifications, drawings and directions of the engineer including all costs for labour, materials, transportation, handling, testing and disinfection complete at the approved BOQ rates.

7 HYDROSTATIC TESTS (Water supply System)

Hydrostatic tests shall be performed as per AWWA C-200-80 according to PN rating of pipe provided in BOQ.

a) The test pressure shall be held for not less than 15 Minutes

The test information shall be recorded on a suitable recording chart. The pipeline shall be manually cleaned of all debris, stones and sand prior to laying, jointing and hydraulic test. Pipeline and pipe work shall be subjected to hydraulic pressure tests in the presence of the Engineer. Such tests shall comply with BS 8010 or CP 312, unless otherwise specified. Testing shall be carried out in two stages.

b) Test of sections as construction proceeds.
c) A final test of the whole of the pipe work or pipeline on completion.

The Contractor shall provide all plant, equipment, and fittings etc. including water, necessary for the hydraulic test. He shall inform the Engineer, well in advance of the time for tests, details of his proposals including the supply of water, its source and method of conveyance. No connections to the pipeline or pipe work which would involve cutting, tapping or altering the Permanent Works, shall be allowed.

Test gauge shall be of approved manufacture having dials at least 200 mm diameter, graduated such that the test pressure is at least 75 % of the full scale reading. If necessary different gauges shall be supplied for different pipeline sections. Two gauges of each type shall be provide for the sole use of the Engineer and shall remain in the Engineer's possession for the duration of the Contract.

7.1 Test Procedure

Each section of the pipeline or pipe work to be tested shall be capped or blanked off at each end and securely strutted or restrained to 'withstand the forces that will be exerted when the test pressure is applied. Testing against closed valves will not be permitted. Hydrants, washout valves and isolation valves shall be fitted with blank flanges and these together with in-line valves shall be left open. Air valves already fitted shall be permitted to function during the test. The air valve manufacturer's confirmation shall be obtained that the valves are capable of withstanding the test pressure involved.

Proposals for testing where thrusts on structures are involved, even where thrust collars on the piping are installed, shall be submitted, with the calculations of the forces to be carried, to the Engineer for approval.

The Contractor's proposed method of filling the pipeline or pipework with water shall be approved by the Engineer. The sectional length under test shall be filled making certain that all air is displaced through an air valve installed at the high end of the line. The section shall then remain under constant pressure - 10 to 20 m head of water - for a period of several hours until the pressure can be maintained without additional pumping. Pipes of materials liable to absorb water, e.g. concrete lined pipes shall be allowed to become saturated under this moderate pressure for 24 hours.

The pressure shall then be slowly increased to the full test pressure and pumping discontinued for 3 hours or until the pressure has dropped by l0 m, whichever occurs earlier. Thereafter pumping shall be resumed and continued until the test pressure has been restored. The quantity of water pumped to restore the pressure shall be the measure of leakage from discontinuation of pumping until its resumption.

The pipe section shall pass the test if the leakage is not more than 0.35 litre per mm of pipe diameter per kilometre per 24 hours for each 100 m head of pressure applied.

Notwithstanding the satisfactory completion of the hydraulic test, if there is any discernible leakage of water from any pipe or joint the Contractor shall, at his own cost, replace the pipe, repair the pipe or re-make the joint and repeat the hydraulic test.

No pipeline shall be accepted until and unless the leakage of any section of the pipeline tested is not more than the rate of leakage specified above and all sources of discernible leakage have been rectified.

Pipelines shall be tested as above except where the Engineer issues such instructions as are necessary for testing parts of the Works that have been designed for stresses limited by consideration other than those applying to the pipeline system.

7.2 Test Pressure

Test pressure is to be measured at the centre of the blank flange situated at the lowest end of the pipeline under test. Unless otherwise specified or shown

on the drawing all pipelines and pipe work shall be tested according to PN provided in BOQ or as determined by the Engineer.

The contractor shall submit a schedule of pipeline test pressures to the Engineer for approval prior to commencing testing.

7.3 Sectional Hydraulic Test

The Sectional Hydraulic Test shall be carried out after the pipeline or pipe work section to be tested has been laid, jointed and backfilled to a depth sufficient to prevent flotation of the pipeline, but leaving the joints exposed. The sections to be tested shall be to the approval of the Engineer and shall be no longer than 1,000 m or above, when either the pipeline is laid adjacent to or underneath the carriageway. The joints between each tested section shall be left exposed until the pipeline has passed the Test on Completion:

7.4 HYDRAULIC TEST ON COMPLETION

The test on completion shall be carried out after all the pipeline or pipe valve sections have been joined together on completion of sectional testing. The joints between sections shall be backfilled once the test is satisfactorily completed.

7.5 DISINFECTION & CLEANING OF PIPE

7.5.1 Disinfecting Water Mains

Applicable procedures for disinfecting new and repaired potable water mains are presented in standards such as ANSI/ AWWA C651, Disinfecting Water Mains.(8) ANSI/ AWWA C651 or equivalents uses liquid chlorine, sodium hypochlorite, or calcium hypochlorite to chemically disinfect the main. Disinfecting solutions containing chlorine should not exceed 12% active chlorine, because greater concentration can chemically attack and degrade pipes

7.5.2 Cleaning

Pipelines operating at low flow rates (around 2 ft. /sec or less) may allow solids to settle in the pipe invert. HDPE has a smooth, non-wetting surface that resists the adherence of sedimentation deposits. If the pipeline is occasionally subject to higher flow rates, much of the sedimentation will be flushed from the system during these peak flows. If cleaning is required, sedimentation deposits can usually be flushed from the system with high pressure water.

Pressure piping systems may be cleaned with the water-jet process, or may be pigged. Pigging involves forcing a resilient plastic plug (soft pig) through the pipeline. Usually, hydrostatic or pneumatic pressure is applied behind the pig to move it down the pipeline. Pigging should employ a pig launcher and a pig catcher.

7.6 Payment for Testing, Disinfection and Cleaning of Pipelines

No separate payment will be made for pressure and leakage testing of pipelines for the supply of clean water and all necessary testing apparatus, pumps, gauges and pipe-works, the cost of supervision and labour in testing and retesting, if necessary and all other work, materials and equipment in complying with the requirements of testing of pipelines.

7.7 Measurement and Payment

Measurement and payment will be based on completed work performed in accordance with the drawings, specifications, and the contract payment schedules.

8 HDPE PIPES AND FITTINGS

8.1 HDPE PIPES FITTINGS AND ACCESSORIES

8.1.1 DESCRIPTION

The PS 3580:1984 PN-8, 10 & 12.5 & in trenches to correct alignment and grade, as indicated in the drawing and specifications including all other accessories and equipment.

8.1.2 SCOPE

This material specification details the minimum requirements for the design, manufacture, testing, inspection and supply of High Density Polyethylene (HDPE) or High Performance Polyethylene (HPPE) pipe material and fittings to be used for transport and potable water.

This specification is intended to be used for PN-08 and pipe series SDR 21. Contractor has to substantiate the reason when he is deviating from SDR 21 and has to get approval from the Engineer.

8.1.3 APPLICABLE STANDARDS AND CODES

The following codes and standards, to the extent specified herein, form a part of this specification. The latest edition of these codes and standards shall govern the work.

ISO 4427	Polyethylene (PE) pipes for water supply –specifications
ISO 161-1	Thermoplastic pipes for conveyance of fluids – nominal outside diameter and nominal pressure- part 1: Metric series
ISO 1167-1to4	Thermoplastic pipes, fittings and assemblies for the conveyance of fluids
ISO 3126	Plastic pipes – Measurement of dimensions
ISO 4065	Thermoplastic pipes – Universal wall thickness table
ISO 6964	Polyolefin pipes and fittings – Determination of carbon black content by calcination and pyrolysis – Test method and basic specification.
ISO 9080	Thermoplastic pipes for the transport of fluids – Method of extrapolation of hydrostatic stress rupture data to determine the long-term hydrostatic strength of thermoplastic pipe materials.
ISO 11922-1	Thermoplastic pipes for the conveyance of fluids – Dimensions and tolerances Part: 1: Metric series.
ISO 12162	Thermoplastic materials for pipes and fittings for pressure applications – Classification and designation – overall service (design) coefficient.
ISO 13761	Plastic pipes and fittings – pressure reduction factors for polyethylene pipeline systems for use at temperatures above 200 C.
ISO 7005 – 3	Metallic flanges – Part 3, Copper alloy and composite flanges
BS EN 12201	Plastic piping systems for water supply - polyethylene
ISO 974	Determination of the brittleness temperature by impact
ISO 2505	Thermoplastics pipes - Longitudinal reversion
ISO 6259	Determination of tensile properties

ISO 1133	Determination of the melt mass-flow rate (MFR) and the melt volume-flow
ISO 877	Methods of exposure to direct weathering

8.2 TECHNICAL REQUIREMENTS

8.2.1 MATERIAL

The CONTRACTOR shall identify the manufacturer of the resin, the resin type and classification. In addition, the CONTRACTOR shall provide evidence that the resin proposed is suitable for use at the design temperature and under the design pressures.

Any change in the material, the material specification, or the manufacturer's location shall be subject to prior approval of the ENGINEER.

Pipes and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions, blisters, dents or other damaging defects.

Material shall be uniform in opacity, density, interior smoothness, and other physical properties.

It shall have adequate resistance to weathering and other ageing from storage for a minimum of two years after manufacture.

The material of the polyethylene pipes and fittings which is in contact with or likely to come in contact with drinking water shall not constitute a toxic hazard, shall not support microbial growth and shall not give rise to unpleasant taste or odour, cloudiness or discoloration of the water.

The concentration of substances, chemical and biological agents leached from materials in contact with drinking water, and measurement of the relevant organoleptic / physical parameters, shall not exceed the maximum values recommended by the World Health Organisation in its "Guidelines for Drinking Water Quality" or the EEC Council Directive on the "Quality of Water Intended for Human Consumption", whichever is more stringent in each case.

For the manufacturing of pipes & fittings new materials to be used only (Rework material is not acceptable).

Pipe manufacturer shall confirm that all fittings to be provided for the pipe systems shall meet the same quality requirements as for the pipes to ensure the same performance for design life cycle.

The pipes and fittings shall be manufactured from polyethylene containing only those antioxidants, UV stabilisers and pigments necessary for the manufacturing process to fulfil the requirements of the specification.

All pipes and fittings shall be suitable for butt fusion or electro fusion techniques.

Contractor shall provide PE manufacturers guideline for the applicability of the material used. If required PE manufacturers shall provide assistance and training.

8.2.2 PHYSICAL PROPERTIES

Pipes and fittings shall be made of high density polyethylene (HDPE) and shall comply with the requirements of ISO 4427 PE 100. The material shall be produced by a member of the PE 100 + Association.

The material used for the manufacturer of pipes and fittings shall be in accordance with Table 1 and Table 2 of clause 4.4 of ISO 4427-1

The minimum required strength (MRS) of the material compound shall be 10 MPa at 20 ^{o}C.

The design stress shall be 8 MPa.

Lifecycle durability of 80 years is to be confirmed.

For design calculation, pressure, reducing coefficients 4427-1, Annex A are applicable. The thermal stability of polyethylene material shall meet the requirements of ISO 4427.

8.2.3 PIPE DIMENSIONS (GEOMETRICAL CHARACTERISTICS)

The pipe dimensions for water systems shall be based on standard dimensions according to ISO 4427 and measured in accordance with ISO 3126.

Straight pipe shall be supplied in standard lengths measured at 23º C ± 2º C. unless otherwise specified; coil lengths shall not exceed 100 m (328 ft.).

Coiled pipes shall be coiled such that localized deformation is voided and the minimum internal diameter of the coil shall not be less than 18 d_n.

8.2.4 PIPE APPEARANCE

When viewed without magnification the internal and external surfaces of pipes shall be smooth, clean and free from scoring, cavities and other surface defects. The pipe ends shall be cut cleanly and square to the axis of the pipe.

All polyethylene pipes to be used for the transmission and distribution of potable water shall be black and have blue stripes.

The carbon black content in the compound shall be 2.25 + 0.25 % by mass when measured in accordance with ISO 6964. The dispersion of carbon black when determined in accordance with ISO 11420 shall be equal to or less than grade 3.

8.2.5 FITTINGS

The fittings shall be injection moulded or formed from material compatible to that of the pipe and shall be as resistant to the external and internal environments as the other demands' of the pipe system.

At locations where HDPE to metal connections are specified, Nylon based polyamide 11 coating system complying with the requirement of AWWC224 or epoxy coated backing rings shall be used, or special restrained transition fittings subject to approval by the ENGINEER. The flanges shall be drilled to ISO 7005-2, as per the design requirements.

8.2.5.1 FITTINGS APPEARANCE

When viewed without magnification the internal and external surfaces of pipes shall be smooth, clean and free from scoring, cavities and other surface defects. The fitting shall be blue or black.

8.2.5.2 FITTINGS DIMENSIONS

The dimensions shall be measured in accordance with EN/ISO 3126

8.2.5.3 WALL THICKNESS OF FITTINGS

The wall thickness of the body of the fitting at any point shall be equal to or greater than the minimum wall thickness of the corresponding pipe.

8.3 PIPE INSTALLATION

a) Trench excavation shall be carried out in accordance with Excavation of the specification.

b) Install pipe, fittings, and accessories in accordance with manufacturer's instructions.
   - Provide qualification details of the manufacturer's technical expert to be assigned to the Contract. The technical expert shall have expertise, experience and skills necessary for advising and monitoring all aspects of transport, storage, handling, installation and testing of pipes as appropriate.
   - The technical expert shall provide comprehensive technical assistance to the Contractor throughout
   - Contract and regularly monitor the Contractor's activities and report on shortcomings.

c) The pipeline shall be within 1 inch of the specified line and the invert level shall be within 6mm of the specified value and shall be such that there is no back fall at any point on a gravity pipeline.

d) Install bedding, surround and backfill in accordance with the pipe manufacturer's requirements.

e) Install appurtenant facilities on the pipeline such as manholes, valve chambers as specified of the specification.

f) Lay pipes from downstream to upstream unless agreed otherwise with the Engineer.

g) HDPE pipelines can accommodate gradual changes of direction in the vertical and horizontal plane. However the pipe should not normally be bent to a radius less than 25 times the outside diameter of the pipe.

h) When cut pipe is required, ensure that the cutting is done by a machine, leaving a smooth cut at right angles to the axis of the pipe.
   - Ensure that all pipes and fittings are sound and clean before laying. When pipe lying is not in progress, ensure that the pipe ends are at all times fitted with watertight plugs or caps. The plugs or caps shall only be removed for the purposes of making a connection of the pipe end or testing the pipeline. The plugs or cap shall be replaced immediately on completion of the test.

8.3.1 BUTT FUSION JOINTING

a) Butt fusion jointing shall only be used to join pipes of the same PE material with compatible MFR and with the same nominal wall thickness and outside diameter. The following procedures shall serve as a general guide only. The Contractor shall obtain detailed jointing instructions from the

manufacturer who shall have a technical representative available at the Engineer's request during the jointing process.

i. The butt fusion machine should be sited within a shelter and the ends of the pipe being joined should be covered or plugged to prevent through drafts.
ii. Each component that is to be fused should be held in position in the purpose built clamping jig. The lengths of pipe hanging outside the jig should be supported by means of roller cradles.
iii. The pipe ends should be faced so that the finished surfaces are perfectly smooth free of visible ridges, valleys or other surface imperfections.
iv. The outside diameters of the pipe ends should match closely without the offset exceeding 10%
v. The pipe ends should be heated to the pipe manufacturer's recommended temperature and interfacial pressure. The Contractor should use a pyrometer or other surface temperature measuring device to confirm and record the actual surface temperature for each weld. Temperature indicating crayons should not come into contact with the surface to be welded.
vi. After the pipe ends have been properly melted, the heater tool should be removed within the specified time. The molten pipe ends should be brought together and allowed to cool without disturbance to form the permanent weld. The proper bead size and geometry specified for the pipe being welded should be formed.

8.3.2 SADDLES/SIDEWALL JOINTING

Saddle /sidewall fusion jointing shall be accomplished by using a mechanical saddle fusion machine that has been designed for this purpose to ensure proper alignment, temperature and force control. The following procedures shall serve as a general guide only. The Contractor shall obtain detailed jointing instructions from the manufacturer who shall have a technical representative available at the Engineer's request during the jointing process.

i. Any dirt or coating that might interfere with the proper operation of the saddle fusion machine should be removed from the pipe and the surfaces of the pipe and saddle roughened to expose fresh material and any reside brushed away.
ii. Test fit the saddle fusion machine to ensure that alignment and contact are as they should be.

iii. Commence the fusion process and periodically verify the surface temperature using a pyrometer or other surface temperature measuring device. If temperature indicating crayons are used, they should not be used on a surface which comes into contact with the surfaces to be welded.

iv. After the heating period, remove the heater plate and check for the correct melt pattern on both the fitting and the pipe. Join the fitting to the pipe with the prescribed fusion force.

v. Cool the joint without disturbance until the melt has formed a permanent weld. The joint should not be subjected to any external stresses until the fusion joint has cooled.

8.3.3 ELECTRO FUSION JOINTING

a) Electro fusion jointing involves heating the electro fusion joint internally, either by a wire coil at the interface of the joint or by a conductive polymer. Heat is created by an electric current passed to the conductive material in the fitting.

i. Ensure that the fitting is dimensionally appropriate for welding to the pipe. Clean the pipe surface in the joint area. Cut the end of the pipe square. Mark on the pipe surface the proper position of the fitting to be installed. Scrape the surface of pipe area to be joined, removing all surface degradation and contamination. Avoid contamination of the scraped pipe surfaces.

ii. Place the pipe and fitting in the clamping fixture to prevent movement of the pipe or fitting.

iii. Connect the electro fusion control box to the fitting and to the power source. Apply electric current to the fitting as specified in the manufacturer's instructions. Turn off the current when the proper time has elapsed to heat the joint properly.

iv. Allow the joint to cool for the recommended time and remove the clamping fixtures. Do not remove prematurely from the clamps as any strain on a joint that has not fully cooled can be detrimental to joint performance.

8.3.4 MECHANICAL JOINTS AND FITTINGS

a) Many types of mechanical connection styles and methods exist. The Contractor shall submit suitable mechanical joints. All such joints shall be recommended and acceptance tested by the manufacturer of the

pipe. Where marked on the drawings end-load resistant fittings of an approved type shall be used.

b) When tightening polyethylene flanges care shall be taken to produce an equal torque load to the limits given by the manufacturer. A torque wrench shall be used. Since polyethylene creeps under load it is essential that the bolts are re-tightened several times prior to commissioning to minimize the risk of leakage.

c) All joint materials and gaskets shall be suitable for use in the prevailing climate, soil, ground water, and potable water and irrigation water conditions.

8.4 INSPECTION AND TESTING

8.4.1 CERTIFICATION AND DOCUMENTATION

CONTRACTOR shall supply the ENGINEER with copies of certificate and test documents. Such documentation shall be subject to the Engineers' approval prior to shipping.

8.4.2 TEST RESULTS AND FREQUENCIES

The MANUFACTURER shall establish and maintain a current record of test results according to the requirements of the applicable standards and this specification. The MANUFACTURER shall perform all the tests required by ISO 4427 to demonstrate the characteristics and quality of the resin material and the dimensional tolerances of the pipe. The MANUFACTURER shall document all the tests, with frequencies and results as indicated in ISO 4427. The records shall

8.4.3 INSPECTION AND AUDIT REQUIREMENTS

Pipe shall comply fully with ISO 4427, the requirements of the PE 100 + Association and all the additional requirements of this specification.

To verify compliance with this specification, the ENGINEER shall reserve the right to appoint an independent third party inspector to witness the applicable qualification tests, review production records, and inspect general handling and shipping procedures. The third party inspector shall have full access to the testing and production facilities and will be a fully authorized representative of the ENGINEER.

8.4.4 ACCEPTANCE CRITERIA

The order shall meet the following criteria:

A copy of the raw material MANUFACTURER's "Certificate of Quality Control Testing" covering each batch of raw material used for pipes purchased under this specification, shall be available for inspection by the ENGINEER on request.

Pipe wall thickness shall be controlled by continuous scanning using ultra-sound or other qualified devices. These devices shall be regularly calibrated for accuracy by certificated agency.

Successful test performance and acceptable results for the testing program outlined in this specification.

An acceptable inspection report from an independent third party inspection company according in the manufacturer's country.

When performed, acceptable results from an independent test audit of any portion of the tests noted in ISO 4427 and this specification.

8.4.5 DEFECTS

When the rejected item is a length or coil of pipe, the lengths or coils manufactured immediately before and after the defective lengths or coils shall be carefully examined. If further defects are found, this is sufficient cause for rejecting the entire batch. This will not apply to local damage that did not occur during manufacture, such as gouges or cuts during handling or transit.

8.4.5.1 QUALITY ASSURANCE/QUALITY CONTROL

A copy of the MANUFACTURER's QA/QC plan shall be submitted to the ENGINEER with its quotation for review and concurrence prior to award. If MANUFACTURER's facility is ISO certified, QA audit requirements shall be waived in favour of ISO 9000 registrar audits, unless the ENGINEER'S trend analysis program indicates areas of concern

8.4.5.2 PACKING, MARKING AND VENDOR DOCUMENTATION

8.4.5.3 Pipe Identification and Packing

The marking information and sequence shall comply with ISO 4427. All pipes and fittings, including test samples shall be clearly and permanently marked using indent printing in a colour that contrasts with the pipe.

All pipes shall be indelibly marked at maximum intervals of 1m

The marking shall indicate at least the following information:

- The manufacturer's name and/or trademark

- The dimensions (nominal outside diameter x nominal wall thickness)

- Material and designation

- The nominal pressure (PN) in bar

- The pipe series (S or SDR) (optional)

- The production period (date or code)

- The number of this International Standard.

The word "water" shall also be included if the pipe is intended for potable water.

- The maximum quantity of pipe to have the same coil/length number is one silo (coiled pipe) or one bundle (straight lengths). The maximum combined length of pipe in the silo or bundle with the same coil/length number shall not exceed the maximum allowable coil length as specified.
- When pipe material is boxed, the coil number shall be clearly marked on the outside edge of the box or silo. Invoices and packing lists shall include the date of manufacture and coil/length numbers for all material in the shipment.
- The fittings shall be packaged in bulk or individually protected were necessary in order to prevent deterioration and contamination. The package shall have at least one label with manufacturer name, type and dimension of the fittings and number of units.

8.4.5.4 Packaging and Transportation

The CONTRACTOR/SUPPLIER shall provide packing and transportation procedures for approval by the ENGINEER and shall comply with the following requirements.

8.4.5.5 Delivery

Delivery of the plastic pipes and fittings to site, shall be no later than six months after the stamped manufacture date.

8.4.5.6 Weathering

A certificate from the pipe/fitting manufacturers shall be provided, confirming that the products may be stored in the open for minimum of 2 years without any adverse effect.

8.4.5.7 Tie-downs

Tie-downs shall be at least 100 mm (4.0 inch) wide and be clean and free from sand, gravel and other such materials. For straight length pipe (up to 12 m (39 ft.)), a minimum of 6 tie-downs are required.

8.4.5.8 Pallets

The pallets shall be suitable for transporting the material from the place of manufacture to the designated receiving location without causing any damage to the pipe. The pallets shall not contain any broken planks or extremities that may damage the coiled pipe or straight lengths. They shall be durable enough to prevent loose pallet nails from gouging the bottom coil/straight length.

8.4.5.9 Overhang

Pipe shall not overhang at either end of the trailer.

8.4.5.10 Stacking

The CONTRACTOR/MANUFACTURER shall not ship small coils stacked inside silos of larger coils. Frames manufactured for the containment of straight lengths of polyethylene pipe during transport and storage shall not contain nails or other fastening devices that may damage the pipe.

8.5 TRUCKING

Where pipes are transported by vehicles, the vehicles should have a flat bed and be free from sharp edges or projections. During transport, polyethylene pipes shall be protected from diesel fumes and be continuously supported to prevent movement between the material and its support.

8.6 SILO'S

Silo packs of coiled pipes shall be squarely stacked and well supported on pallets. Coils shall not overhang the pallets and, shall not be stacked higher than 2.3 m (8.0 ft.)

8.7 MEASUREMENT AND PAYMENT

8.7.1 MEASUREMENT

The quantities to be paid for shall be the number of linear feet of pipe placed, completed and accepted.

8.7.2 PAYMENT

The quantities, as measured above, shall be paid for at the contract unit price respectively, for each of the particular pay items listed in the BOQ. Payment shall be full compensation for laying, jointing and all accessories used.

9 uPVC PIPE

uPVC pipes shall be approved manufacture and confirm to the standard as specified in General section

9.1 SCOPE OF WORK

The work covered by this section of the specifications consists of furnishing all plant, labour, equipment, appliances and materials and in performing all the operations in connection with lying, jointing, testing, disinfection and commissioning of upvc pipe work complete in strict accordance with the specifications herein and the applicable drawings and subject to the terms and conditions of the contract.

9.2 STANDARDS AND SPECIFICATION

For sampling testing and tolerance limit, specification BS3505:1968 and PS 3051 1991 shall be followed. The upvc pipes jointing shall be cement solvent joint or Z- joint. The contractor should provide the Technical Detail and Boucher to the Engineer or Engineer's representative for approval.

9.3 PHYSICAL PROPERTIES

The physical properties of UPVC pipes shall fall with in the following limits

Properties	Value	Unit
Specific Gravity	1.42 - 1.46	-
MECHANICAL		
Tensile strength at 23 °C	450 – 600	kgf/cm^2
Modulus of elasticity at 20°C	30,000	kgf/cm^2
Elongation at break	> 80	%
Impact strength at 0°C	0.5 – 1	Ft lb / in of notch
Impact strength at 20°C	1 – 2	Ft lb / in of notch
Compressive strength	600 – 700	Kgf/cm^2
Bending Strength	1000	Kgf/cm^2
THERMAL		
Specific heat at 20°C	0.24	Cal/gm/°C
Vacate softening point	85	°C

Heat distortion temperature at 18.5 kgf/cm^2	75	°C
Thermal conductivity	0.12 – 0.14	W/m °C
Coefficient of linear thermal expansion	0.08	Mm/mm °C
ELECTRICAL		
Dielectric constant (800 cycle)	3	-
Dielectric strength	425	Volts/mil
Inflammability	Will not support combustion	-
Water absorption (24 hrs at ambient temp.)	0.07	%

9.4 ABBREVIATIONS

uPVC	Unplasticized polyvinyl chloride
PVC	polyvinyl chloride
BS	British Standard
PS	Pakistan Standard
OD	Outside diameter
PN	Nominal Pressure

9.5 Nominal Pressure (PN)

The following class/pressure shall be followed
Class B (PN=6 bars),
Class C (PN= 9 bars)
Class D (PN=12 bars),
Class E (PN= 15 bars)

9.6 THICKNESS AND DIAMETER

The diameter and thickness shall be as followed

Nominal size Inch	Mean Outside Diameter	Wall Thickness			
		Class B 6 bar	Class C 9 bar	Class D 12 bar	Class E 15 bar
	max	min	min	min	min
	mm	mm	mm	mm	mm
3”	89.1	2.9	3.5	4.6	5.7

4"	114.5	3.4	4.5	6.0	7.3
5"	140.4	3.8	5.5	7.3	9.0
6"	168.5	4.5	6.6	8.8	10.8

9.7 uPVC FITTINGS

uPVC fittings shall be approved manufacture and shall be confirm to the standard as specified in General section I For sampling testing and tolerance limit, BS and PS pecification shall be followed.

Metal fittings (cast iron and ductile iron fittings) can be used for diameter ranging 10 inches and above. The metal fittings are connected with the pipe using rubber ring Z-joint system.

9.8 JOINTING

9.8.1 Solvent Cement joint

Jointing is done by applying a uniform layer of solvent cement to spigot and socket ends of pipes to be jointed together and assembling them with a quick action. Right after jointing, the surplus cement shall be removed and a period of 24 hours should be allowed to elapse before pressure testing. It may be noted that completion.

9.8.2 GUIDE TO THE CONSUMPTION OF LUBRICANT, CLEANER AND SOLVENT CEMENT PER 100 JOINTS

Range of pipe and fittings diameter (mm)

Aprox.	32 – 40	50 – 63	75 - 90	110 – 125	140 - 160
	1" – ¼"	1" – ½"	2 ½" – 3"	4"	5" – 6"
Lubricant (kg)	-	2.0	3.50 – 4.00	4.00 – 5.00	5.0 – 6.5
Cleaner (liter)	0.35 –0.50	0.65 – 0.90	1.00 – 2.00	3.00 – 5.00	6.5 – 9.0
Solvent Cement (Liter)	0.78 –1.00	1.30 – 1.800	2.00 – 4.00	6.00 – 10.00	13.0 – 18.0

9.8.3 Z-JOINT

Z – Joint is also commonly known as "rubber ring" joint. These joints contain an electrometric sealing component which is automatically compressed to

form an effective seal when the spigot end of upvc pipes inserted into the socket.

These joints are not designed to resist end thrust. Therefore, particular care should be taken to ensure that the pipeline is property anchored. Anchor blocks should be designed to withstand the thrust resulting from the maximum pressure to which the pipe is likely to be subjected, normally the test pressure. It is desirable to insulate the uPVC pipe from direct contact with the anchor block by means of a suitable flexible membrane.

9.8.4 FLANGED JOINT

Flanged joints can be used to connect uPVC pipes with metal pipes, valves and fittings provided with flanges. Joints are made by the compression of the gasket or a ring seal set in the adaptor of the flange. Flanged joints are also preferable, where there is a need to dismantle pipeline from time to time. Care should be taken while selecting flange accessories their flange should be compatible with the uPVC flange adaptor.

9.9 INSTALLATION OF uPVC PRESSURE PIPES

9.9.1 INSTALLATION OF BURIED PIPE

Unplasticized PVC pipes must be laid onto a trimmed trench bottom, where soil is uniform, fine grained and free from sharp objects. The trench width must be sufficient to enable the lying and jointing of the pipes and proper compaction around the pipe. The minimum recommended trench width (W) is equal to pipe OD plus 600 mm or as specified in the Drawings.

The minimum depth of cover required for water mains is 1000mm from finished surface level to the crown of the pipe. Thus, the minimum excavated depth (D) of the trench for water mains is pipe OD + 1000mm + Bedding.

The normal thickness of bedding is a min of 100mm. for pipe sizes greater than 8 inches; the bedding thickness should be increased to a minimum of 150mm and or specified in the Bill of Quantities.

Because of the flexible nature of the material the pipe should be suitably anchored at all changes of direction and at fixed points. The anchors

should be designed to withstand the maximum thrust developed during hydrostatic pressure testing.

Un plasticized PVC pipes should not be installed in direct sunlight or near any heat source. The liner expansion of uPVC is about six to seven times that of steel, so precaution is to be taken to compensate for it. The pipe line should be installed in such a way as to minimize the stress. The best way of doing this is to arrange piping so that bends occur between anchor points. Along walls pipe rack, hangers, clamps, straps or u-bolt can be used.

9.9.2 Support Spacing

Recommended horizontal and vertical support spacing is given in the table.

*Pipe Outside Diameter	Water Temperature °C				Vertical spacing
	20 °C	30 °C	40 °C	50 °C	
OD	Horizontal Spacing				
mm	cm	cm	cm	cm	cm
16	75	60	40	-	80
20	85	70	50	-	90
25	90	75	55	45	100
32	100	85	65	50	120

9.9.3 MEASUREMENT

All UPVC pipes shall be measured according to the work actually done and no allowance will be made for any waste in cutting to the exact length required. The measurement for pipes shall be in running fee nearest to a inch. Of length along the centre line of pipe as actually laid at work sites.

The rate for providing, laying and jointing of UPVC pipes shall be deemed to include the cost of collars/rubber rings, jointing material, testing and extra excavation required for ordinary bedding of pipes and also for collars and pipe sockets, if any.

If any damage is caused to the pipe line during the execution of work or while cleaning/testing, the pipe line as specified. The contractor shall be held responsible for the same and shall replace the damage pipe line and retest the same at his own cost to the full satisfaction of Engineer.

Water for testing of pipeline shall be arranged by Contractor at his own cost.

Pipes shall be brought on site proportionate to the required progress for Thirty days only.

10 RCC PIPES.

Pipes for sewers shall be of RCC manufactured in SR cement from approved pipe factory. The pipes shall conform in all respects to ASTM C-76/ BS 5911. The thickness of barrel of sewer pipe shall be 30% more than the thickness proposed in ASTM C-76 for the same internal diameter of pipe. The pipes shall be socketed for push on rubber joints. The Contractor shall submit with his tender a detailed sketch of R.C.C. pipe with statement indicating details of socketed joints and also details of reinforcement including numbers and diameter of horizontal and spiral bars for each diameter of pipe. Conforming the requirements All R.C.C. 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.

11 MS PIPES AND SPECIALS

11.1 Mild Steel Section Specifications

The pipes shall be made of Steel plate / coil X-42 of API standard No. 5 D Grade or PSS-0014-84.

11.2 Chemical Properties and Tests

The chemical composition of the steel shall fall within the following limits:

Carbon - 0.28% max.

Manganese - 1.25% max.

Phosphorous - 0.04% max.

Sulphur - 0.05% max.

11.3 Mechanical Properties and Tests

- Yield Stress - 42000 psi (min. psi)
- Ultimate Tensile Strength - 60000 psi (min. psi)
- Elongation on Gauge - 27 (min. %)

11.4 Standard Specifications

For sampling testing & tolerances limits, specifications No. AWWAC-200-80 shall be followed.

11.5 Thickness of Plates / Coil

Thickness of plate / coil shall be as specified in the respective items in the BOQ. All plates used shall be free of surface defects.

11.6 Pipe

The term pipe signifies a hollow cylinder made of M.S. Steel plate / coil of uniform internal dia

11.7 Diameter

The internal diameter of the pipes shall correspond to the net specified diameter after protective lining.

The outside diameter of the body of the pipe as measured by taping the circumference shall be uniform.

11.8 LENGTHS

Pipes shall be finished in uniform lengths.

11.9 STRAIGHTNESS

The pipe shall be straight.

11.10 ENDS

The ends of the pipe shall be so formed that when pipes of the same class and diameter are welded or jointed together to form a continuous straight conduit with a smooth & uniform interior surface.

11.11 JOINTS

Joints shall be welded as per AWWA specifications.

11.12 MANUFACTURE OF PIPES

Before starting production of M.S. pipes the contractor shall furnish the following manufacturing procedure. This procedure shall include but not limited to the following information.

i) Material quality, full details and checks analysis including residual elements.
ii) Material manufacturing details.
iii) Method of plate / coil forming.
iv) Welding procedures, including procedures for skelp welding.
v) Method & degree of coil expansion where applicable.
vi) Method of straightening, sizing and hydrostatic testing.
vii) Inside diameter.
viii) Quality control and Inspection procedures. The submitted procedures and any agreed modifications shall be strictly followed in the production of pipes. The pipes shall be spirally welded with at least two welding passes, one of which shall be on the inside. The Contractor may propose straight welding for pipe manufacturing. This should be clearly mentioned in the tender submitted by the Contractor.

The Contractor shall submit all manufacturing procedures and qualification tests result to the Engineer for approval before the total production has exceeded 20 pipes. In the event test results are not available before production has exceeded 20 pipes, the contractor shall stop production and not restart until all test results have been approved by the Engineer.

The Engineer shall witness the manufacture and testing operation of desired quantity of pipes to verify compliance with the agreed procedure.

11.13 INTERNAL PROTECTION OF PIPES – CEMENT MORTAR LINING

The internal cement mortar lining shall be applied in-situ of cement, sand, mortar 1:3 after completion of laying and backfilling of pipeline in trench, in continuity, in one course or more, by electronically driven lining machine traveling through pipe and centrifugally distributing the mortar uniformly across the pipe. The discharge shall be from the rear of the machine so that machine will be continuously fed with mortar by train of intermediate loading machine fed by Power Loader and high speed electric mixers, to achieve desired standard of lining.

The rate of travel of machine and rate of mortar discharge shall be mechanically regulated to produce a smooth surface and uniform thickness throughout. The lining machine shall have electronically controlled rotary trowels for smoothing of the lining so as to obtain William Hazel Coefficient in range 130-140. The mortar shall be densely packed and adhere wherever applied, there shall be no injurious rebound.

11.14 LINING MATERIAL

11.14.1 SAND

Sand shall consist of inert granular material. The grains shall be strong, durable and uncoated. The sand shall be well graded and shall pass a No. 16 mesh screen, with not more than fiver 5 percent passing a No. 100 Sieve.

Graded sand will be bagged to ensure 1:1 mix while feeding the mixer.

Sand shall be clean and free from injurious amount of dust, clay, lumps, shale, soft or flaky particles, mica, loam, oil, alkali and other deleterious substances. The total weight of such substances shall not exceed three percent of the combined weight of the substances and the sand that contains them.

11.14.2 PORTLAND CEMENT

Portland cement shall confirm to type I or type II of ASTM C150 or shall be as otherwise specified by the Engineer.

11.14.3 WATER

Water for mixing mortar shall be clean and free of mud, oil and injurious amounts of organic materials or the deleterious substances. Potable water shall be used.

11.14.4 MIX FOR LINING

11.14.4.1 COMPOSITION

Mortar for lining shall be composed of cement, sand and water that have been well mixed by the concrete mixer and shall be such consistency as to produce a dense, homogeneous lining.

11.14.4.2 PROPORTIONS

The approximate proportions of cement and sand in the mortar for the lining shall be 1 part of Portland cement to 1 part of sand by volume. The exact proportions shall be determined by the characteristics of the sand used as approved by the Engineer.

11.14.4.3 WATER CONTENT

The water content shall be the minimum that produces a workable mixture, with full allowance made for moisture collecting on the interior of the pipe surface.

11.14.4.4 MIXING

Mortar shall be mixed long enough to obtain maximum plasticity. The mortar shall be used well before initial set.

11.15 THICKNESS OF LINING

The lining shall be uniform in thickness within the allowable tolerance, except at joints or deformations in the pipeline, at which places also the thickness shall be as uniform as possible to the satisfaction of the Engineer. Cement Mortar Lining thickness shall be as specified by AWWA C602-83 and approved by the Engineer.

11.16 CURING

Curing operations shall begin immediately following completion of the machine placement of the mortar lining in a section of pipeline. The selection of pipe shall be closed with airtight cover over all openings and shall be maintained in a moist condition.

When a section of pipeline has been completed, the Contractor shall be responsible for careful curing of the mortar lining until the Engineer fills the

section with water, or until the lining work has been accepted by the Engineer, but in no case for less than seven days.

11.17 CLEANING OF PIPE FOR LINING

The interior surface of pipe to be lined shall be cleaned to remove corrosion products, chemicals or other deposits, loose and deteriorated remains of old coating materials, oil, grease and accumulations of water, dirt and debris. Shot or sand blasting is not required to prepare surface for lining.

11.18 MACHINE APPLICATION OF MORTAR LINING

The lining shall be applied in one course or more by machine traveling through the pipe and distributing the mortar uniformly across the pipe. The discharge shall be from the rear of the machine so that the newly applied mortar is not marked. The rate of travel of the machine and the rate of mortar discharge shall be mechanically regulated to produce a smooth surface and uniform thickness throughout to the satisfaction of the Engineer. The mortar is density packed and adheres wherever applied; there shall be no injurious rebound.

11.19 GUARANTEE AND PERFORMANCE CRITERIA

Internal Cement Mortar Lining should be got done by an approved and specified firm, who must have proven past experience in machine application of cement mortar lining. During the warranty period if any damage occurs because of lining defect it shall be got rectified by the specialist company at no cost to the Employer. 15 years written warranty would be required to be provided by the specialist company with proven record. The Contractor will be allowed cement lining for individual pipes and specials in case of inclined or vertical length or for start length of pipes.

11.20 PAYMENT

Payment for the internal cement lining and external protection of the MS pipeline shall be made for the acceptably completed work as per specifications at the approved tender rates, which shall include all costs for labor, material and equipment etc.

11.21 MILD STEEL SPECIALS

11.21.1 GENERAL

The specials like bends; tees etc. to be used shall be manufactured with MS plates of specified thickness. Internal diameters shall be as given on the drawings or as directed by the Engineer. The Contractor shall submit shop drawing for all special before the manufacturing of special

11.21.2 QUALITY OF STEEL

- CHEMICAL PROPERTIES

All collars and specials shall be made from steel, the analysis of which shows not more than 0.06% of sulphur or phosphorous.

- PHYSICAL PROPERTIES

The steel shall comply with the requirements as described for M.S. Pipes.

11.21.3 DIAMETER

The internal diameter of the specials and collars shall be as specified for pipes or as approved and directed by the Engineer.

11.21.4 JOINTS

The specials shall have standard flanges with holes at both ends and nuts and bolts with matching flanges provided with pipes. Plain ended bends shall be provided where specified for making weld joints or as approved and directed by the Engineer.

11.21.5 LENGTH / WIDTH

Length of each special and the width of the collar shall be as shown in drawing or approved and directed by the Engineer.

11.21.6 COATING

The internal and external coating for specials for rising main shall be same as provided for M.S. Pipes.

11.22 TESTS

The specials and the pipes shall withstand a pressure of 61 meters.

11.23 PAYMENT

The rates quoted for M.S. specials shall include cost of providing for material, labour, equipment including cost of cutting, rolling, levelling, chamfering, welding, drilling holes in flanges etc. complete including internal and external protection similar to M.S. Pipes mentioned in these specification cement lining. Payment shall be made as per tendered rates.

12 VALVES

12.1 Valves

12.1.1 General

All the valves and penstocks shall be made of ductile iron with stainless steel lining 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 statistically 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. Jointing material including nuts, bolts, washers and rubber packing shall be supplied in quantities of approved quality required plus 10 packing extra. The material of all type of valves & penstocks including appurtenances such as nuts bolt and flanges etc. shall be resistant to saline water up to the design life. 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 a valve and pipes if required so in the form as approved by the Engineer.

12.1.2 Valve Identification

All valves shall be identified by permanently fixed trifoliate labels/brass plates which shall identify the valve number and function, and be attached by stainless steel cable ties to an integral part of the valve - not the hand wheel or lever. Information on the tags shall be:

NO - Normally Opened

NC - Normally Closed

NT - Normally Throttled

NA - Normally Automatic

SOC - Set On Commissioning

12.2 GATE VALVES

Gate valves shall generally comply with BS 5163. Valves shall be of the non-rising stem type with flanged ends to BS 4504 PN 16. The body, wedge, bonnet, stuffing box, gland and thrust bridge shall be of best quality cast iron to BS 1452 Grade 14, the seats, nut, faces and guides of gunmetal to BS 1400 Grade LG2-C and the stem of forged bronze to BS 2872 Grade CZ114. Each valve shall have a drain plug fitted at the bottom of its seating along with proper arrangement of disposal of drain water. Stuffing boxes shall be designed to have soft packing fitted. Valves shall be rated for 150 PSI maximum working pressure with the bodies capable or with standing a test pressure of 300 PSI without leakage.

12.3 Washout Valves

The washout valves shall be in general conform to the requirements of BS 5163. 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. Washout valve shall be locally manufactured confirming to the standards described herein.

12.4 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 air valve float chamber and float chamber cover shall be of ductile iron with stainless steel lining with all other parts of non-corrodible materials. All orifices shall be located well clear of the liquid level in the float chambers, and designed to prevent sedimentation of floating solids. Valve bases shall be as specified. Air valves shall be provided with separate isolating valves and drain plugs. Air valves with 'built in' isolation facility are not permitted. The installation of air valves utilizing solid cylindrical control floats is acceptable. Air valves shall be imported, procured from manufacturer of international repute and as approved by the Engineer.

12.5 Non-Return Valve

Non-return valves shall be of the free-acting type capable of withstanding and reducing shock following rapid flow reversal in a pipeline. They shall be suitable for pumps and delivery system provided. Valve bodes shall be of two part construction in best quality cast iron with detachable cover plates to facilitate inspection of the bearing and door. Doors shall be of best quality cast iron with renewable seats of gunmetal to BS 1400. Hinges pins shall be of stainless steel totally enclosed within the valve body. The doors shall be arranged such that they do not swing through an angle of more than 45 degree. Valve shall be rated for 20 bars maximum working pressure with the body capable of withstanding a test pressure of 30 bars and the seat 20 bars without leakage. The maximum velocity through nay check valve shall not exceed 3.5m / sec. without the written approval of the Engineer

12.6 VALVE CHAMBERS

Valves shall be housed in R.C.C. chambers to be constructed by the Contractor. These valve chambers and method of assembly shall be as shown in the drawings or as directed and approved by the Engineer. All Chamber covers and frames in the slab of chambers of appropriate sizes (As per drawing) shall be of cast iron of robust construction and suitable for heavy duties and provided with locking arrangements.

12.6.1 PAYMENT

Payment shall be made for the acceptably completed valves, fittings, valve chambers in accordance with the specifications, drawings and directions of the Engineer including all costs for labour, materials, equipment, transportation, handling, testing and disinfection complete at the approved BOQ rates.

13 CAST IRON COVERS WITH FRAMES

13.1 SCOPE OF WORK

The work to be done under this section of the specifications consists of furnishing all plant, labour, equipment, appliances, materials and performing all operations required in connection with the installation of C.I. cover with frame, gratings and ladder rungs, complete as specified herein, as shown on the drawings and or as directed by the Engineer.

13.2 CAST IRON COVERS WITH FRAME

Cast iron cover and frame shall be of the sizes and duty as specified on the drawings. The specified size means the clear opening. The cover shall be complete with frame. Top of cover shall be roughened in an approved pattern. Locking and licking arrangement shall also be provided. The frame shall be well set in place at the time of pouring of concrete. The cover shall tightly fit in the frame. It shall be airtight and water-tight.

The duty, weight, test and working load for 600mm circular or square C.I. cover and frame shall be as follows: -

Class/Duty of Cover and Frame	Gross* Weight (Approx.)	Peak or Test Load	Services Working Load
Extra Heavy Duty	----------	900 KN	300 KN
Heavy Duty	225-285 Kg	400 KN	135 KN
Medium Duty	130-140 Kg	50 KN	17 KN
Light Duty	70-80 Kg	10 KN	3.5 KN

* The column of gross weight is indicative only for the duty of Chambers. The Contractor shall ensure that the chamber is rated for above mentioned test load irrespective of the weight.

13.3 Measurement

Measurement of acceptably completed work of cast iron will be made on the basis of actual number of cover with frame provided and installed in position as shown on the drawings or as directed by the Engineer.

13.4 Payment

Payment for the acceptable measured number of Cast Iron shall be made on the basis of unit rate per number quoted in the bills of quantities and shall constitute full compensation for all the works related to the item.

13.5 STEEL LADDER

Steel ladder shall consist of specified size of M.S. flats in strings and 1" (25, mm) diameter M.S. steel bars in rungs. The M.S. rungs shall be riveted and welded in 25 mm diameter holes in flats. The ends of each climb of the ladder shall be embedded in the concrete.

All components of ladder shall first be painted with two coats of approved red oxide primer and then with three coats of black enamel paint. The steel ladder shall be fabricated installed as per drawing or as directed by Engineer.

Payment shall be made on the basis of approved tender rates for each item of accepted work as per contract.

14 CONSTRUCTION, DEVELOPMENT AND TESTING OF TUBEWELL

14.1 Scope

The work covered in these specifications consists in furnishing all plant, labor, equipment, appliances, and materials required for performing all operations in connection with the construction of Tube-well in accordance with these specifications and drawings.

14.2 Drilling of Tube wells

Drilling of tube wells shall include, moving in, setting up, preparing the site, drilling the bore hole, collecting data and removing temporary casing, dismantling, moving out and cleaning up. Measurement for drilling of tube-wells will be made of the actual depth of borehole drilled, measured from the original ground surface. No measurement will be made of over drilling required because of sloughing, caving ground or for the Contractor's fault in casing; for tube well abandoned due to jammed tools, caving ground, or negligence on the part of the Contractor; or for tube wells not constructed in accordance with all of the requirements of these specifications.

- The Contractor shall drill bore hole at the location shown on the drawings and as directed by engineer. The diameter of the borehole will be specified in BOQ. The Contractor shall prepare the site for the construction of the tube wells and shall arrange for the disposal of water, cuttings, and bore soils away from the tube well.
- The bore hole shall be drilled by the Reverse Circulation Rotary Method. Bore hole shall be drilled to a depth as specified by the Engineer In charge. It is anticipated that the depth of tube wells may vary; however, no minimum depth for tube well or average depth is guaranteed. The bore holes shall be drilled sufficiently straight and plumb so that the pump and tube well casing may be installed concentric with the hole and within the tolerance specified for plumpness of the casing that is from ground level to a depth specified in BOQ and drawings, the bore hole shall be absolutely, vertical, straight and in plumb, and for the remaining depths, deviation should not exceed ½% (half per cent).
- The Contractor shall be responsible for protecting the tube wells from contamination by foreign material until the completed tube well and appurtenant facilities are the completed tube well and appurtenant facilities are accepted by the Engineer In charge. The Contractor shall

bear any expense needed to make good damage to tube well, tools, or equipment that may be caused by caving, washing, or other disturbance within the tube-well.

- If unstable material is encountered in drilling, the Contractor shall stabilize the material. The use of drilling fluid additives or other suitable materials may be employed in stabilizing the borehole with the approval of the Engineer In charge. If necessary, temporary casing shall be furnished and installed by the contractor to hold the walls of the hole during drilling operations and until the gravel shrouding has been placed. All temporary casing shall be removed by the contractor in stages as the gravel shrouding is placed. The temporary casing may be new or used and will remain the property of the Contractor.
- If, in opinion of the Engineer In charge, it is necessary to discontinue work on any bore because it is out of line more than the amount specified or on account of jammed tools, caving ground, or because of negligence on the part of the contractor; the contractor shall drill another bore hole at an alternative location. The Contractor will not be entitled to payment for any work done or materials furnished for bore holes abandoned as a result of his negligence.

14.3 Data and Records

- The Contractor shall keep an accurate drilling log of bore hole, including a description of all materials encountered and their location in the borehole. In the case of defective or incomplete records, the contractor shall complete the records of his own expense. All records and data shall be kept by the Contractor on approved forms. The Contractor shall deliver to the Engineer In charge the original of all records.
- Representative whole samples or cuttings of the material penetrated shall be taken at each lithology encountered and from each 10 feet depth of the borehole. Special care shall be exercised to determine the thickness and location of each change in material encountered and to obtain satisfactory samples. Immediately upon taking each sample, the sample shall be placed in Polythene bag, partitioned wooden box or other approved container, properly marked for identification and plainly labelled with the depth of the top and bottom of the section of the bore hole represented. The Containers shall be furnished by the Contractor. The method of obtaining,

processing, and storing the samples shall be subject to approval by the Engineer In charge. The Contractor shall deliver all samples to the field headquarters of the Engineer in charge on completion of boring work.

14.4 Tube-well Piping

Tube well piping shall consists of all works required in connection with the installation of Pump housing, blind pipes, strainers, Bail plug, centralizer etc. Concentric reducers will be considered as casing of the larger size to which the reducers are directly connected.

14.4.1 Reducer

The bottom end of the pump housing pipe shall be connected to mild steel tapered reducer, by means of coupling. The other end of the reducer shall be connected to the top end of the blind pipe.

14.4.2 Pump Housing and Blind Pipe

Mild steel welded pipe 3/164 thick (or as directed by the engineer in charge) shall be provided as per drawings or as directed by the Engineer In charge for pump housing and blind pipes.

14.4.3 Strainer

Brass strainer should be provided as per the manufacturer's manual.

14.4.4 Brass Strainer:

Brass Strainer shall be of the type suitable for installation in the tube wells. It shall by the product of a manufacturer currently engaged in the commercial production of brass strainers for tube wells. Workmanship shall be of the highest grade and in accordance with the best modern practice. Material not definitely specified shall be of the quality regularly sold by the manufacturer in the Market.

14.4.5 Quality of Strainer:

The strainer shall be of the non- continuous slot type. The strainer shall be designed to produce a minimum loss of head or draw down between the water bearing strata and the well with 1/84 wall thickness.

14.4.6 Openings:

Strainer openings shall be machine cut openings 3/35 inch in width. The area of openings shall be minimum 15 percent in case of 8 inch well screen. The number and area of opening shall be such that the expected yield of the well may be developed with minimum of openings or slots and shall be so designed as to prevent clogging and shall be free from jagged edges, irregularities, etc., that will accelerate clogging.

14.4.6.1 Strength:

The strainer shall have adequate strength to resist the external forces that will be applied after it is installed and to minimize the likelihood of damage during the installation. The strainer shall not be liable of change of alignment at any of its joints after installation.

14.4.6.2 Fittings:

The strainer and blind pipe shall be provided with suitable couplings. All fittings including couplings, where required for joining sections of the strainer, shall be constructed of the same material as the strainer.

14.4.7 Bail Plug

The bottom of the tube well shall be provided with the bail plug of suitable size of M.S. welded pipe approved by the Engineer In charge.

14.4.7.1 Centralizer

Centralizer shall be provided at 2F ft. interval along the depth of tube well. No measurement shall be made of Centralizers, bail plugs or other accessories required for the complete installation.

14.4.7.2 Lengths

The lengths, diameter and material of all kinds of pipes strainers shall be got approved from the Engineer In charge before installation by the Contractor.

14.5 Fabrication:

- The depth of pump housing pipe of mild steel shall be established by the Engineer In charge for each tube well depending on local sanitary conditions of shallow ground water and depth of pump setting.
- Adjoining sections of pump housing pipe shall be assembled by field welding, with butt welding straps.

  All fields welding shall be performed by the electric arc method.

14.6 INSTALLATION

- The Contractor shall install the entire pump housing assembly straight, plumb, and concentric in the drilled hole, to permit the installation of the pump in such a manner that it will operate satisfactorily and without damage. The methods employed by the Contractor in the installation of the casing and in obtaining or correcting the verticality and straightness of the pump housing casing, shall be subject to approval of the Engineer In charge.
- Centralizer shall be attached to the pump house casing so that it will be centred in the drill hole throughout its entire length and held in such position while gravel shrouding is being placed. Centralizer will be placed at 25' intervals throughout the length of the tube well.
- Measurements for determining the deviation of the pump housing casing from the vertical shall be made by the use of a circular plumb having a minimum outside diameter of 1/5 inch less than the inside diameter of the pump housing casing. When the plumb is lowered to the bottom of the pump housing casing, the line from which the plumb is suspended shall not deviate from the centre of the pump housing casing at the top, by more than 1/5 inch at the bottom of the pump housing casing. All deviations shall refer to a vertical line passing though the centre of the pump housing casing at the top of the pump housing casing.
- Straightness shall be determined by lowering a section of pipe 4E feet long or a dummy of the same length to the bottom of the pump housing casing. The minimum outside diameter of the pipe or dummy shall be 1/5 inch less than inside diameter of the pump housing casing.
- If a dummy issued, it shall consist of a rigid spindle with three cylindrical rings, each ring having a height of at least 15 inches. The rings shall be true cylinders and shall be located at each end in the centre of the dummy.
- The central shaft of the dummy shall be rigid so that it will maintain the alignment of the existing of cylindrical rings. The pump housing casing

shall be sufficiently straight so the pipe or dummy can be passed freely throughout the entire length of the pump housing casing.

- Any tube well failing to meet the specified requirements for straightness, verticality and concentricity shall be abandoned, and the contractor shall construct a new well at his own expense at an alternative site designed by the Engineer In charge.

14.7 GROUTING

The annular space outside of the pump housing pipe shall be sealed with cement grout. Grout shall consist of one part of cement to one part of sand by volume and not more than 1/5 gallons of water per cubic foot. The annular space shall be flushed with water prior to grouting to ensure that the space is open and to remove foreign material. The grout shall be placed through a minimum 3/´ inch diameter grout pipe extending to the bottom of the annular space initially and shall remain submerged into the grout during the entire time the grout is being placed to ensure complete filling of the annular space. The grout shall be pumped into the pipe or applied continuously by gravity. The pipe may be left in place or it shall be gradually removed. In the event of interruption in the grouting operations, the bottom of the pipe shall be raised above the grout level and shall not be re-submerged until all air and water have been displaced from the grout pipe. The grout shall be allowed to set a minimum of $ days after a placement prior to resuming work on the well.

14.8 GRAVEL SHROUDING

Gravel shrouding shall consist of all work required in connection with supplying and installing gravel shrouding in the annular space between the strainer and the walls of the bore hole, from the bottom of the strainer to top of the strainer and from top of the strainer to 3E ft. above, after developing and testing, stock-piling, grading, washing, storing, and installing gravel shrouding in the tube well. Measurement for gravel shrouding will be made of the depth of the gravel shrouding actually furnished and placed in the tube well.

14.8.1 Material

All gravel used for shrouding shall be clean, hard, well rounded, washed, carbonate free, and water worn, without thin, flat particles and with the following gradations:

British Standard Screen/Sieve	Percent passing
3/8 inch	100
No. 4	60 - 80
No. 7	20 - 40
No. 14	0 - 5

14.8.2 Installation

The specified spaces shall be gravel surrounded by the Contractor from the bottom to 3E ft. above the top of the Strainer in such a manner that there will be no voids other than granular space between the gravel particles. Water shall be circulated in the tube-well, has the gravel is being placed, by lowering the drill pipe inside the casing and operating the circulation pump. The gravel shall be placed to the top of the tube-well and shall be finally settled by bailing after all gravel had been placed temporary casing, if used, shall be carefully withdrawn in 5 to 10 feet stages during placement of the gravel shrouding and the gravel shall be introduced so that each stage of the hole above the bottom of the casing is completely filled before the casing is with drawn to the next stage.

14.9 DEVELOPMENT TESTING

Development and testing shall consist of all work required in connection with the development of tube well to produce the design capacity of relatively sand water with a minimum draw down, and the testing of tube-well to determine the effectiveness of the development operations as specified herein.

Development and testing shall include, but not limited to surging, back washing, and pumping and tube well at higher than rated capacity; testing the tube well for specified capacity, and sand content and degree of development; and disinfections and sealing tube well.

14.9.1 Development

The tube well will be developed either by compressed air or by piston type's slugger. The development will be carried out in the presence of the Engineer

In charge or his representative. The Contractor shall maintain a complete record of the development operation and shall make regular periodic measurements of discharge rates, sand content and water level measurements. The procedures used shall include back washing and pumping at higher than rated capacity and may include surging or similar procedures determined by the Contractor. The development of the tube well shall be performed for a minimum of six hours by step pumping, back washing and surging the tube-well with a vertical turbine pump. The Contractor shall notify the Engineer In charge following the completion of the six hours pumping period that the tube well is ready for testing.

14.10 TESTING

The Contractor shall test tube-well under the direction of the Engineer In charge as described herein upon completion of the development operations the tube-wells shall be permitted to recover for a minimum period of one hour. During this recovery period, the tube-well shall be sounded. If the comparison of the depth by sounding and length of the casing string indicates that there is more than six feet of materials in the tube-well, it shall be cleaned to within feet of the bottom of the bail plumb.

- Following the recovery period, the tube-well shall be pumped at 150 percent of rated capacity for a period of one hour. At the end of the first five minutes of pumping the sand content of the water shall be determined by using a 1000 S millimetre. In off cone or other device approved by the Engineer In charge. The sand content of the water shall be less than 100 ppm. A second sand content determination shall be made 10 minutes after the start of pumping. The sand content at this time shall be less than 30 ppm. If the sand content tolerances are exceeded at this time, or at any subsequent time up to the time of final acceptance of the installation, while pumping at the rate of 150 per cent of design capacity or less, the development of the tube-well shall be considered incomplete and the Contractor shall resume development of the tube-well will produce water meeting the sand content tolerances. Sand content determinations, water level, and discharge measurements during the remainder of the one-hour sand test period shall be made as directed by the Engineer In charge.
- When the sand test has been satisfactorily completed, the tube-well shall be further developed for one hours at 150 per cent of the rated capacity of the tube well by surging and back washing with the test pump at five

to ten minute intervals. Following the development period, the tube well shall again be pumped for a period of one hour at 150 percent of design capacity during which time the sand test shall be repeated. The specific capacity of the tube well shall be determined from the water level measurements and flow rates obtained during the pumping periods. If the specific capacity obtained from the second pump test is found to be more than 10 per cent greater than that obtained in the first pump test, the development shall be considered to be incomplete and the contractor shall resume development, at his own expense, until the tube-well is development sufficiently to meet this requirement.

- Upon satisfactory completion of the above 1 hour pumping period the tube-well shall be permitted to recover for a period of one hour. Upon the completion of this recovery period, a four hour multiple step pump test shall be performed by pumping the tube-well for one hour at each of approximately four equal increments. The last increment shall be at 15E percent of rated capacity. Following this last increment of the step test, the tube-well shall be pumped at a rate of 15E percent of design capacity for a period of two hours.

14.10.1 SUMMARY

The following is a short summary of the development and testing procedure:

14.10.2 Development

Development Time 6 hours (Minimum) Recovery 1 hour (Minimum)

14.10.3 Testing

- Pumping period 1 hour
- Development 4 hours
- Pumping period 1 hour
- Recovery 1 hour (Minimum)
- Step Pumping 4 hours
- Pumping period 2 hours

14.10.4 EQUIPMENT

The Contractor shall furnish all necessary equipment for testing the tube-well, including a water-lubricated or oil lubricated test pump capable of delivering at least 150 percent of the tube-well rate capacity at all stages of the tests, a valve for fine adjustment of the discharge, an electric measuring device to

determine the draw down during each stage of the test and In off cones to measures and content. If oil-lubricated test pups are used, the contractor shall exercise all reasonably precautions to keep the leakage of lubricating oil into the tube-well at a minimum and shall promptly remove all oil, which collects on the water surface in the tube-well by the addition of detergent or other suitable chemicals and pumping the emulsified oil from the tube-well.

14.10.5 MEASUREMENTS AND DATA

The Contractor shall take draw down and discharge measurements and other pertinent data during each test at intervals as specified by the Engineer In charge. All such data shall be recorded on forms approved by the Engineer In charge, and the original of such forms shall be delivered to the Engineer In charge at the completion of the development and testing operations.

14.10.6 DISINFECTIONS

After development and testing of the tube-well has been satisfactorily completed, and when approved by the Engineering in charge, the Contractor shall disinfect the tube-well by dispersing Chlorine solution throughout the entire depth of the well to obtain minimum chlorine content of 50 ppm (parts per million). The procedure and equipment used to introduce and disperse the chlorine in the tube-well shall be at the option of the Contractor, and shall subject to approval by the Engineer In charge.

14.10.7 SEALING

Upon completion of disinfections of the tube-well the Contractor shall seal the tube-well by tack welding providing 1/4 inch thick steel plate cap to the pump housing pipe around its circumference. Compliance with this requirement will not relieve the Contractor of his responsibility for safe-guarding any part of the tube-well completed until the Certificate of Acceptance is issued for the entire tube-well installation.

14.10.8 PAYMENT

Payment shall be made on the basis of completed job of tube well drilled or material supplied and installed dully approved and measured by the Engineer In charge as per Bill of Quantities.

15 PUMPING MACHINERY

15.1 SCOPE

The work to be done under this section of the specifications includes furnishing all plant, labour, equipment, appliances and materials and in performing all operations required in connection with the installation of pumping machinery including all accessories as specified herein or shown on the Drawings or as directed by the Project Manager.

15.2 MATERIALS AND PRODUCTS

Materials and machinery shall conform to the latest referenced specifications and other provisions specified herein and shall be new and unused. In case where manufacturers are specified, materials and equipment will be of the same manufacturers. In all other cases the Contractor shall submit the names and addresses of the Manufacturers and trade names of the materials and equipment that he intends to buy. Other information such as diagram, drawing and descriptive data will be supplied if so desired by the Project Manager. Approval of materials and all the machinery under this provision shall not be construed as authorising any deviations from the specifications. The approval of machinery of manufacturer other than that specified will be purely on the discretion of the Project Manager. The Project Manager will fully ascertain the facts and satisfy himself as to the performance of the machinery offered by the Contractor.

15.3 SPECIAL REQUIREMENTS OF PUMPS

The Contractor shall furnish with each pump properly identified characteristic curves prepared and certified by the manufacturer showing capacity, head, efficiency and brake horsepower throughout the entire range of the pump.

The pumps shall have stable throttling curves and be suitable for unrestricted parallel operation.

All pumps shall be electric driven.

The pumps and their drives shall not overload or trip when operating against zero pressure.

The design, construction and materials shall be such that damage as a result of cavitation is completely eliminated.

Pumps shall have bearings and be suitable for continuous as well as intermittent operation without external sealing or cooling water. The pumps shall be such that they shall come into operation at once after a prolonged shutdown period without having to take special measures. Pumps shall be capable of delivering specified quantity of water at the specified pressure.

Pumps shall be tested at site before their final acceptance.

Pumps shall be installed at positions shown on the Drawings and/or as directed by the Project Manager.

Pumps and their drives shall be in perfect alignment when installed in position.

Pump set shall be provided with reducer/enlarger if necessary on pump discharge pipe, and suction piece on t he suction end.

Motors shall run on 3-phase, 400 volts + 10%, 50 c/s A/C power. Motors shall be protected from low voltage, overload, over- heating and phase failure.

15.4 PUMP AND MOTOR

15.4.1 Horizontal Centrifugal Pump & Motor

The pump sets will consist of horizontal centrifugal pump and motor of specified capacity and head and duty and shall be horizontal, totally enclosed, fan cooled, squirrel cage induction motors of specified power.

Pump materials shall be as under:

Body : Fine grained grey cast iron

Impeller : Stainless Steel or Bronze

Pump Shaft : Stainless Steel

Shaft Sleeve : Stainless steel or Bronze

Pumps shall have mechanical seal. The suction and discharge flanges shall be rated for working pressure of 16 bars. The flanges shall be drilled to BS 10 (Table 'D' or 'E') or BS 4504.

15.4.2 Submersible Pump & Motor (for Tube Well)

The pump shall consist of submersible pump and motor of the specified capacity and head and shall be integral sealed but with strainer.

The pump material shall be as under:

Inlet body	:	Grey cast iron/steel
Intermediate body	:	Grey cast iron
Discharge bearing		
Body / bowl	:	Grey cast iron
Impeller	:	Tin bronze (radial type)
Bearing	:	Tin bronze
Pumps lift	:	Gr. Steel
Fastness	:	SS (A2)

15.4.3 PUMP ACCESSORIES

Pumps shall be provided inclusive of the following accessories:

i) Pressure gauge, pressure switches, flow switches etc.

ii) Strainer on pump suction pipe.

iii) Reducer/enlarger is necessary if the pump discharge size is different from discharge piping.

15.4.4 MOTOR PROTECTION

Motors of 3kw or less power shall be started direct on line. Larger motors shall be started by star-delta starter.

Motor shall be protected against under voltage over voltage, overload, over-heating and phase failure.

Motor shall be rated for normal operation against a voltage fluctuation of + 10% and frequency fluctuation of + 2Hz.

15.4.5 CONTROL

15.4.5.1 Potable Water Pump and Motor

For potable water pumps, two pumps shall be duty and one shall be standby. Duty shall however change between the pumps on each start/stop cycle of the pump.

Operation of potable water pumps shall be controlled by water level switches in the water

15.4.6 Submersible Pump & Motor (Tube Well)

Operation of tube well pumps shall be manual.

15.4.6.1 PRESSURE GAUGE

Pressure gauge shall be of copper alloy, bourdon tube type with 100mm diameter dial face. The dial shall be englaved in black on white background from zero to 16 bars or 1.5 times the working pressure whichever is larger. Gauge shall be installed to socket welded to the pipeline with an isolating plug/ball valve. If the pipeline installation is such that the above requirement cannot be met pressure gauge of remote reading type shall be installed.

15.4.6.2 BRASS STRAINER

Brass strainers shall be of bucket type with flanged end. They shall be installed at the end of pump suction pipe. The wall thickness of the strainer shall not be less 1/8 inch. The diameter of the holes or the width of the slots shall not be greater than ¼ inch. The open area of the strainer shall not be less than 1.5 times the cross-sectional area of the suction pipe on which it is installed.

15.4.6.3 PRESSURE SWITCH

Pressure switch shall be electric actuating device, which will close/open the circuit at preset lower/higher pressures. The device shall be housed in die cast aluminium casing with enamel finish. The switch shall be adjustable. The pressure switch shall be rated for a working pressure of 16 Bar. The switch shall be wired to control panel.

15.4.6.4 WATER LEVEL INDICATOR

The water level indicator for high and low water level cut off shall operate on 230 Volt AC, 50 Hz and supplied complete with float, float chains, counter-weights, chain clamps, steel mounting brackets, chain guide roller and any other equipment and material necessary for installation and satisfactory operation.

The level indicator shall have at least 5 switch-contacts or as required for sensing the required water levels within the specified range. The level indicator shall be suitable to match with the specific gravity of the fluid in which it is intended to be installed. All operational, constructional and installation details shall be furnished by Contractor for approval.

The bidder may quote for non-mechanical type of water level indicator to give equivalent performance. Technical literature and data of the indicator to be furnished along with the bid documents.

15.4.7 MAINTENANCE MANUALS AND TOOLS

14.1 A book or books containing the complete information in connection with the assembly, operation, lubrication, adjustment and repair of the pumping equipment, electric motor, together with detailed parts list with drawings or photographs shall be furnished in duplicate.

14.2 For the pump room, special tools necessary for maintenance and repair of the pumps and electric motors including tools kits, grease guns etc. with accessories shall be furnished.

14.3 The manufacturer's recommended list of spare parts to be stocked by the CLIENT shall be submitted by the Contractor to the Project Manager for approval. Such spare parts will also be furnished by the Contractor.

14.4 All the maintenance manuals, tools, spare parts etc., shall be supplied by the Contractor at no cost of the CLIENT and all cost shall be deemed to be included by the Contractor in his bid against item of pumping set.

15.5 MEASUREMENT AND PAYMENT

15.5.1 Pumping Machinery

15.5.1.1 Measurement

Measurement for payment of pumping machinery pressure gauge, brass strainer, pressure switch shall be the actual number acceptably provided and installed in position; the Contractor's bid against these item shall include cost of providing and installing the pumping machinery including the pumps, electric motors, all accessories, manuals, tools, spare parts, etc., as shown on the Drawings, as specified herein or as directed by the Project Manager.

15.5.1.2 Payment

Payment will be made for acceptable measured quantity of pumping machinery pressure gauge, brass strainer, pressure switch and water level indicator on the basis of unit rate per number quoted in the Bill of Quantities. The amount bid shall be full payment for the work specified.

15.5.1.3 Payment

Payment will be made for acceptable measured quantity of chain pulley and block on the basis of unit rate per number quoted in the Bill of Quantities. Payment will constitute full compensation for the complete works including all specified works related to the item.

15.5.2 Level Indicator

15.5.2.1 Measurement

Measurement of acceptably completed works of level indicator will be made on the basis of actual number installed in positions, tested, flushed, and commissioned as specified herein, in bill of quantities, as shown on the drawings and/or as directed by the Project Manager.

Measurement of acceptably completed works of level indicator will be made on the basis of actual numbers as specified herein, in bill of quantities, as shown on the drawings and/or as directed by the Project Manager.

15.5.2.2 Payment

Payment for acceptable measured quantity of level indicator will be made on the basis of unit rate per number quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the items.

Payment for acceptably measured quantity of level indicator will be made on the basis of unit rate per number quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the items.

16 POLYVINYLCHLORIDE WATER STOPPER

16.1 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.

16.2 MATERIAL REQUIREMENTS

- PVC water stops shall be extruded from an elastomeric plastic compound, having basic resin of polyvinylchloride (PVC).
- 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^2 (1750 psi)	568
Ultimate elongation, using die III	350%	573
Low temperature brittleness with no sign of failure such as cracking or chipping	- 35^o F	570
Stiffness in flexure, 1/2" span	28 kg/cm^2 (400 psi)	571

16.3 CONSTRUCTION REQUIREMENTS

i. 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.
ii. All embedment in concrete, lapping, turning and sealing shall ensure absolute water tightness.
iii. No holes shall be made through any water stops.

iv. The water stops, wherever indicated on drawings or directed by the Engineer, shall be cast integrally with the in-situ concrete, with separate junction and intersection pieces, placed and jointed at Site.

v. The water stops shall be installed, in such a way that they are held securely, in their correct position, during the placement of concrete.

vi. The concrete shall be fully and properly compacted around the water stops to ensure that no voids or porous areas remain.

vii. Where reinforcement is present; adequate clearance shall be left, between water stops and the reinforcement, to permit proper compaction of concrete.

viii. Splices, in the continuity, or at the intersections of runs of PVC water stops, shall be performed by heat-sealing the adjacent surfaces.

ix. A thermostatically controlled electric source of heat shall be used to make all splices. The correct temperature at which splices should be made will differ with the material used but should be sufficient to melt but not char the plastic.

x. After splicing, a remoulding 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 centre axis, protrusions, and the like) shall be maintained across the splice.

16.3.1 MEASUREMENT

- 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.
- No allowance will be made, in the above computed lengths, for the laps and splices.

16.3.2 RATE AND PAYMENT

- 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.
- 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.

17 BITUMEN COATING

17.1 SCOPE

The work under this section of the Specifications consists of furnishing all plant, labour, equipment, appliances and materials and in performing all operations for bitumen coating treatment to foundations, complete in strict accordance with this section of this section of the specifications and the applicable drawings and subject to the terms and conditions of the Contract.

17.2 SUBMITTAL

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

17.3 MATERIALS

Bitumen 10/20 grade.

17.4 DELIVERY STORAGE AND HANDLING

Materials shall be protected from damage during loading shipment delivery and storage Non-staining materials shall be used for blocking and packing.

17.5 PREPARATORY WORK

All surfaces, to be treated shall be dust free and dry. Application shall not start unless the preparatory work has been inspected and approved by the Engineer.

17.6 WATER PROOFING TREATMENT IN FOUNDATION / SUB-STRUCTURES

All surfaces to be bitumen painted shall be thoroughly cleaned of any accretion, dust, dirt etc. by scraping, wire brushing or as directed by the Engineer. The surface shall be primed with a coat or asphalt oil used at the rate of not less than 1 gallon /100 square feet. Two coats of hot bitumen paint shall be applied at the rate of 40 lbs/100 sft. Each coat. The first coat shall be allowed to dry for about 6 hours before applying the second coat. During operation of painting great care shall be taken to avoid air bubbles. The manufacturer's advice/ recommendations shall be taken to avoid air bubbles. The manufacturer's instructions and Engineer's directions shall be followed.

17.7 MEASUREMENT AND PAYMENT

17.7.1 General

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

17.8 Bills of Quantities.

The rates quoted by the Contractor in the Bill of Quantities shall include work to be executed under these specification in any floor and at any height except where otherwise specifically stated in the relevant item of Bill of Quantities and the Contractor shall not be entitled to any claim or claim any compensation on this account.

All preparatory work, scrapping, scratching and cleaning.

17.9 Measurement

Measurement of acceptably completed works of bitumen coating will be made on the basis of net actual area in square feet as shown on the Drawings or as directed by the Engineer.

17.10 Payment

Payment will be made for acceptable measured quantity of bitumen coating on the basis of unit rate per square feet quoted in the Bills of Quantities. The unit rate shall include all cost of surface preparation and shall constitute full compensation for all the works related to the item.

18 QUALITY ASSURANCE & QUALITY CONTROL REGIMEN

18.1 GENERAL

The objective of Quality Assurance (QA) and Quality Control (QC) activities is to ensure the quality of the construction of the Project. The quality of the construction activities are interlinked to both the materials used in the construction and the way of performing the construction by a systematic, schematic and effective usage of men and material.

In order to provide assurance to the Gwadar Development Authority, the Contractor shall comply scrupulously with the following procedural points during the execution of the Project.

18.2 TOOLS OF QA AND QC

- The submittal of any material shall be given to the Engineer/ Department in advance of at least one month for approval.
- All the inspection reports, testing reports, approvals submitted and sought from the Engineer/ Department and the relevant records shall be safely maintained and properly filed in liaison with and in a manner agreed with the Department to facilitate checking at any time by the Department during the Contract.
- Materials approval statement report shall be prepared in liaison with and in a manner agreed with the Department and in the approved format and programme of the Department.
- Submittal Action Summary (SAS) spreadsheets for materials shall be prepared in liaison with and in a format agreed with the Department.
- All references to BS, AASHTO, ASTM, AWWA, DIN, EN, ISO etc. or any other standards given in the Specification (in this Section or the rest of the Specification) shall mean the latest versions of these Standards. The latest version may also mean a completely new Standard that has superseded the Standard mentioned in the Specification.
- The approval of materials should be obtained in the standard forms whose specimen copies “Form P” is bound in this volume of the Specification.
- No two Suppliers/ Manufacturers shall be allowed to supply the same material for the Contract, unless the first one failed in quality or supplies schedule. This should be documented properly in record. This measure is to prevent the mixing of material and to facilitate the traceability in future.

- In case of imported materials, no payment shall be made unless the Contractor/ Engineer sign the bill of lading. However, the responsibility of authenticity always lies solely with the Contractor. The bill of lading shall be made available to the Department on demand.
- All the Engineering materials/equipment/instruments or any other items used 'in the permanent works of the Contract shall be compulsorily and legibly marked with the manufacturer's name, casting or making references and all other specified relevant requirements. In the absence of the above, the products will not be considered genuine.
- All the materials that are brought from the manufacturers located outside the PAKISTAN shall preferably be registered in their respective countries with their respective standard institutions For example,

The registration means the acquisition of their logo, i.e." Kite mark "or "French mark", etc. No deviation from this is allowed.

- All properties/characteristics mentioned in the technical data of the submitted material shall authenticate by test results preferably from an independent laboratory.
- All the type tests or the approved tests carried out on the pipes or any other material shall be performed in the worst conditions of loading as per the standards and specification, corrosion, strain, etc. Subsequently the material supplied thereafter shall be quality better than or at least equal to the tested one.
- All the records of tests conducted in the factory shall be maintained by the factory for the inspection by the Engineer/Department at any time.
- The Engineer/Client shall have free and unhindered access to the manufacturing company at any time to check for compliance. Failure to provide such access shall lead to the withdrawal of the approval.
- Raw material that is being used to fabricate the product shall be approved first and then its use shall be continued for that whole Project unless permitted in writing to change.
- All electromechanical related tests on material will have to be performed before and during handing over. Test certificates shall be submitted to the Engineer.
- All products shall be designed to achieve a minimum service life of 50 years in accordance with AWWA M45, under all applicable loads,

environmental, installation and operating conditions. Manufacturer will provide certificate of the minimum service life of 50 years.

All the suppliers have to give the definite guarantees of performance and materials in PAKISTAN environment. No material will be accepted without the guarantees.

Any material (small or big) will not be accepted, even if it complies with specifications and standards, unless it is accompanied by guarantee letter for a definite period, the minimum of which shall be 10 years. Guarantee shall cover the likely wear and tear due to handling/installation/service etc.

Guarantee means at the end of the specified guarantee period the product shall retain 90% of its original properties.

Guarantee letter shall be in the name of the Client and it shall be comprehensive and straightforward and shall not have any hidden meaning or objective. In any case, whatever guarantee is given; it does not mean that this guarantee is enough and relieves from any QA/QC tests as and when laid down by the Department.

The guarantee is meant for the period starting from the issue of the Preliminary Acceptance Certificate of the Contract.

- If a factory's approval is suspended /withdrawn then the manufacturer will not be allowed to continue the supply of that failed /passed item from the date of suspension.
- The Contractor/Engineer/Department may be requested to have an amalgamated filing system
- Standards are binding for the Contractor unless modified/changed/altered by the Engineer/Department for betterment.
- If any discrepancy is brought to light in specifications, standards, Engineer's instructions, comments on general approval letter, comments of approval forms, it shall immediately be brought to the notice of the Department.

18.3 FLOW DIAGRAM

The Contractor shall comply with the procedures of materials approval as outlined below. The Department reserves the right to modify the procedure as it sees fit.

- Flow Diagram for Previously Approved Material
- The Contractor shall comply with the Conditions of the general approval of the factory as mentioned in the general approval letter issued by The Client for various materials.
- In case of any discrepancy regarding the quality requirements of the materials and works in the different contract documents the highest standard will be applicable.
- The complete procedure with forms and flow chart for the materials approval is given below

18.3.1 PURPOSE:

To submit the organized transmittal for the approval of material in a contract.

18.3.2 SCOPE

The procedures applicable to all Contractual approval of any materials

18.3.3 RESPONSIBILITY

Main: contractor, consultant, project management, if any, and manufacturer.

18.3.4 PROCEDURE

This form is to be filled whenever the contractor asks for the approval of an item/material to be used in the works. Be this material be civil, electro-mechanical, structural, chemical, small/big, etc. for their work.

Form "P" shall be used for any material that has been previously approved by Gwadar Development Authority.

This Materials approval form is divided into 5 Sections.

Contractor's Section: Which is to be filled by contractor only

Consultant's Section: Which is to be filled by consultant only

Project Management Section: Which is to be filled by Project Management only, if any

Client Section: To be filled by Client personnel only

Attachments: Which is to be filled by contractor only, he will have to check mark the box beside that attachment which he has included in the Materials approval submittal.

19 CONTRACTOR'S SECTION

Project and / or Area:

Name: Write the official name of the contract

Consultant: The name of the site supervision consultant of the project and its full address including the site telephone numbers, the fax numbers and the official email

Contractor: The name of the contractor of the project and its full address including the site telephone numbers, the fax numbers and the official email

Submittal No. Write the number of the Submittal No.

Rev.: if a particular Material is returned to the contractor for any reason by any department then he has to revise it after removing the objection. When this is done it is called revised. This rev number is to be written in the box provide below. Write A if it is first revision, B if second and so on like 5A then 5B, then 5C if needed.

Date Submitted: The date when these Materials are actually submitted to the consultant. Be it revised or original.

Producer/Fabricator: The complete postal name and address which shall include the:

Name & Address: Street address if any, Telephone and Fax Nos, and email or website. This is for cross checking the authenticity.

Supplier's the complete postal name and address which shall include the:

Name & Address: Street address if any, Telephone and Fax Nos, and email or website.

Specification Ref: The specification reference article No. of these material in the general/particular Spec.

BOQ Reference: The specification reference article No. of these material in BOQ.

Product Registration: This is the product certification acquired by any organization.

Body: For example

BSI Kite mark, DWI mark for the product from UK;

DIN, MPA, FRG, DVGW from Germany;

AENOR from France;

ACI, ANSI, ASTM from USA, and so on

These registration bodies are Govt. controlled/sponsored bodies formed by the act of law. They generally give the certificate for the compliance of the product with a particular well known latest international material standard. After issuing certification these registration bodies continue to monitor the said factory every six months/one year to check whether the company is continuing to implement the basic product quality or not (for they are certified).

ISO Registration: This is the Quality Management System certification issued to an organization by ISO Registrar, who is entitled to issue ISO certification. After issuing certification these registration bodies continue to monitor the said factory every Six Months / One Year to check whether the company is continuing to implement the basic Quality Management System. (For they are certified)

Technical Details: These shall include the main summary of details of the product like class, type, strength, dimensions, in the nutshell the identifying properties by which we will be able to identify and differentiate our product from the other similar products and the main raw materials used also should be mentioned and if there is a space the properties of it as well.

Previous Contract & its Scope of Application or limitation:

Where this Product is used and applied in the contract with the name of the contract. Was there any limitation placed at that time of approval/application. Attach a copy of the previous approval that can be obtained from the supplier/manufacturer

Proposed area/s of application/s:

Where this materials is to be used now with respect to the application and environment.

Project Manager the signature of the PM of the contractor after thoroughly going through the statement written for his name. The date and the stamp shall also be imprinted.

20 CONSULTANT SECTION

STATUS: Approved / Not Approved

If not approved by the consultant then he shall send it back to the contractor for revision. If approved then passed it to the project management/client after check marking the status

A.R.E/M.E: To be signed by the ARE or Material Engineer of Consultant after thoroughly going through the submission and made sure that it is submitted as authority/department wants it.

R.E: To be signed and stamped by the RE of Consultant after thoroughly going

Through submission and made sure that it is submitted as authority/department wants it.

I. CLIENT

To be filled by the client.

You can have a look at the ideal submission which is with the Quality In charge, Quality Section or Quality Consultant of Gwadar Development Authority.

II. ATTACHMENTS

All the attachments that needs to be appended shall be check marked

Compliance checklist: It shall be in the form of table where a comparison is made between the specified parameters and the submitted parameters and contractor's inference about its compliance.

Specification/s: General and Particular specifications & addendum if any.

Drawings: Related Drawings of the material submitted for approval.

Catalogue/Brochure: Where the technical Details of the product are given.

Test Certificates: Test certificates of the test conducted on the submitted product within last one year but preferably 6 months. These certificates are of those parameters that are mentioned in specifications.

BOQ: Related BOQ articles of the submitted material.

Complying Standards copy: A copy of the international standards with which the submitted material complies or that is mentioned in specifications.

Previous approvals: A copy of the previous approval from Gwadar Authority.

General Approval: A copy of the latest/last issued General Approval, if any.

Sample: Sample of the product submitted.

Guarantee: A letter of Guarantee of the products from the manufacturer signed by president, CEO, and authenticated by the supplier.

ISO Certifications: ISO 9000 Certificate and if needed both the manual and processes.

Product Certification: Product certificate from product certifying international standard bodies like BSI Kite mark , DIN, AENOR, MPA, FRG, ETC.

Certificate of Origin: From where this material is coming attested by the PAKISTAN embassy and chamber of commerce of that country.

Certificate of Manufacture: The address of the factory where this material is manufactured attested by the PAKISTAN embassy and chamber of commerce of that country.

Bill of Lading: Bill that shows the details of shipment of the submitted materials.

Packing List:Which comes along with the Bill of Lading which shows what is packed.

License/s: License of the manufacturer and preferably of the supplier too. In any case manufacturer's license is obligatory.

Letter of Appointment: Letter of appointment as authorized distributor or agent from the manufacturer to the supplier, preferably attested.

Arrangement of the Materials Approval Submittal in a folder

All attachments shall be stamped and approved

	FOLDER SETTING
Top	Covering Letter from the consultant
	Covering Letter from the contractor

Divider No.1divider no Compliance checklist	1
Divider No.2 Divider No.1divider no Specification/s	2
Divider No.3 Divider No.1divider no Drawings	3
Divider No.4 Divider No.1divider no Catalogue/Brochure	4
Divider No.5 Divider No.1divider no Test Certificates	5
Divider No.6 Divider No.1divider no BOQ	6
Divider No.7 Divider No.1divider no Complying Standards copy	7
Divider No.8 Divider No.1divider no Previous approvals	8
Divider No.9 Divider No.1divider no General Approval	9
Divider No.10 Divider No.1divider no Sample	10
Divider No.11 Divider No.1divider no Warranty	11
Divider No.12 Divider No.1divider no ISO Certifications	12
Divider No.13 Divider No.1divider no Product Certification	13
Divider No.14 Divider No.1divider no Certificate of Origin	14
Divider No.15 Divider No.1divider no Certificate of Manufacture	15
Divider No.16 Divider No.1divider no Bill of Lading	16
Divider No.18 Divider No.1divider no Packing List	18
Divider No.19 Divider No.1divider no License/s	19
Divider No.20 Divider No.1divider no Chamber of Commerce	20
Divider No.2120 Divider No.1divider no	21

Letter of Appointment

20.1 FOLDER SETTINGS

There are 12/21 or more attachments required for any Materials approval. All these are given in the Materials approval form. All these attachments are numbered from 1 to 21. There are certain blanks left which is used only when some special need comes. Special attachments shall be mentioned in these blanks.

There shall be 1 copy and one original Materials approval submittal.

The submittal for the Materials is to be arranged in the above mentioned fashion, every time you make a submittal.

On the Top the official covering letter of the consultant. Followed by the Contractor's letter.

Next to it is the contractors detailed Materials approval submittal arranged AS MENTIONED ABOVE in the form of sections separated by numbered plastic dividers. The number of numbered plastic dividers shall be at least 25. Numbered as 1, 2, 3...14, 21... Each number represents the number of the attachment that is mentioned in the Materials approval form.

Please Note Even if you are not attaching any sheet in these dividers then also you still have to keep this divider without any attachments.

For example:

Divider Number 1 represents the Compliance checklist.

Divider Number 2 Specification/s

Divider Number 3 Drawings

Divider Number 4 represents the technical Details of the product. In this division separate each product by A4 size coloured sheet on which the product name is mentioned and then append the product details. Suppose you're submitted materials has a total of 10 different products/models then you shall have 10 A4 size coloured sheets with the product name written on it. Likewise if you materials has 15 products/ model bills you shall have 15 A4 size colour sheet dividers.

Divider Number 5 Test Certificates of the submitted product/s

Divider Numbers 21, 22, 23 is left blank to accommodate any other irregular attachment that may be required. If there is any such attachment then you write the name of that attachment in these numbers 21, 22, 23.

NECESSARY FACILITIES OF FRESH WATER TREATMENT, WATER SUPPLY AND DISTRIBUTION GWADAR
GOVERNMENT OF BALOCHISTAN

MATERIALS APPROVAL SUBMITTAL

Form "P" (for previously approved materials)

All sections of the form must be completed and attachment enclosed where not applicable shall be marked "NA"

CONTRACTORS SECTION

Project Name and / or Area				**ATTACHMENTS** ↓	✓
Consultant:		Contractor:	1	Compliance checklist	
			2	Specification/s	
Suvmittal No.	Rev:	Date Submitted:	3	Drawings	
Material:		Producted Name:	4	Catalogue/Brochure	
Producer/Fabricator's Name & Adress:		Supplier's Name & Address	5	Test Certificates	
			6	BOQ	
			7	Complying Standards copy	
			8	Previous Approvals	
Specification Ref:		BOQ Reference:	9	General Approval	
Product Registration Body		ISO Certification Body	10	Sample	
Technical Details:		Quantity/s	11	Warranty	
			12	Iso Certifications	
			13	Product Certification	
			14	Certificate of Origin	
			15	Certificate of Manufacture	
			16	Bill of Lading	
			17	Packing List	
Previous Contract & its Scope of Application or limitation			18	License/s	
			19	Chamber of Commerce	
Proposed area/s of application/s			20	Letter of Appointment	
			21		
" Ideclare that the proposed materials comply with Contract documents etc, & the information given above is authentic" → Sign with stamp P.M			22		
			23		
			24		

CONSULTANT

☐ Approved ☐ Not Approved ☐ Returned with comments

Comments:

We verified the enclosed attachments and certify that the submission complies with contract documents & AM requirements → sign with stamp A.R.E. / M.E. R.E.

PR MGM

☐ Recommended ☐ Not Recommended ☐ Returned with comments

Comments:

We reviewed the consultant's evalustion and found it complying with contract requirmements → sign with stamp A.R.E. / M.E. R.E.

CLIENT

☐ Endorsed ☐ Not Endorsed ☐ Further information Required

Comments:

Signatures with dates **QUALITY ENGINEER** **HEAD OF MATERIALS QC SECTION**

20.2 PIPE MANUFACTURER/SUPPLIER ASSISTANCE:

Manufacturer shall ensure to provide technical assistance during and till whole length of pipe installation period including, but not limited to:

- Unhindered technical assistance, via modern modes of communication i.e. Email, Telephone, Fax etc.
- Full time technical staff deployment to the site for fool proof installation of pipe and to ascertain up to the mark workman ship.
- Number of deployed technical staff, their schedule of working and other relevant details shall be provided prior to the start of installation of the pipe.
- Qualification details and experience of all deployed technical staff shall be made available prior to the deputation to the site.
- Any special equipment or machinery which is essential for the installation of pipe on site, if deemed necessary, shall be supplied by the manufacturer.
- Manufacturer's technical staff shall supervise loading, unloading and transportation process of the pipe for each consignment.
- On site hydraulic test, as listed in the specifications, shall be carried out in the presence of, and up to entire satisfaction and approval of the manufacturer's technical staff.
- Formal approval certificate duly signed by in charge of manufacturer's technical staff shall be provided for further approval by the Engineer.

20.3 FIELD QUALITY CONTROL

- All sampling and testing of material and work shall be carried out by the Contractor under the direction of the Engineer in accordance with the specifications and standards specified.
- The Contractor shall provide all material, labor, plant and testing equipment required to carry out the tests. Costs for all testing are deemed to be included in the rates and Contract price.
- Random tests of field density of backfill shall be taken at formation level and at each layer of backfill and at location and frequency as directed and required by the Engineer.
- If tests indicate Works does not meet specified requirements, the Contractor shall remove Work, replace, compact, and retest, all at the Contractors expense.

- Where instructed by the Engineer, the Contractor shall arrange for an approved independent testing laboratory to carry out tests to determine in-situ the density of the backfill material.
- Compaction, testing and analysis of soil materials shall be performed in compliance with the following standards:

Description	AASHTO Standard
Sampling	T-2, T-88
Sample Preparation	T-87
Sieve Analysis	T-27
Density in place (Sand Cone Method)	T-191
Liquid Limit	T-89
Plastic Limit & Plasticity Index	T-90
Moisture Content	T-93, T-217
Modified Proctor Compaction	T-180
Sand Equivalent	T-176
CBR	T-193
Classification	M-145

1885 SMI UNIVERSITY

Sindh Madressatul Islam University

DEVELOPMENT OF SINDH MADRESSATUL ISLAM UNIVERSITY (SMIU) CAMPUS AT EDUCATION CITY MALIR, KARACHI WATER SUPPLY SYSTEM INCLUDING TUBE WELL

Tender Document

Volume-III

Bill of Quantities

EA Consulting Pvt Ltd

ARCHITECTURE | ENGINEERING | PROJECT MANAGEMENT

PAKISTAN | UAE | CANADA

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WATER SUPPLY SYSTEM
(i/c Tube Well)

BILL OF QUANTITIES

S.No	Description	Amount
A	**SCHEDULE ITEM** Water Supply System (Pipe Works) Part-I	3,089,848.0
	Total of Schedule Items - A ____% Above/Below/AT Par on PWD-2022 Schedule	**3,089,848.00**
	Total of Schedule Items - A	
B	**NON-SCHEDULE ITEM** Water Supply System (Pipe Works) Part-I Water Supply System (Tube Well) Part-II	
	Total of Non-Schedule Items - B	
	TOTAL CARRIED TO GRAND SUMMARY (A+B)	

Development of Sindh Madressatul Islam University

Campus At Education City, Karachi

BILL OF QUANTITIES

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
1	2	3	4		6	7 = 4 x 6
		SCHEDULE ITEMS				
1	Code-103, Item#2 P-40	**EXCAVATION** Excavation for foundation trenches and drains in gravelly soil and back filling the excavated material in foundation trenches plinth or under floor including breaking clods, watering, consolidation by ramming in layers not exceeding 9 inches (229 mm) in depth to full compaction, dressing and disposal of surplus excavated stuff as directed lead upto one chain (30.5 R.m) and lift upto 5 feet 1.52 m).				
1.1		**From ± 0'-0" to 5' - 0" (for Pipe Line)**	80,748.00	100 Cft	1,862.13	1,503,633
2	Code - 102,Item#13 P-35	**EARTH FILL / ENGINEERED FILLING** Filling depressions with excavated stuff in 6 inches (152 mm) layers within one chain (30.5 R.m) lead including levelling, dressing, watering and consolidatingetc. complete in all respects as per drawing, standard , specifications and as directed by the Engineer.				
2.1		**With surplus earth from foundation, etc.**	53,204.00	100 Cft	1,043.13	554,987
3	Code - 102 Item#14 P-35	Supplying and filling approved quality imported earth in depressions within a radius of 5 miles (8 km) including breaking clods, levelling, dressing, watering and consolidating in 6 inches (152 mm) layers etc. complete, including all lifts.etc. complete in all respects as per drawing, standard , specifications and as directed by the Engineer.				
3.1		**With new earth excavated from outside.**	15,687.00	100 Cft	3,662.48	574,533
4	Code - 114 Item#2, P-173	**PLAIN CONCRETE WORKS** Providing and laying 1:2:4 (1 cement 2 sand and 4 coarse aggregate) cement concrete using graded gravel (bajri) 1inch (25 mm) and down gauge in foundation including levelling, compacting and curing etc. complete in all respects as per drawing, standard , specifications and as directed by the Engineer.				
4.1		**Concrete Cylindrical strength of 3000Psi for Section under carriage way**	1,197.00	100 Cft	32,691.15	391,313
4.2		**Concrete Cylindrical strength of 3000Psi for Thurst block**	200.00	100 Cft	32,691.15	65,382
		Total Carried to Summary				**3,089,848.00**

Development of Sindh Madressatul Islam University

Campus At Education City, Karachi

BILL OF QUANTITIES

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
1	2	3	4		6	7 = 4 x 6
		NON-SCHEDULE ITEMS				
5		**GRANULAR BEDDING** Providing, spreading, and consolidating of sand bedding material of approved quality including watering etc. complete in all respects as per drawing, standard , specifications and as directed by the Engineer.	10,164.00	Cft		
6		**PIPES (HDPE)** Providing, Laying, jointing, commissioning, testing and fixing all relevant fitting including tee, bends, expander, end cap, stub end etc. including. disinfection of HDPE pipes of below mentioned diameter and pressure confirming to specified standards, in trenches to correct alignment and grade as indicated in the drawing and specifications including all other accessories and equipment, complete in all respect, as per specifications & relevant drawings and all works to the entire satisfaction of the Engineer.				
		PN-10 (SDR -21)				
6.1		**63 mm**	3,086.98	P.Rft		
6.2		**110 mm**	3,841.80	P.Rft		
7		**GATE VALVE** Providing & Fixing of Flange End Cast Iron Sluice Valve of Design Standard BS 5150/API 600 compliance with EN 1171/BS 5163 having Nominal Pressure PN-16 - Class 125 S.S. Cr 13% Seat & Stem with Nuts, Bolts, Gas kit/Rubber Packing including Labour complete in all respect, as per specifications & relevant drawings and all works to the entire satisfaction of the Engineer.				
7.1		**DN-110 mm (PN-10)**	2.00	No		
8		**AIR RELEASE VALVE** Supplying, installing, jointing and fixing C.I Air Valve (Double acting) with SS ball heavy duty pattern of approved manufacturer's specification (test pressure) as per standard including 50mm dia isolating flanged gate valve, m.s flanges etc complete in all respect, as per specifications & relevant drawings and all works to the entire satisfaction of the Engineer.				
8.1		**2" (DN-50)**	3.00	No		
9		**WASHOUT VALVES** Providing and installing washout arrangement with extra flanges, bends, tees, etc. required for draining out the lines including pipe complete in all respect as per drawings and specification and as directed by the Engineer In charge.				
9.1		**3" (DN-75) PN-10**	4.00	No		

Development of Sindh Madressatul Islam University

Campus At Education City, Karachi

BILL OF QUANTITIES

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
1	2	3	4		6	7 = 4 x 6
10		**VALVE CHAMBER** Making, construction of Chamber for valves as size mentioned below upto required depth. complete and comprising with C.I cover and frame heavy duty (weight) as shown in drawing, RCC bottom & top slab, C.C walls 1:2:4 complete with curing and finishing, providing and fixing MS foot rest (rungs) as shown on drawings, excavation, back filling and disposal of surplus earth. Including cost of Reinforcement bars, Fair face Steel form work and bitumen coating on external surface of wall, footing and blinding up to substructure level etc, complete in all respect, as per specifications & relevant drawings and all works to the entire satisfaction of the Engineer.				
10.1		**Internal Size of Valve Chamber** **3'-0" x 3'-0"**	9.00	No		
		Total Carried to Summary				

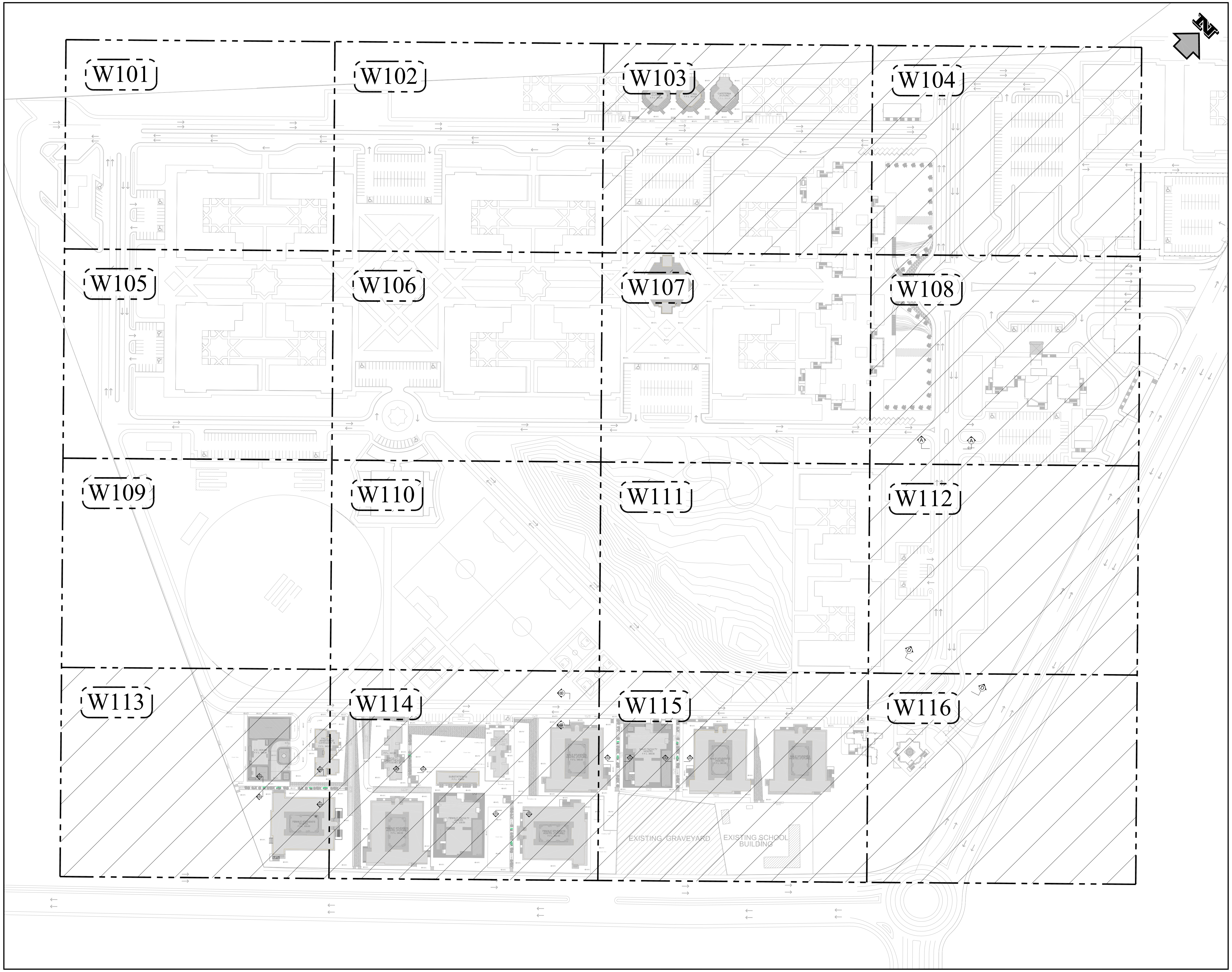
BILL OF QUANTITIES

S.No		Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
1	2	3	4		6	7 = 4 x 6
		NON-SCHEDULE ITEMS				
1	**PART - A (DRILLING OF 4 BOREHOLES)**					
1.1		Drilling in all kinds of soils, strata & rocks, with 8" – 10" Ø bit including mobilization of straight rotary drilling machinery and equipment, material, accessories, staff & labor. 00ft – 500ft.	2000	RFT.		
1.2		Sampling of strata for the study of soil-formation encountered after every 10ft. of interval or change of strata.	JOB	L.S		
1.3		Yield Testing with air-compressor/ submersible pump to estimate the presence of sulfur in the discharge or not by collecting water samples from the test bore and send it to the Laboratory.	JOB	L.S		
1.4		Submission of test bore report with proposed tube well design, soil lithology based on the results of yield testing and soil lithology.	JOB	L.S		
					TOTAL AMOUNT PART "A"	
2	**PART - B (CONVERSION OF 4 TEST BORES INTO 4 TUBEWELLS)**					
2.1		Enlargement of 8"Ø test bore into 12"Ø in all types of soils. 00ft – 500ft.	2000.00	RFT.		
2.2		Providing sanitary seal to avoid the upper polluted water from the tube well with grouting material (sand, silica, S.R. cement) in 1:1:3 to avoid polluted upper zone water from entering into the well.	200.00	RFT.		
2.3		Providing, Lowering Screen and Blank of 8" Ø UPVC "E" casing according to the proposed tube well, complete with all necessary fittings, (S.S cone, cut-screw, jointing solution, centralizers, etc.)	2080.00	RFT.		
2.4		Providing of silica graded pea gravel from kohistan origin & pouring of gravel shrouding in-between the annular space of borehole walls & uPVC casing with the help of water circulation. The size of the graded gravel must be in accordance with the thickness of the UPVC filter slots.	JOB	L.S		
2.6		Long duration pumping test to collect hydraulic data for the finalization of permanent pump & motor by placing temporary high-rated suction pump, motor & run it for 48 hours to check the static water level, dynamic water level, draw down, well recharging time to provide the specifications for permanent submersible pump & motor along with safe continuous discharge range and pump setting depth.	JOB	L.S		
2.7		Chemical analysis of water samples	4.00	SAMPLE		
2.8		Submission of Report	JOB	L.S		
					TOTAL AMOUNT PART "B"	
4	**PART "C" (PUMPING SYSTEM)**					
4.1		**SUBMERSIBLE PUMP & MOTOR** Providing, installing, testing and commisioning of Grundfos / KSB or equivalent submersible pump with Standard Motor control unit with dry protection including electrical cables to control pump on and off, Supply of S.S Nut/bolts, G.I Clamps, Rubber Packings, Tail Pipe (S.S), Cover plate (G.I) , etc, required to complete in all respects as per standard specification, drawing and entire satisfaction of the Engineer.				
4.1.1		Pump 69 IGPM and head of 150 FT.	1.00	EACH		
4.1.2		Pump 154 IGPM and head of 170 FT.	1.00	EACH		
4.1.3		Pump 102 IGPM and head of 170 FT.	1.00	EACH		
4.1.4		Pump 101 IGPM and head of 160 FT.	1.00	EACH		
4.2		**RISER PIPE** Supplying, laying, jointing, testing, disinfection & commissioning of Riser pipe 2.5" dia (GI Medium) including tees, bends, flanges, expender etc complete in all respects as per standard specification, drawing and entire satisfaction of the Engineer.	1,600.00	RFT.		

S.No		Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
1	2	3	4		6	7 = 4 x 6
4.3		**GATE VALVE** Providing & Fixing of Flange End Cast Iron Sluice Valve of Design Standard BS 5150/API 600 compliance with EN 1171/BS 5163 having Nominal Pressure PN-10 - Class 125 S.S. Cr 13% Seat & Stem with Nuts, Bolts, Gas kit/Rubber Packing including Labour complete in all respect, as per specifications & relevant drawings and all works to the entire satisfaction of the Engineer.				
4.3.1		**2.5" (DN-50)**	4.00	EACH		
4.4		**DOUBLE ACTING AIR VALVE** Supplying, installing, jointing and fixing C.I Air Valve (Double acting) with SS ball heavy duty pattern of approved manufacturer's specification (test pressure) as per standard including 50mm dia isolating flanged gate valve, m.s flanges etc complete in all respect, as per specifications & relevant drawings and all works to the entire satisfaction of the Engineer.				
4.4.1		**2.5" (DN-50)**	4.00	EACH		
4.5		**CHECK VALVE** Providing and fixing cast iron non check valve with gun metal working parts with hinged door, flanged ends and rubber washer and bolts and nuts etc. complete in all respect, as per specifications, relevant drawings and all works to the entire satisfaction of the Engineer.				
4.5.1		**2.5" PN-10**	4.00	EACH		
4.6		**PRESSURE GAUGE** Providing and installing pressure guage with stainless steel body with siphon and cock complete in all respect as per drawings and specification and as directed by the Engineer In charge.				
4.6.1		**2.5" PN-10**	4.00	EACH		
					TOTAL AMOUNT PART "C"	
					TOTAL AMOUNT PART A,B & C	

WATER SUPPLY SYSTEM

MASTER PLAN



Client :

Consultant :

EA Consulting Pvt Ltd
AL-9,15th Lane,
Off Khayaban-e-Hilal,
DHA Phase 7,
Karachi, Pakistan 75500
PABX: +92-21-111-111-584,
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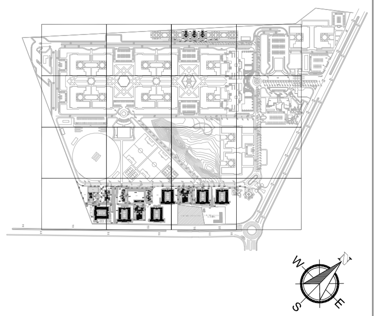
Project :

Development of Sindh Madressatul Islam University (SMIU) Campus At Education City, Malir Karachi (P H A S E - I)

Key Plan :



No.	DATE	DESCRIPTION
00	April, 2024	ISSUED FOR TENDER

REVISIONS

Note:

Date of Issue	April, 2024
Issued To	Client
Issued For	Tender

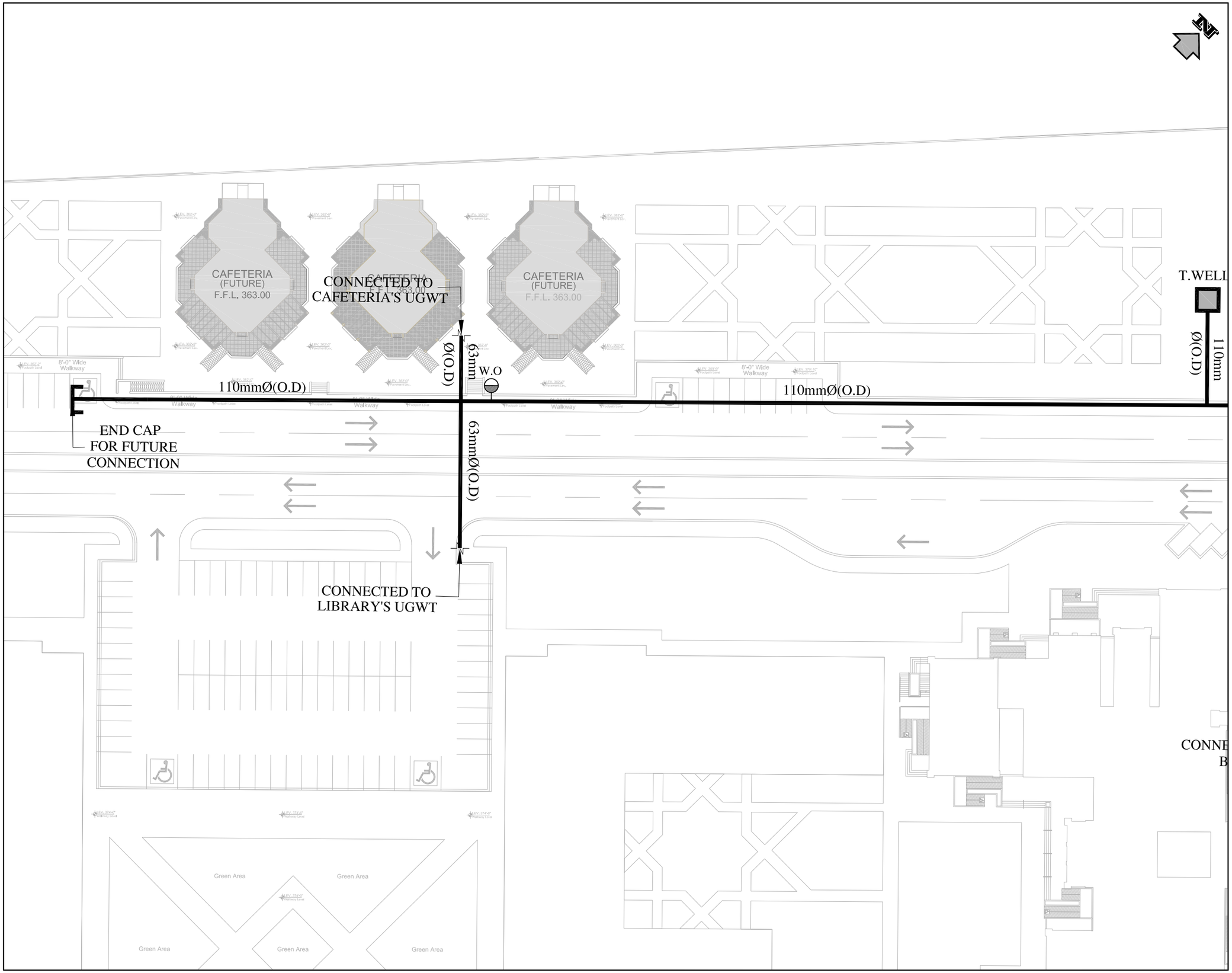
Status:
TENDER

Drawing Title :
MASTER PLAN
AND SHEET INDEX
(FOR WATER SUPPLY SYSTEM)

Designed : Bilal	Checked : Fahad	Approved : Fahad
Drawn : Furqan	Date : April,2024	Scale / Sheet : A-1
Project Code : 00986		Rev. : 0

Drawing No. :
EA-00986-SMIU-U-W100

LAYOUT PLAN



MATCH LINE DWG NO:EA-00986-SMIU-U-W102

MATCH LINE DWG NO:EA-00986-SMIU-U-W104

MATCH LINE DWG NO:EA-00986-SMIU-U-W107

Client :

SINDH MADRESSATUL ISLAM UNIVERSITY
ESTABLISHED TO LEARN TO FORTH TO SERVE
1885

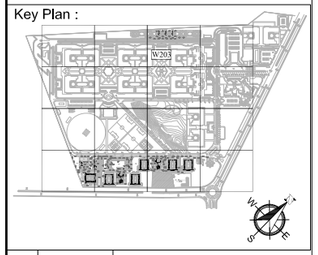
Consultant :

EA Consulting Pvt Ltd
AL-9,15th Lane,
Off Khayaban-e-Hilal,
DHA Phase 7,
Karachi, Pakistan 75500
PABX: +92-21-111-111-584,
Fax : +92-35841825
Email:www.eaworld.com

Project :

Development of Sindh Madressatul Islam University (SMIU) Campus At Education City, Malir Karachi (P H A S E - I)

Key Plan :



No.	DATE	REVISIONS
		ISSUED FOR TENDER
00	April, 2024	DESCRIPTION

Note:
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6. The gate valves to remain closed, can only be activated if any of the tubewell is not functional.

Legend:

110mmØ PIPE	
63mmØ PIPE	
AIR RELEASE VALVE	A.V
WASH OUT VALVE	W.O
GATE VALVE	G.V
END CAP	
TUBE WELL	

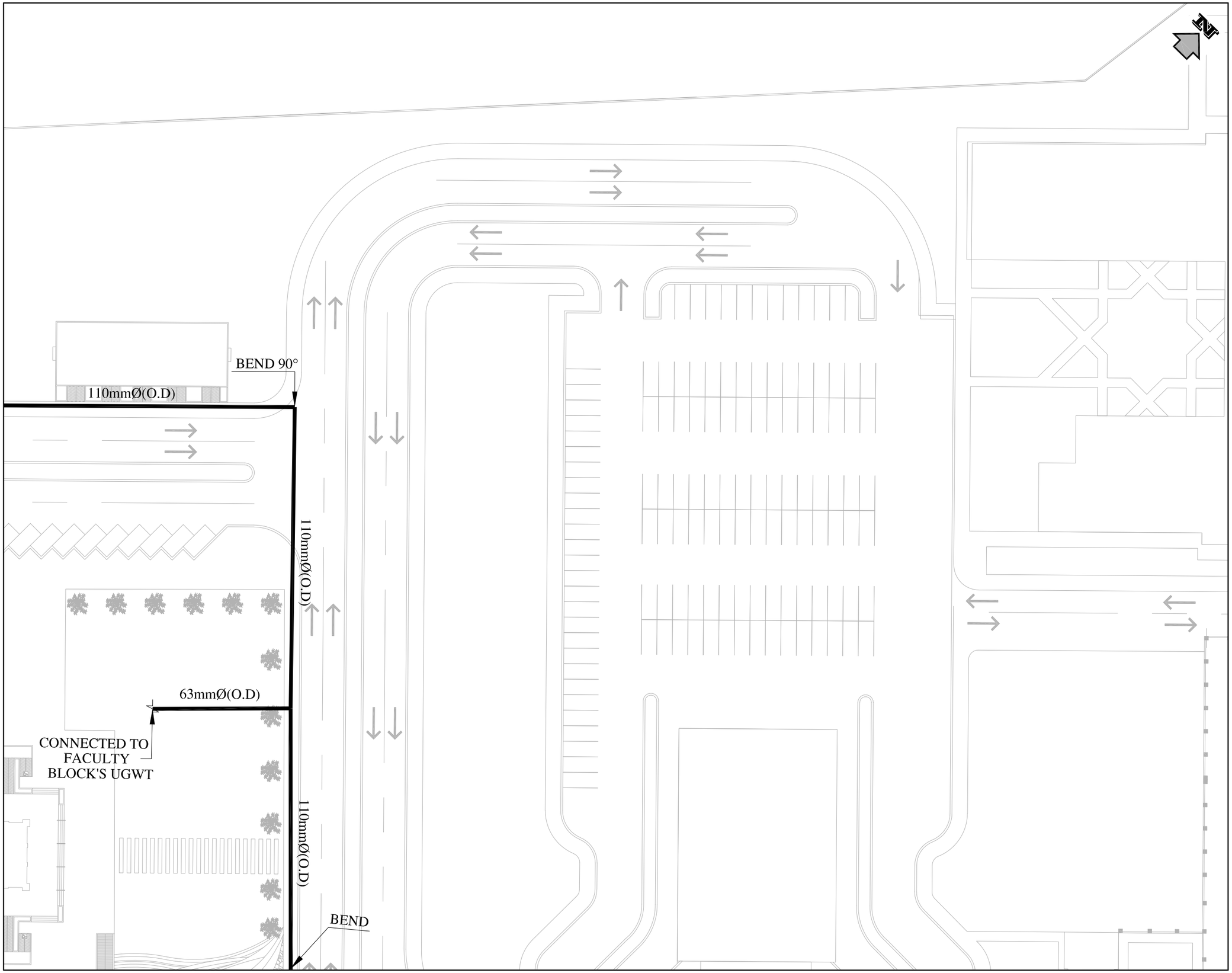
Date of Issue	April, 2024
Issued To	Client
Issued For	Tender

Status: TENDER

Drawing Title :
LAYOUT PLAN OF
WATER SUPPLY SYSTEM

Designed :	Checked :	Approved :
Bilal	Fahad	Fahad
Drawn :	Date :	Scale / Sheet :
Furqan	April,2024	1"=22'-6" A-1
Project Code :		Rev. :
00986		0

Drawing No. :
EA-00986-SMIU-U-W103



Client :

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AL-9,15th Lane,
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Email:www.eaworld.com

Project :

Development of Sindh Madressatul Islam University (SMIU) Campus At Education City, Malir Karachi (P H A S E - I)

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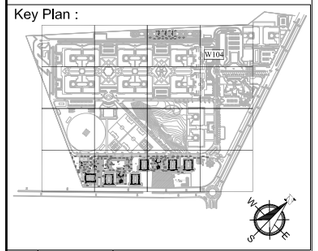

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00	April, 2024	DESCRIPTION
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END CAP	
TUBE WELL	

Date of Issue	April, 2024
Issued To	Client
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Status: TENDER

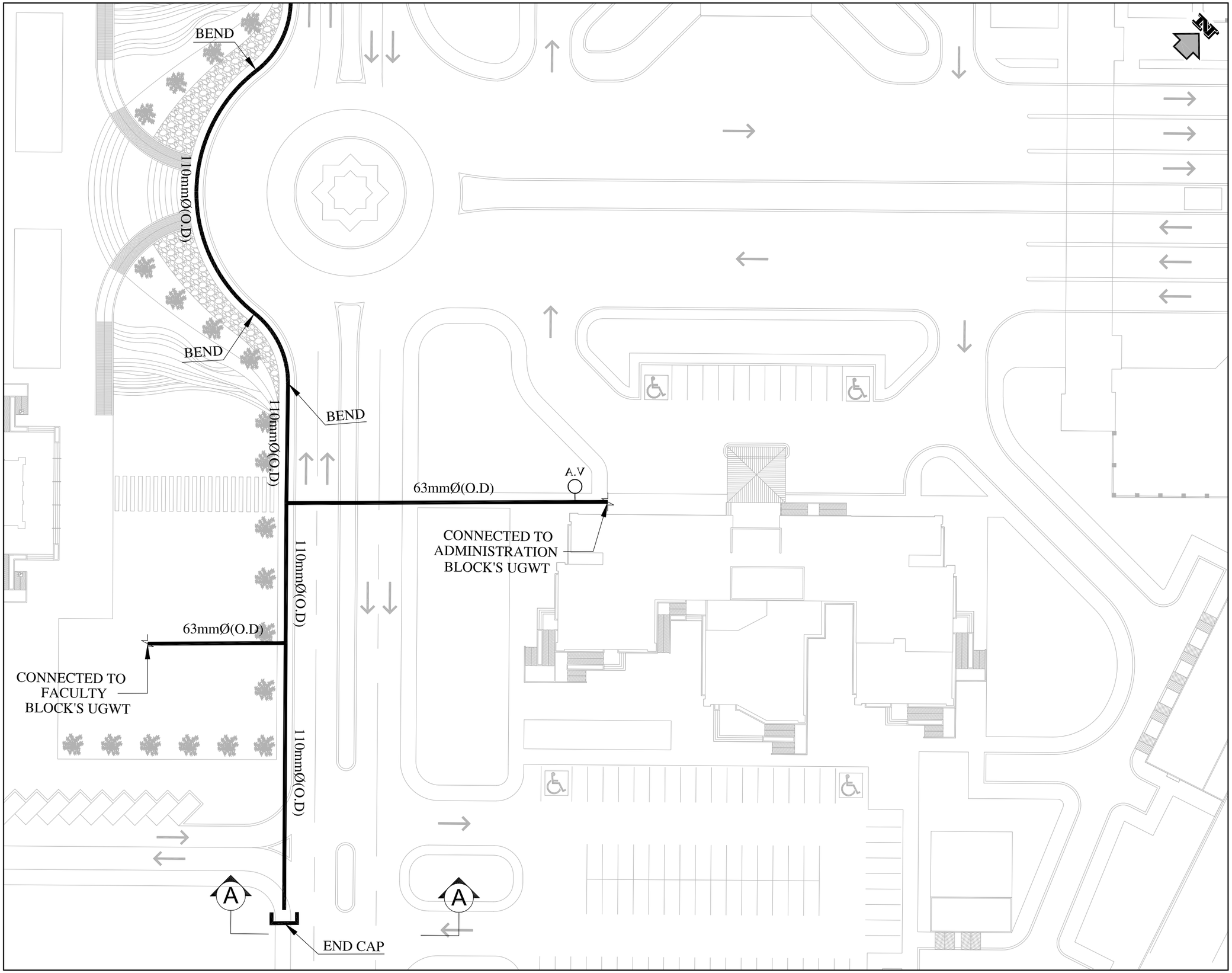
Drawing Title :
LAYOUT PLAN OF
WATER SUPPLY SYSTEM

Designed :	Checked :	Approved :
Bilal	Fahad	Fahad
Drawn :	Date :	Scale / Sheet :
Furqan	April,2024	1"=22'-6" A-1
Project Code :		Rev. :
00986		0

Drawing No. :
EA-00986-SMIU-U-W104

MATCH LINE DWG NO:EA-00986-SMIU-U-W104

MATCH LINE DWG NO:EA-00986-SMIU-U-W107



MATCH LINE DWG NO:EA-00986-SMIU-U-W112

Client :

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Consultant :

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AL-9,15th Lane,
Off Khayaban-e-Hilal,
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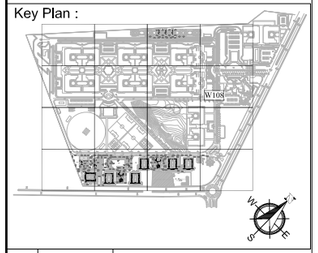

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00	April, 2024	DESCRIPTION
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TUBE WELL	

Date of Issue	April, 2024
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Status: TENDER

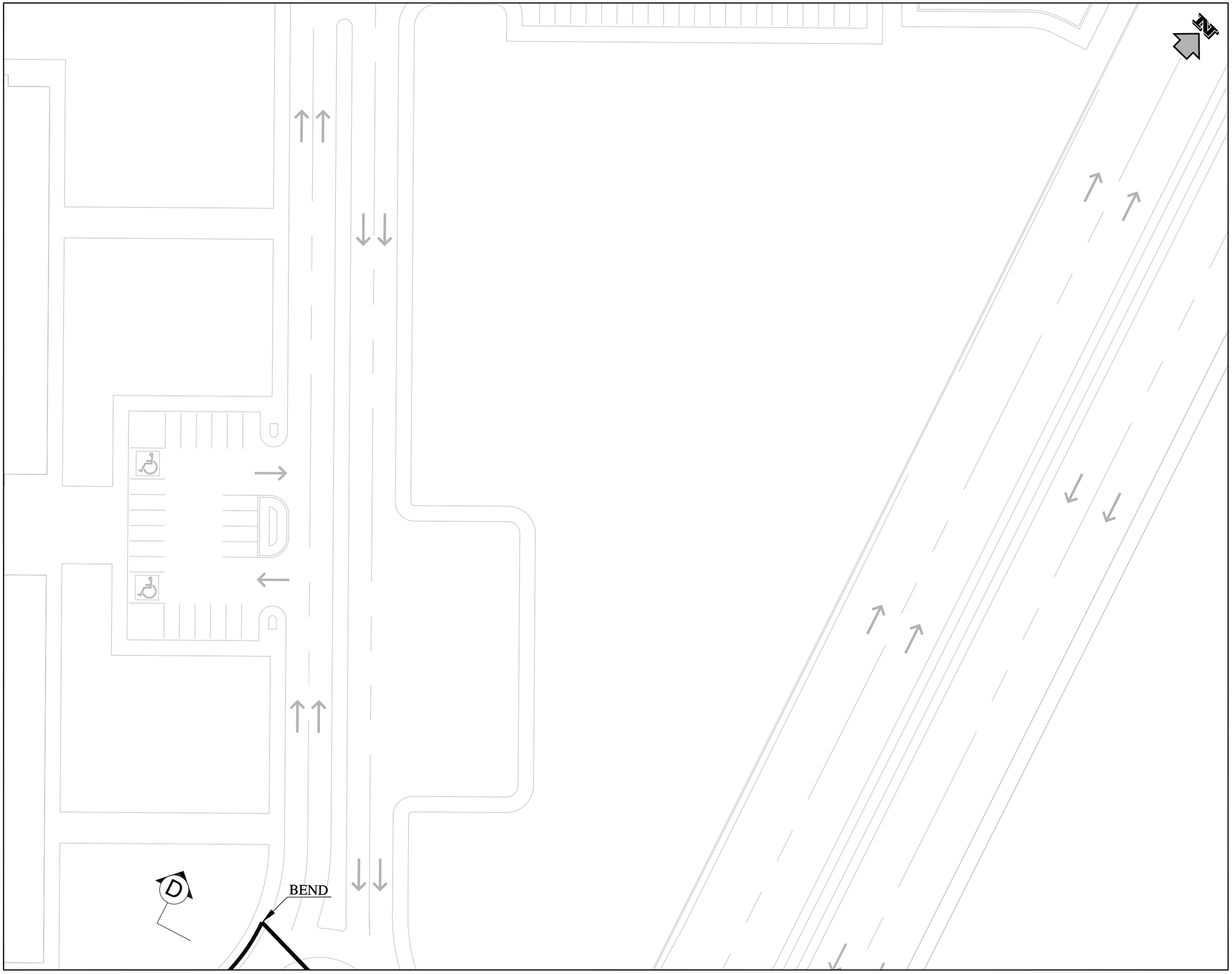
Drawing Title :
LAYOUT PLAN OF
WATER SUPPLY SYSTEM

Designed : Bilal	Checked : Fahad	Approved : Fahad
Drawn : Furqan	Date : April,2024	Scale / Sheet : 1"=22'-6" A-1
Project Code : 00986		Rev. : 0

Drawing No. :
EA-00986-SMIU-U-W108

MATCH LINE DWG NO:EA-00986-SMIU-U-W108

MATCH LINE DWG NO:EA-00986-SMIU-U-W111



MATCH LINE DWG NO:EA-00986-SMIU-U-W116

Client :

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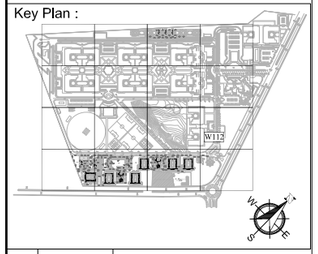

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Date of Issue	April, 2024
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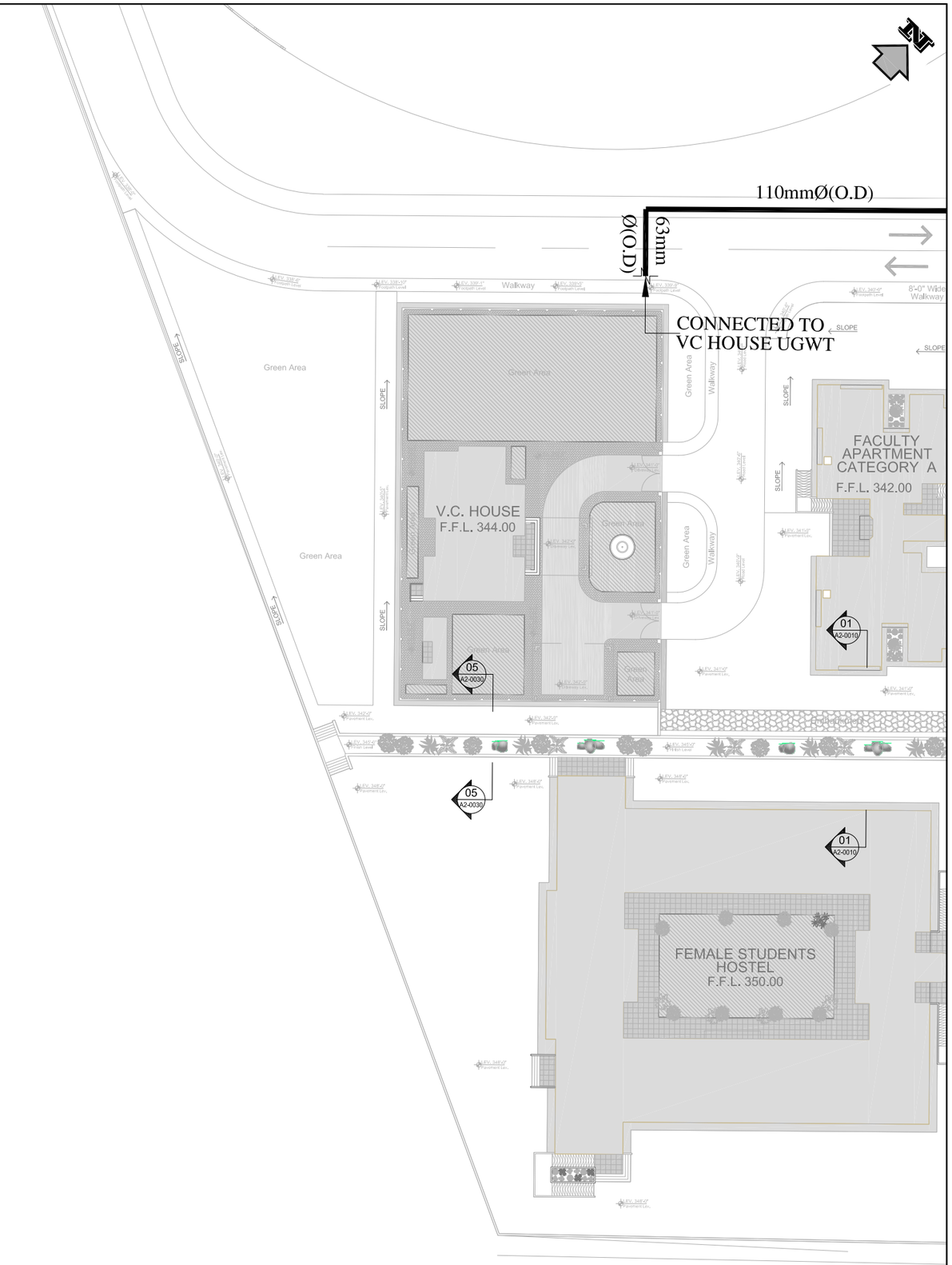
Drawing Title :
LAYOUT PLAN OF WATER SUPPLY SYSTEM

Designed :	Checked :	Approved :
Bilal	Fahad	Fahad
Drawn :	Date :	Scale / Sheet :
Furqan	April,2024	1"=22'-6" A-1
Project Code :		Rev. :
00986		0

Drawing No. :
EA-00986-SMIU-U-W112

MATCH LINE DWG NO:EA-00986-SMIU-U-W109



MATCH LINE DWG NO:EA-00986-SMIU-U-W114

Client :

SINDH MADRESSATUL ISLAM UNIVERSITY 1885

Consultant :

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Project :

Development of Sindh Madressatul Islam University (SMIU) Campus At Education City, Malir Karachi (P H A S E - I)

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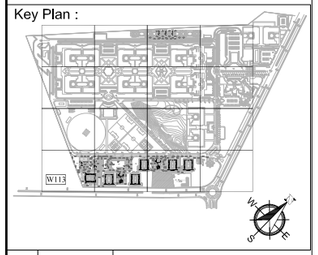

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GATE VALVE	G.V
END CAP	
TUBE WELL	

Date of Issue	April, 2024
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Issued For	Tender

Status: TENDER

Drawing Title : LAYOUT PLAN OF WATER SUPPLY SYSTEM

Designed :	Checked :	Approved :
Bilal	Fahad	Fahad
Drawn :	Date :	Scale / Sheet :
Furqan	April,2024	1"=22'-6" A-1
Project Code : 00986		Rev. : 0

Drawing No. : EA-00986-SMIU-U-W113

MATCH LINE DWG NO:EA-00986-SMIU-U-W110

MATCH LINE DWG NO:EA-00986-SMIU-U-W113

MATCH LINE DWG NO:EA-00986-SMIU-U-W115

T.WELL-1

T.WELL-2

110mmØ(O.D)

63mmØ(O.D)

G.V

W.O

B

CONNECTED TO FACULTY APARTMENTS' AND FEMALE STUDENT HOSTEL'S UGWT

CONNECTED TO FACULTY APARTMENTS' FEMALE STUDENT HOSTEL' & FEMALE FACULTY HOSTEL' UGWTS

CONNECTED TO FACULTY APARTMENTS' & FEMALE STUDENT HOSTEL'S UGWT

8'-0" Wide Walkway

12'-0" Wide Driveway

Green Area

Retaining Wall

F.F.L. 342.00

FACULTY APARTMENT CATEGORY B

FACULTY APARTMENT CATEGORY C
F.F.L. 350.00

SUBSTATION 03
F.F.L. 338.00

MALE STUDENTS HOSTEL (FUTURE)
F.F.L. 360.00

FEMALE STUDENTS HOSTEL (FUTURE)
F.F.L. 342.00

FEMALE FACULTY HOSTEL
F.F.L. 338.00

FEMALE STUDENTS HOSTEL (FUTURE)
F.F.L. 342.00

02 A2-0010

06 A2-0010

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END CAP	
TUBE WELL	

Client :

SINDH MADRESSATUL ISLAM UNIVERSITY 1885

Consultant :

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AL-9,15th Lane,
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DHA Phase 7,
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Project :

Development of Sindh Madressatul Islam University (SMIU) Campus At Education City, Malir Karachi (P H A S E - I)

Key Plan :

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Date of Issue	April, 2024
Issued To	Client
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Status: TENDER

Drawing Title :
LAYOUT PLAN OF WATER SUPPLY SYSTEM

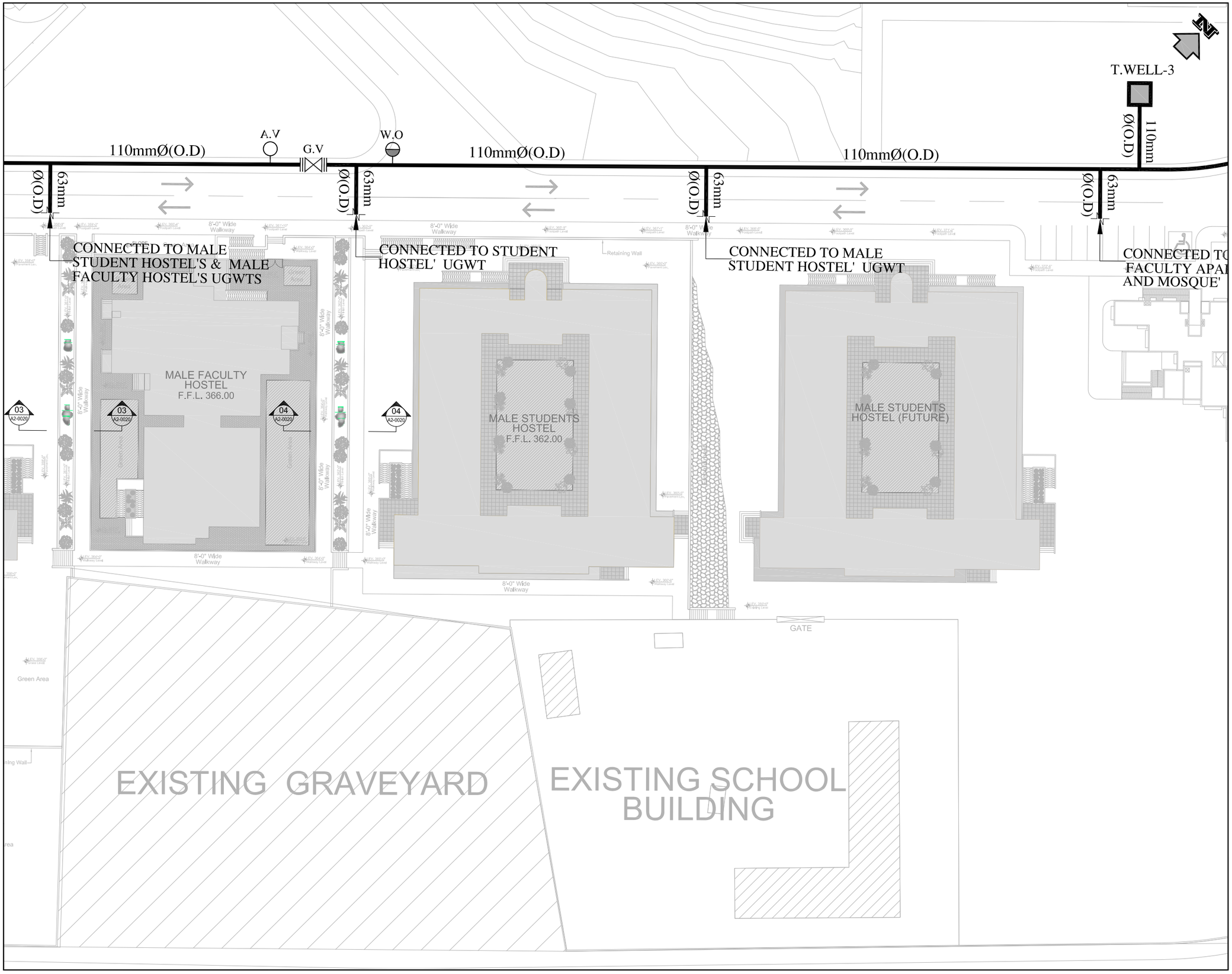
Designed : Bilal	Checked : Fahad	Approved : Fahad
Drawn : Furqan	Date : April,2024	Scale / Sheet : 1"=22'-6" A-1
Project Code : 00986		Rev. : 0

Drawing No. :
EA-00986-SMIU-U-W114

MATCH LINE DWG NO:EA-00986-SMIU-U-W111

MATCH LINE DWG NO:EA-00986-SMIU-U-W114

MATCH LINE DWG NO:EA-00986-SMIU-U-W116



Client :

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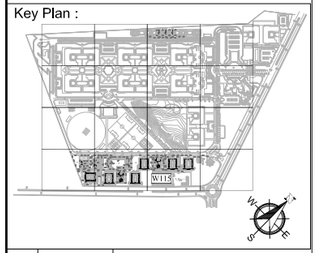

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TUBE WELL	

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LAYOUT PLAN OF WATER SUPPLY SYSTEM

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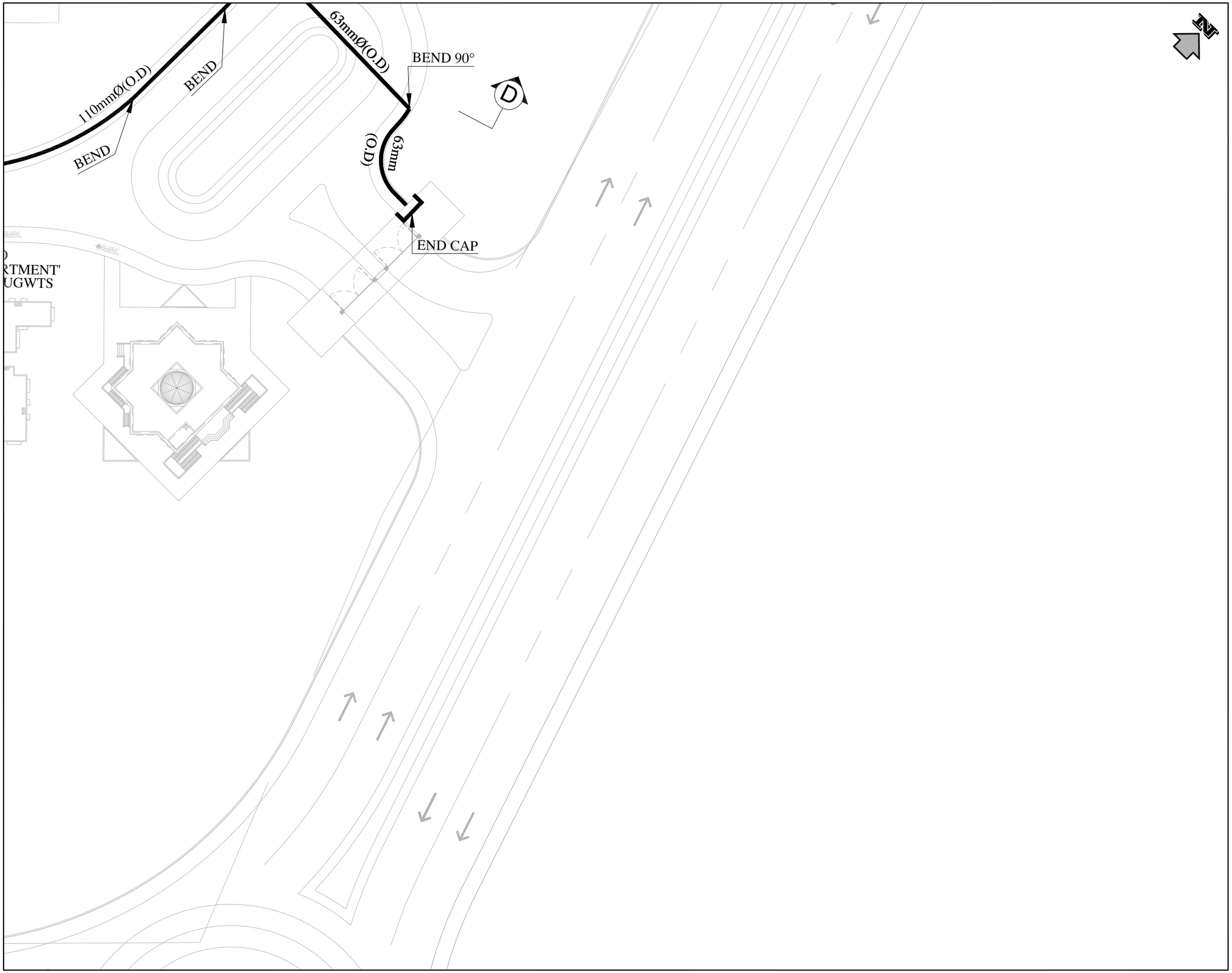
Bilal	Fahad	Fahad
Drawn :	Date :	Scale / Sheet :
Furqan	April,2024	1"=22'-6" A-1
Project Code :		Rev. :
00986		0

Drawing No. :
EA-00986-SMIU-U-W115

MATCH LINE DWG NO:EA-00986-SMIU-U-W112

MATCH LINE DWG NO:EA-00986-SMIU-U-W115



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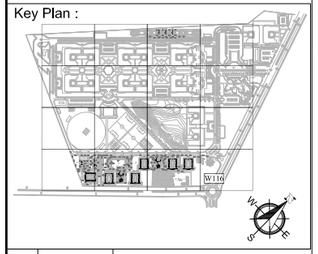

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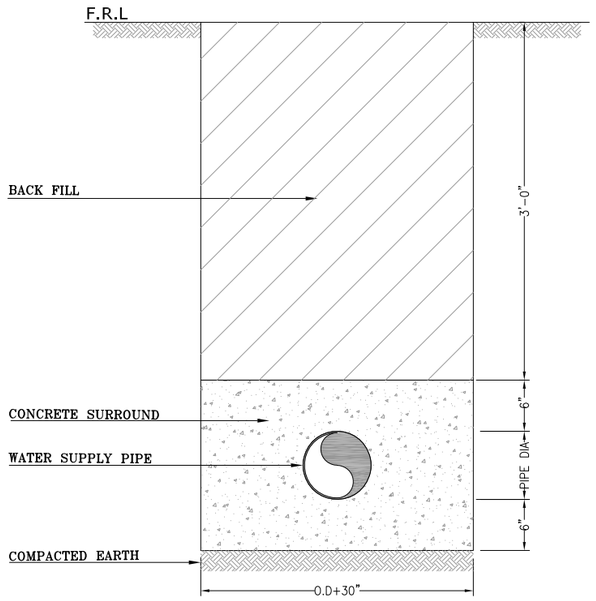
Drawing Title :
LAYOUT PLAN OF
WATER SUPPLY SYSTEM

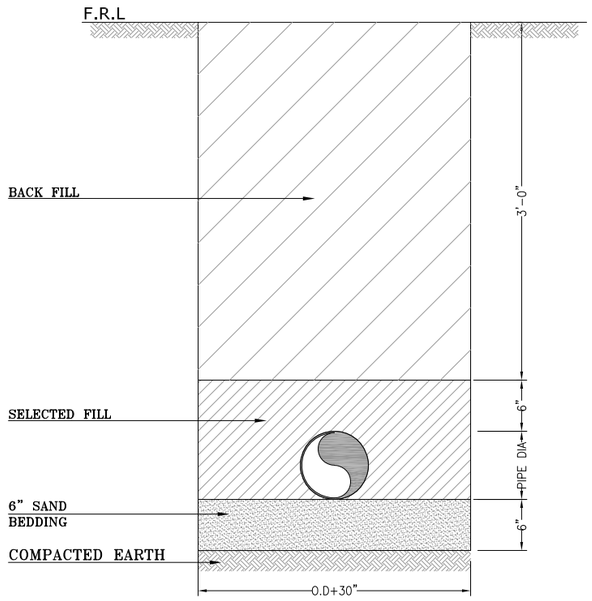
Designed :	Checked :	Approved :
Bilal	Fahad	Fahad
Drawn :	Date :	Scale / Sheet :
Furqan	April,2024	1"=22'-6" A-1
Project Code : 00986		Rev. : 0

Drawing No. :
EA-00986-SMIU-U-W116

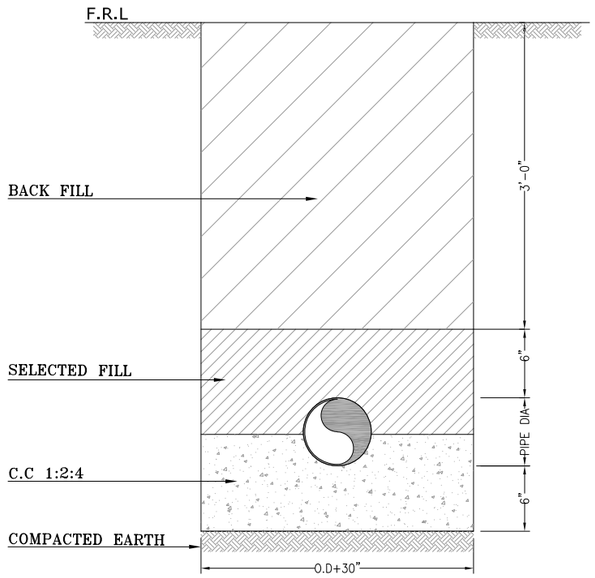
DETAIL DRAWINGS



TYP. SEC.OF PIPE
UNDER THE ROAD



DETAILS OF TRENCH
WATER SUPPLY SYSTEM



CONCRETE PIPE
SUPPORT UNDER SLUSHY SOIL

Client :

Consultant :

EA Consulting Pvt Ltd
AL-9,15th Lane,
Off Khayaban-e-Hilal,
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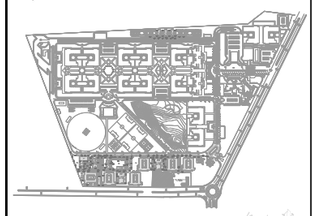

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Note:

1. All Dimensions are in feet unless otherwise stated.
2. For Water supply system layout plan refer Dwg. No. EA-986-SMIU-U-W103,W104,W108,W112 AND W113 TO W116.

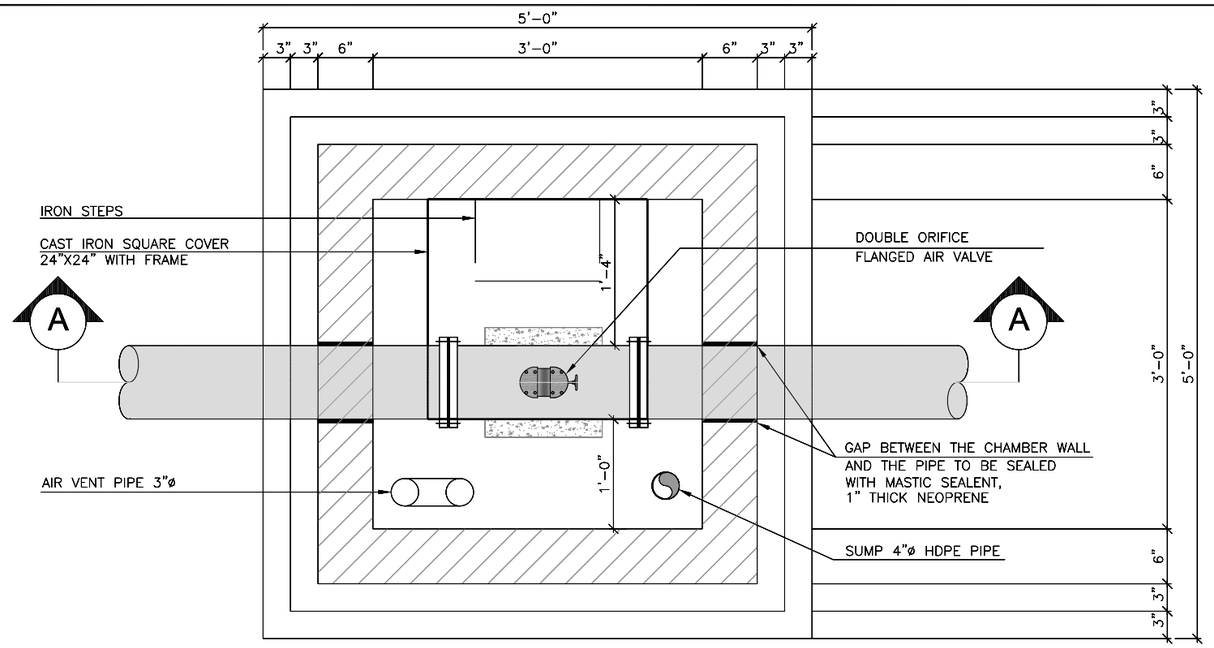
Date of Issue	April, 2024
Issued To	Client
Issued For	Tender

Status: TENDER

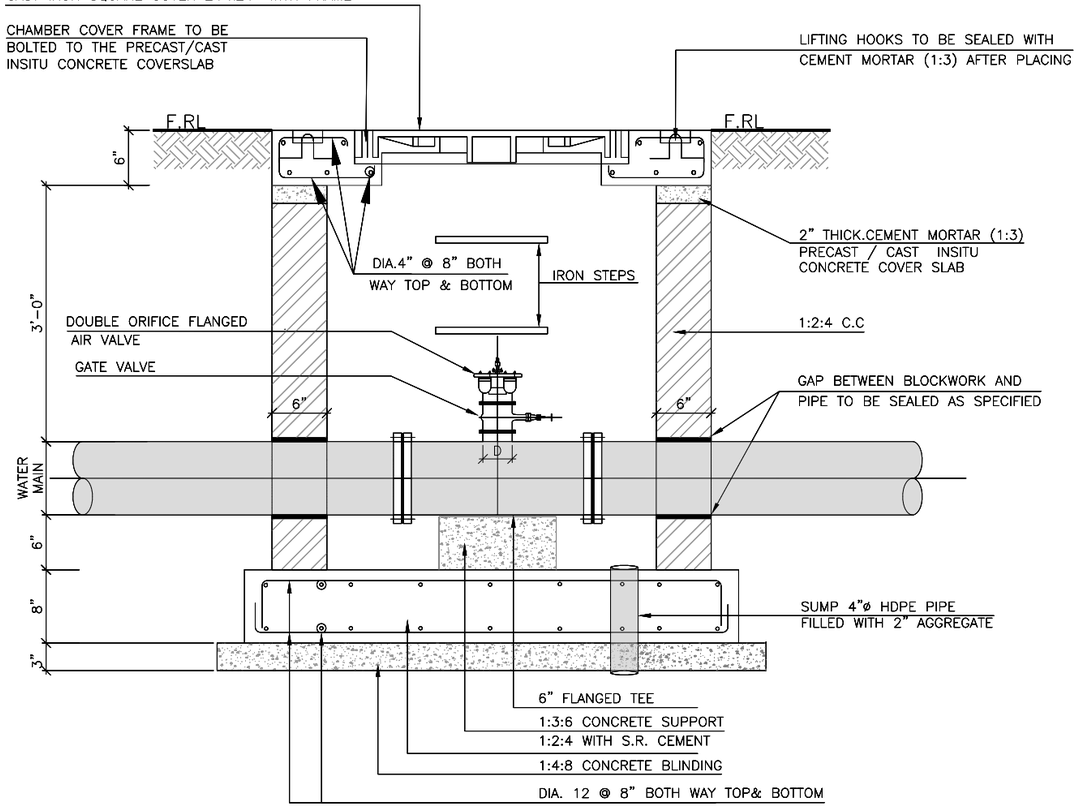
Drawing Title :
DETAIL OF PIPE TRENCH
FOR WATER SUPPLY PIPE

Designed :	Checked :	Approved :
Bilal	Fahad	Fahad
Drawn :	Date :	Scale / Sheet :
Furqan	April,2024	N.T.S A-1
Project Code : 00986		Rev. : 0

Drawing No. :
EA-00986-SMIU-U-W400



PLAN



SECTION A-A

Client :

SINDH MADRESSATUL ISLAM UNIVERSITY 1885

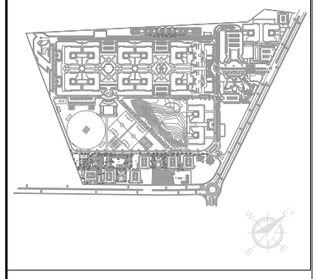
Consultant :

EA Consulting Pvt Ltd
AL-9,15th Lane,
Off Khayaban-e-Hilal,
DHA Phase 7,
Karachi, Pakistan 75500
PABX: +92-21-111-111-584,
Fax : +92-35841825
Email:www.eaworld.com

Project :

Development of Sindh Madressatul Islam University (SMIU) Campus At Education City, Malir Karachi (P H A S E - I)

Key Plan :



No.	DATE	DESCRIPTION
00	April, 2024	ISSUED FOR TENDER

REVISIONS

Note:

1. All Dimensions are in feet unless otherwise stated.
2. For Water supply system layout plan refer Dwg. No. EA-986-SMIU-U-W103,W104,W108,W112 AND W113 TO W116.

Date of Issue	April, 2024
Issued To	Client
Issued For	Tender

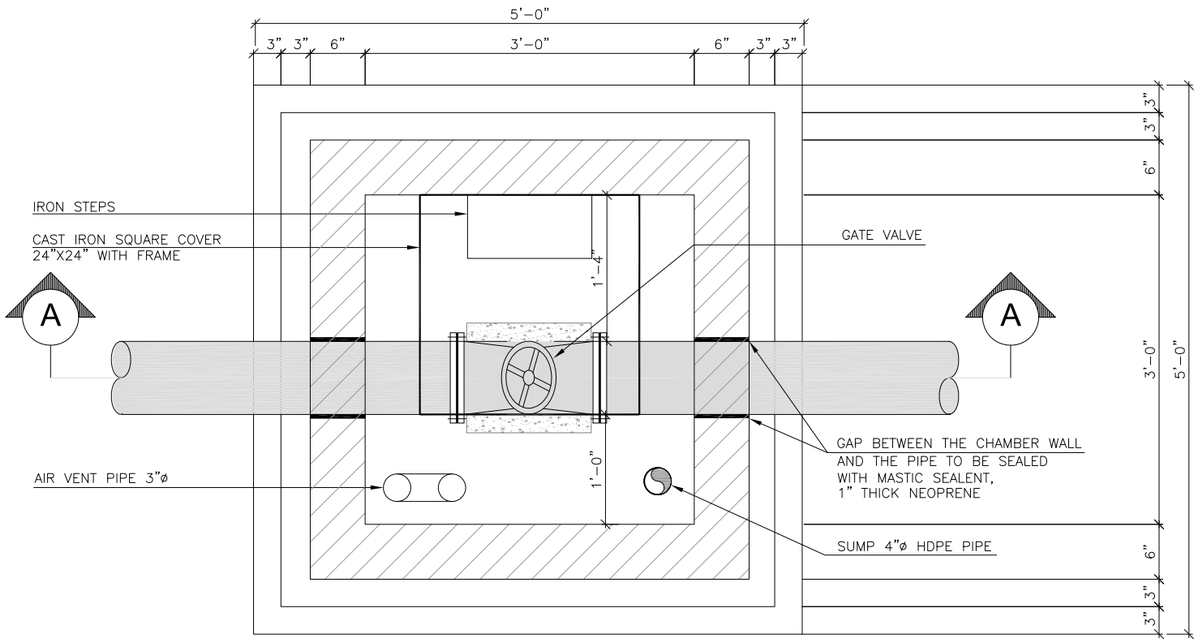
Status: TENDER

Drawing Title :

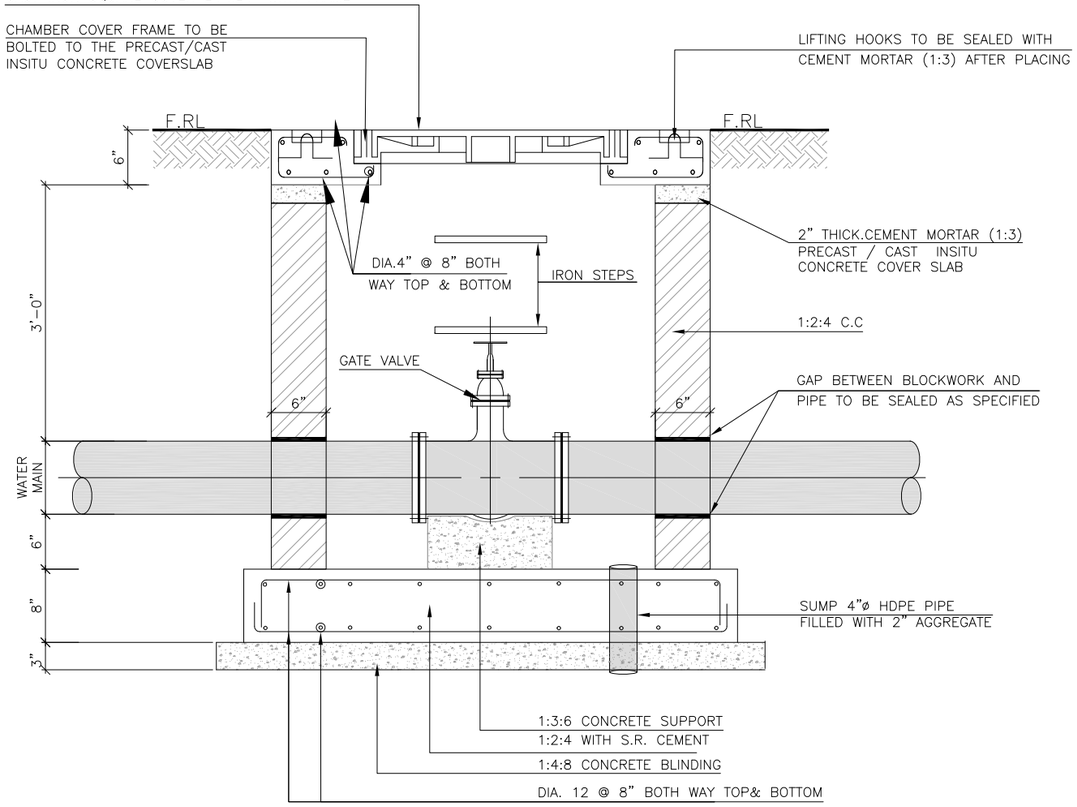
DETAIL OF AIR RELEASE VALVE CHAMBER

Designed :	Checked :	Approved :
Bilal	Fahad	Fahad
Drawn :	Date :	Scale / Sheet :
Furqan	April,2024	N.T.S A-1
Project Code :		Rev. :
00986		0

Drawing No. : EA-00986-SMIU-U-W402



PLAN



SECTION A-A

Client :

SINDH MADRESSATUL ISLAM UNIVERSITY 1885

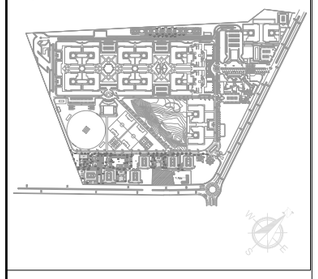
Consultant :

EA Consulting Pvt Ltd
AL-9,15th Lane,
Off Khayaban-e-Hilal,
DHA Phase 7,
Karachi, Pakistan 75500
PABX: +92-21-111-111-584,
Fax : +92-35841825
Email:www.eaworld.com

Project :

Development of Sindh Madressatul Islam University (SMIU) Campus At Education City, Malir Karachi (P H A S E - I)

Key Plan :



No.	DATE	DESCRIPTION
00	April, 2024	ISSUED FOR TENDER

REVISIONS

Note:

1. All Dimensions are in feet unless otherwise stated.
2. For Water supply system layout plan refer Dwg. No. EA-986-SMIU-U-W103,W104,W108,W112 AND W113 TO W116.

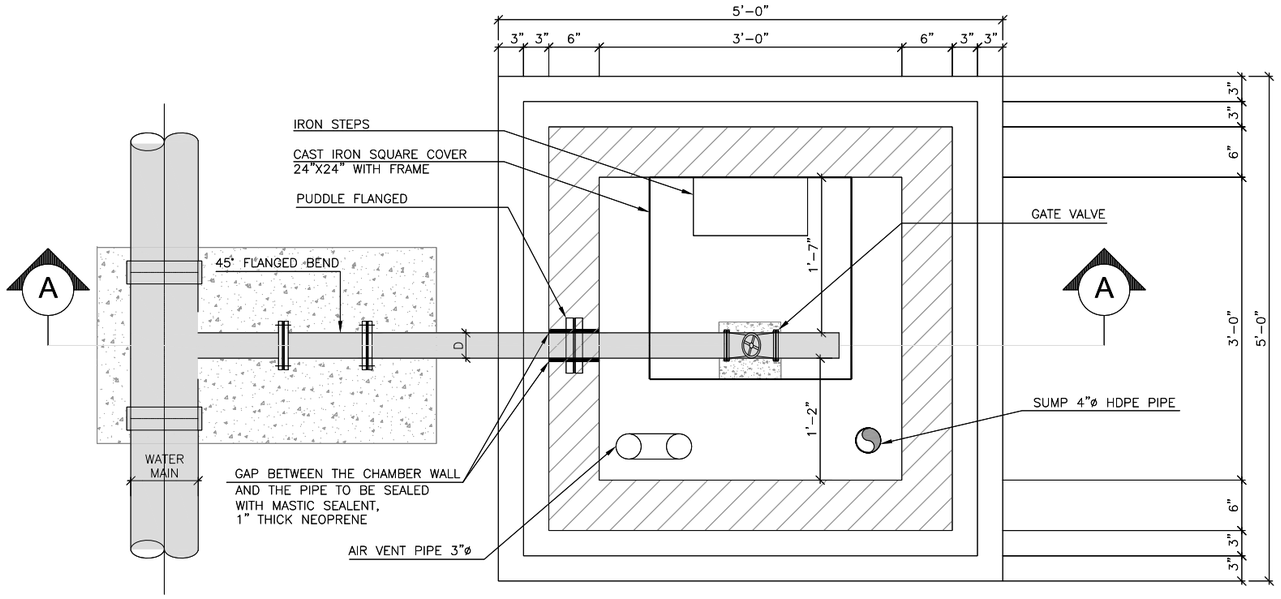
Date of Issue	April, 2024
Issued To	Client
Issued For	Tender

Status: TENDER

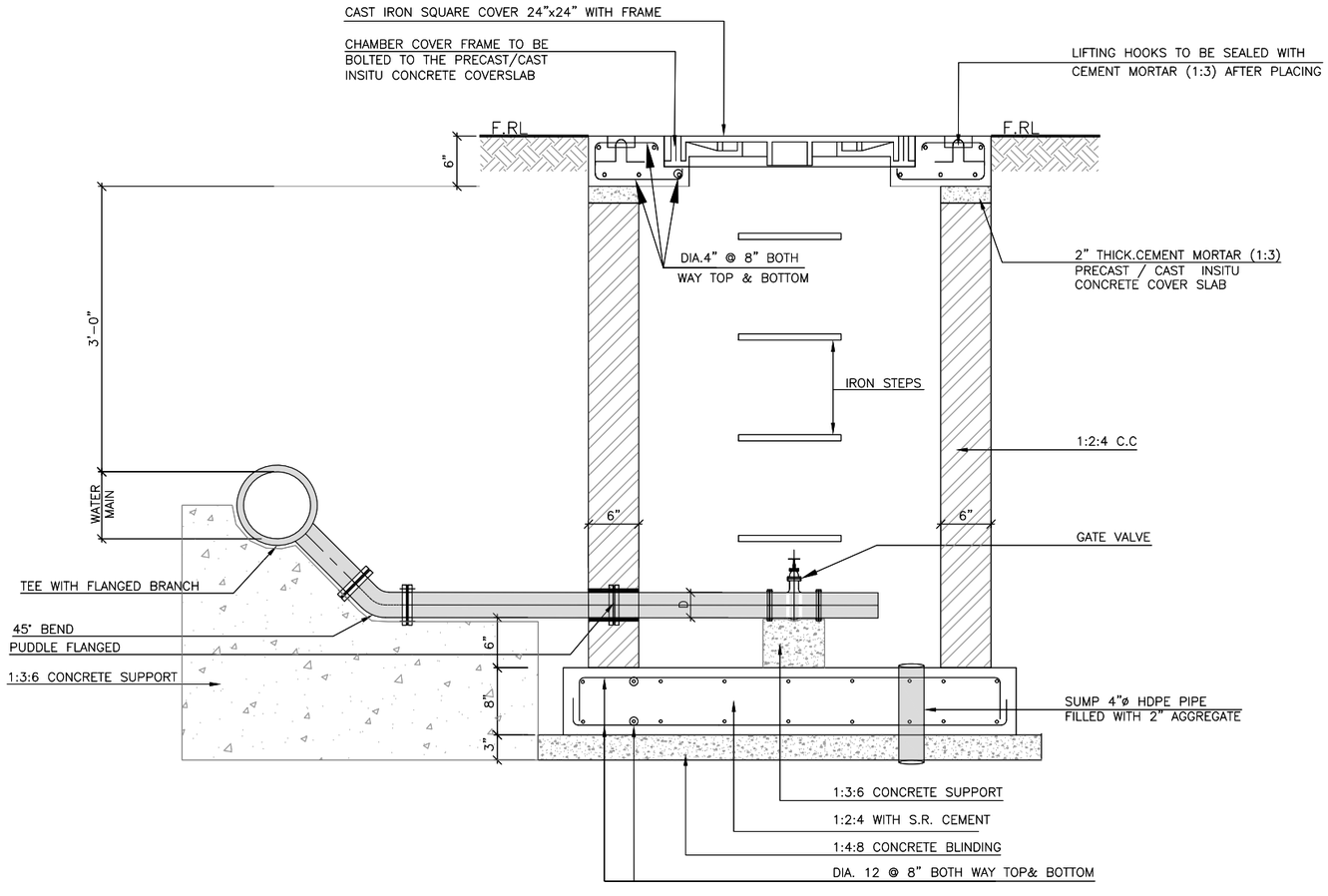
Drawing Title : DETAIL OF GATE VALVE CHAMBER

Designed :	Checked :	Approved :
Bilal	Fahad	Fahad
Drawn :	Date :	Scale / Sheet :
Furqan	April,2024	N.T.S A-1
Project Code : 00986		Rev. : 0

Drawing No. : EA-00986-SMIU-U-W403



PLAN



SECTION A-A

Client :

SINDH MADRESSATUL ISLAM UNIVERSITY
ENTICE TO LEARN
TO FORTH TO SERVE
1885

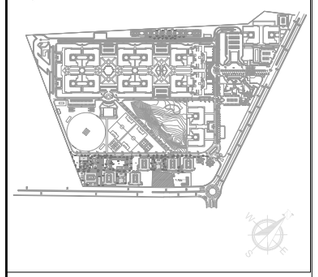
Consultant :

EA Consulting Pvt Ltd
AL-9,15th Lane,
Off Khayaban-e-Hilal,
DHA Phase 7,
Karachi, Pakistan 75500
PABX: +92-21-111-111-584,
Fax : +92-35841825
Email:www.eaworld.com

Project :

Development of Sindh Madressatul Islam University (SMIU) Campus At Education City, Malir Karachi (P H A S E - I)

Key Plan :



No.	DATE	DESCRIPTION
00	April, 2024	ISSUED FOR TENDER

REVISIONS

Note:

1. All Dimensions are in feet unless otherwise stated.
2. For Water supply system layout plan refer Dwg. No. EA-986-SMIU-U-W103,W104,W108,W112 AND W113 TO W116.

Date of Issue	April, 2024
Issued To	Client
Issued For	Tender

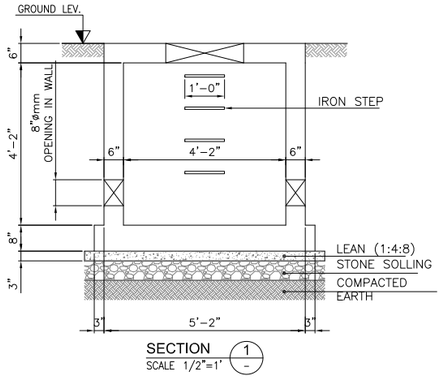
Status: TENDER

Drawing Title : DETAIL OF WASHOUT VALVE CHAMBER

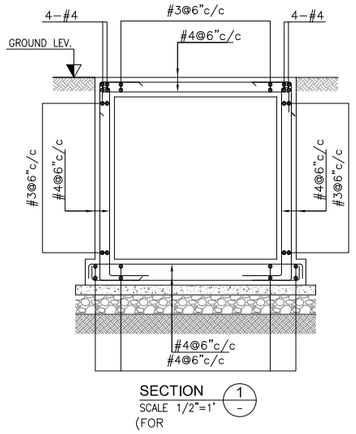
Designed :	Checked :	Approved :
Bilal	Fahad	Fahad
Drawn :	Date :	Scale / Sheet :
Furqan	April,2024	N.T.S A-1
Project Code : 00986		Rev. : 0

Drawing No. : EA-00986-SMIU-U-W404

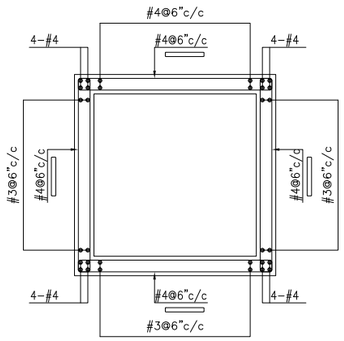
NOTES:–
UNLESS NOTED OTHERWISE
1. FOR GENERAL NOTES AND STANDARD DETAILS REFER DRAWINGS S–0011 TO S–0015.
2. ALL DRAWINGS MUST BE READ IN CONJUNCTION WITH RELEVANT ARCHITECTURAL DRAWINGS.
3. FOR FLOOR FINISHES AND MASONARY WALLS REFER ARCHITECTURAL DRAWINGS.
4. FOR SLLVES,OPENINGS AND OTHER DETAILS ETC. REFER RELEVANT MEP DRAWINGS.
5. ALL DIMENSION ARE IN FEET–INCHES UNITS.
6. ALL LEVELS ARE IN FEET.



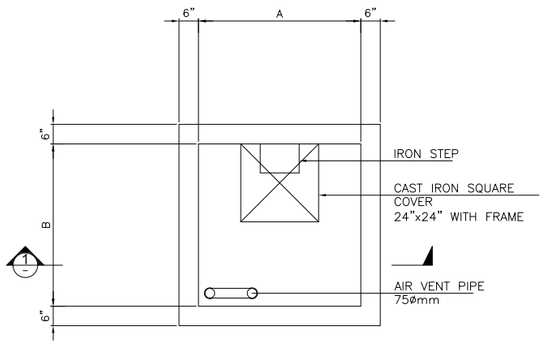
SECTION
SCALE 1/2"=1' (1 / –)



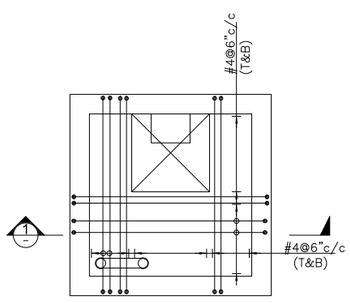
SECTION
SCALE 1/2"=1' (1 / –)
(FOR



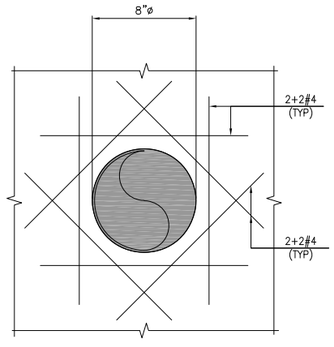
WALL REINFORCEMENT
PLAN OF CHAMBER
(E / –) SCALE 1/2"=1'



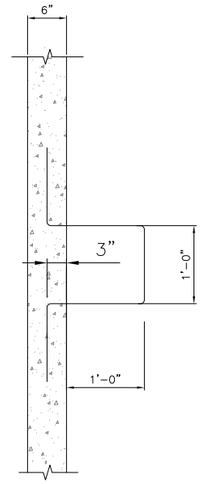
TOP PLAN OF CHAMBER
(B / –) SCALE 1/2"=1'



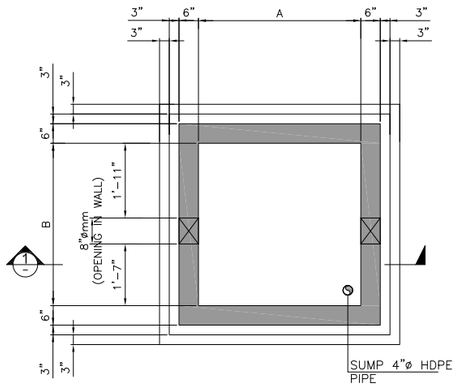
TOP SLAB REINFORCEMENT
PLAN OF CHAMBER
(D / –) SCALE 1/2"=1'



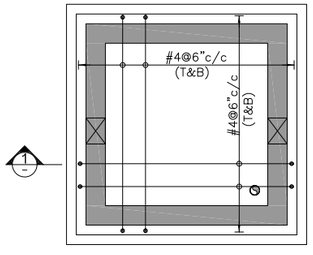
TYP.OPENING REINFORCEMENT
DETAIL IN SLAB & WALL
(F / –) SCALE 1"=1'–0"



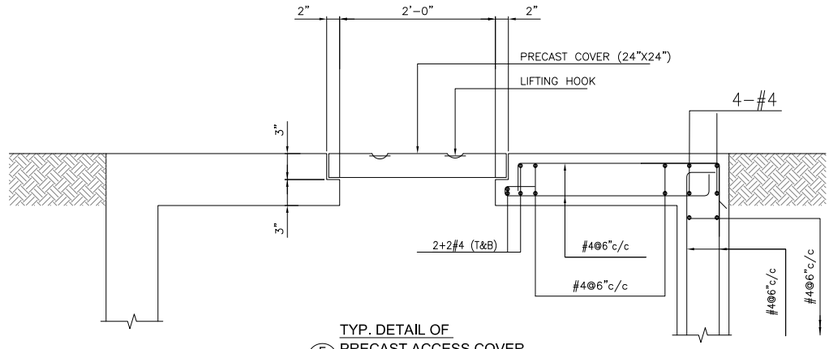
(G / –) STEEL LADDER TYPICAL PLAN
SCALE 1"=1'–0"



FOUNDATION PLAN OF CHAMBER
(A / –) SCALE 1/2"=1'



BOTTOM SLAB
REINFORCEMENT PLAN OF CHAMBER
(C / –) SCALE 1/2"=1'



TYP. DETAIL OF
PRECAST ACCESS COVER
(F / –) SCALE 1"=1'–0"

Client :

SINDH MADRESSATUL ISLAM UNIVERSITY ★ 1885 ★

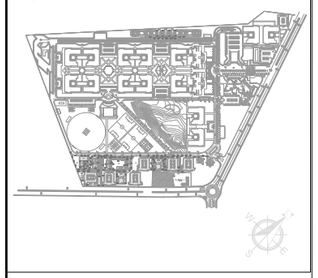
Consultant :

EA Consulting Pvt Ltd
AL-9,15th Lane,
Off Khayaban-e-Hilal,
DHA Phase 7,
Karachi, Pakistan 75500
PABX: +92-21-111-111-584,
Fax : +92-35841825
Email:www.eaworld.com

Project :

Development of Sindh Madressatul Islam University (SMIU) Campus At Education City, Malir Karachi (P H A S E - I)

Key Plan :



No.	DATE	DESCRIPTION
00	April, 2024	ISSUED FOR TENDER

REVISIONS

Note:
1. All Dimensions are in feet unless otherwise stated.
2. For Water supply system layout plan refer Dwg. No. EA-986-SMIU-U-W103,W104,W108,W112 AND W113 TO W116.

Date of Issue	April, 2024
Issued To	Client
Issued For	Tender

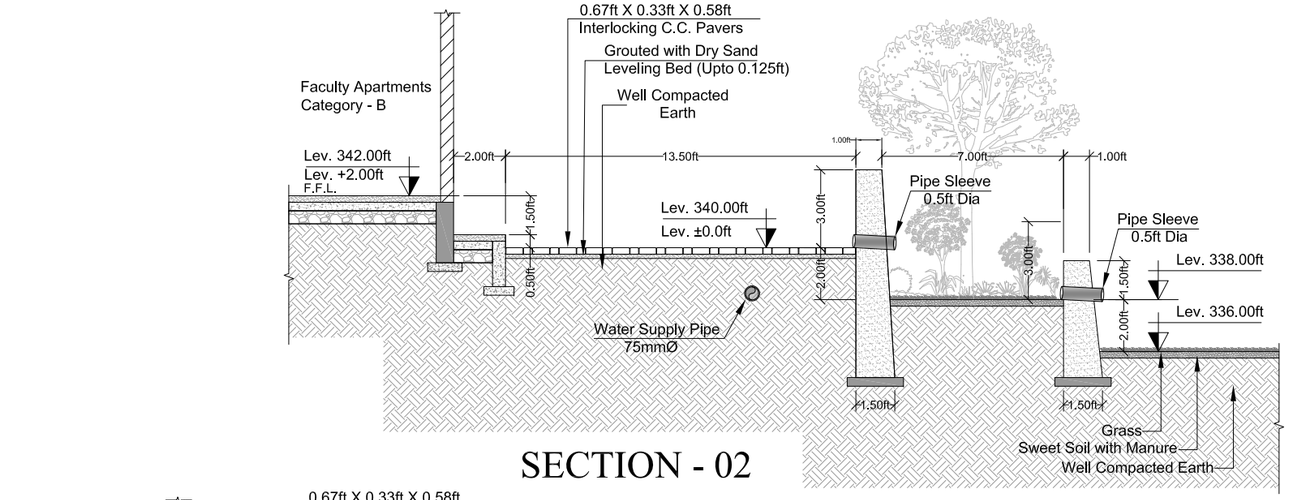
Status: TENDER

Drawing Title :
VALVE CHAMBER AND REINFORCEMENT DETAIL

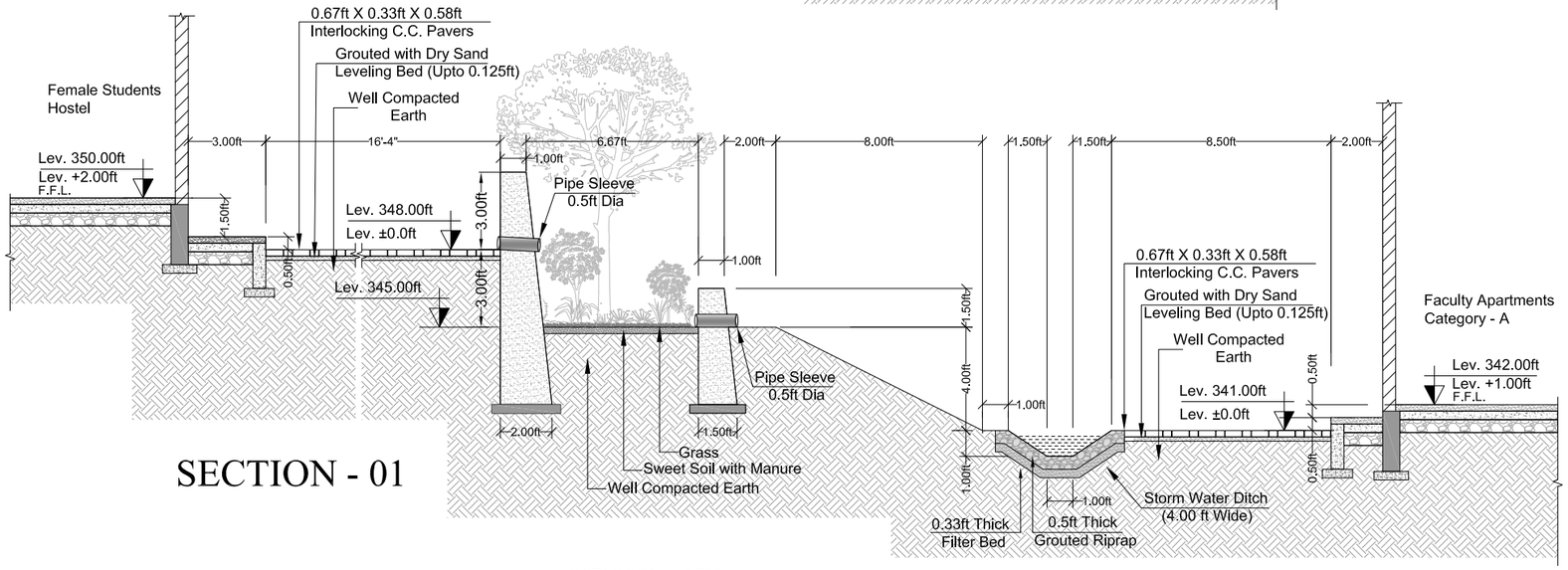
Designed :	Checked :	Approved :
Bilal	Fahad	Fahad
Drawn :	**Date :**	**Scale / Sheet :**
Furqan	April,2024	N.T.S A-1
Project Code :		**Rev. :**
00986		0

Drawing No. :
EA-00986-SMIU-U-W405

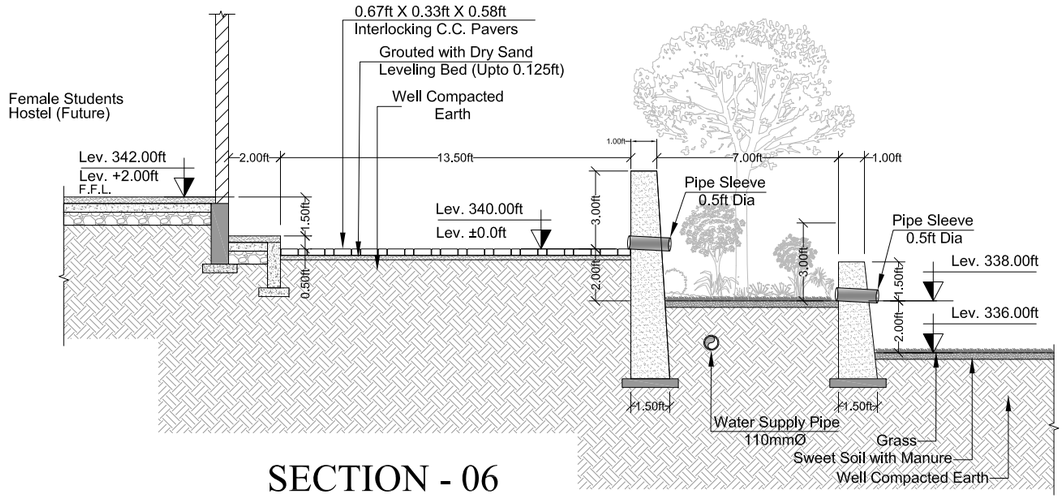
UTILITIES
&
ROAD CROSS SECTION



SECTION - 02



SECTION - 01



SECTION - 06

Client :

SINDH MADRESSATUL ISLAM UNIVERSITY
ENTRE TO LEARN GO FORTH TO SERVE
1885

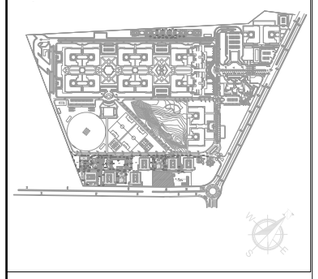
Consultant :

EA Consulting Pvt Ltd
AL-9,15th Lane,
Off Khayaban-e-Hilal,
DHA Phase 7,
Karachi, Pakistan 75500
PABX: +92-21-111-111-584,
Fax : +92-35841825
Email:www.eaworld.com

Project :

Development of Sindh Madressatul Islam University (SMIU) Campus At Education City, Malir Karachi (P H A S E - I)

Key Plan :



00	Aprll, 2024	ISSUED FOR TENDER
No.	DATE	DESCRIPTION
REVISIONS		

Note:

1. All Dimensions are in feet unless otherwise stated.
2. For Storm water drain layout plan refer Dwg. No. EA-986-SMIU-U-D303, D305 TO D316.

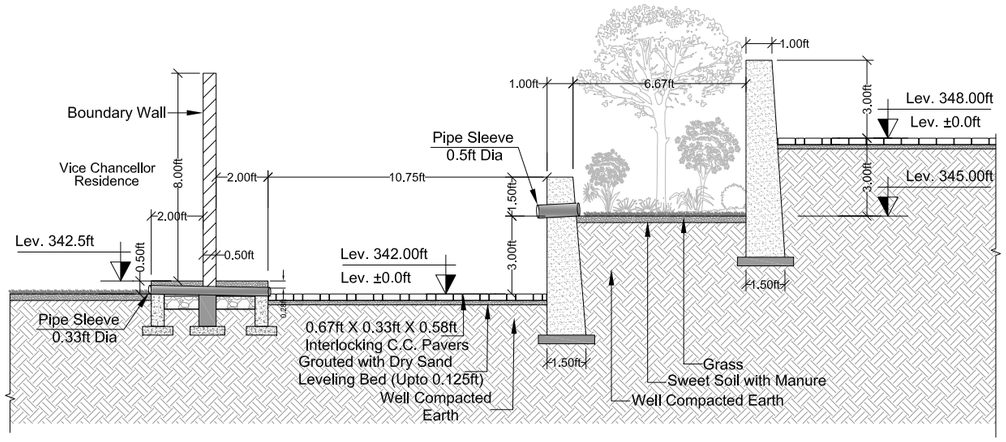
Date of Issue	April, 2024
Issued To	Client
Issued For	Tender

Status: TENDER

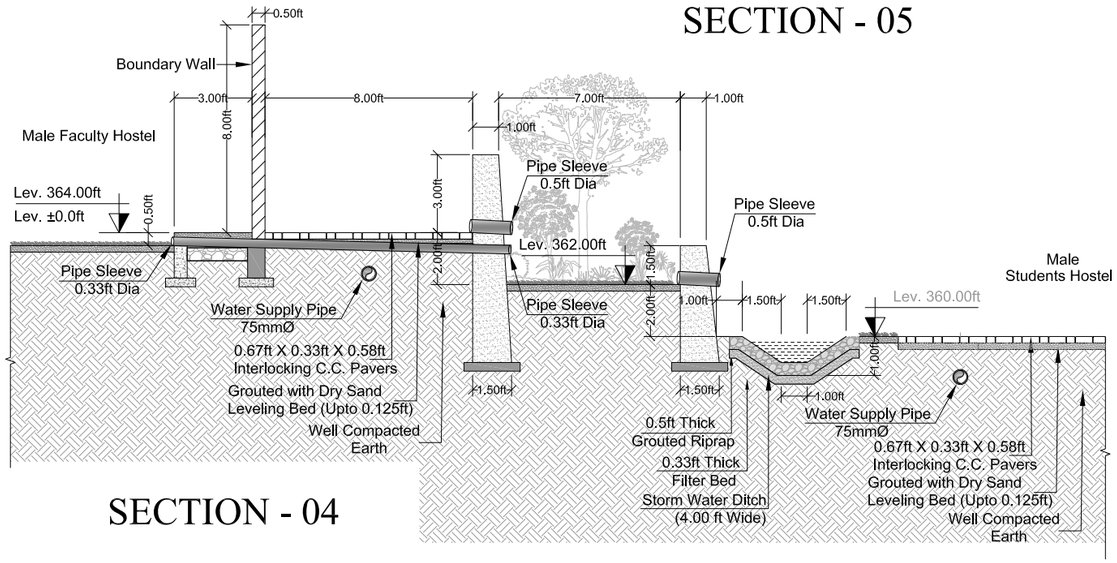
Drawing Title : ROAD CROSS SECTIONS 01 & 02

Designed :	Checked :	Approved :
Bilal	Fahad	Fahad
Drawn :	Date :	Scale / Sheet :
Furqan	April,2024	1:3(1/3"=1'-0") A-1
Project Code :		Rev. :
00986		0

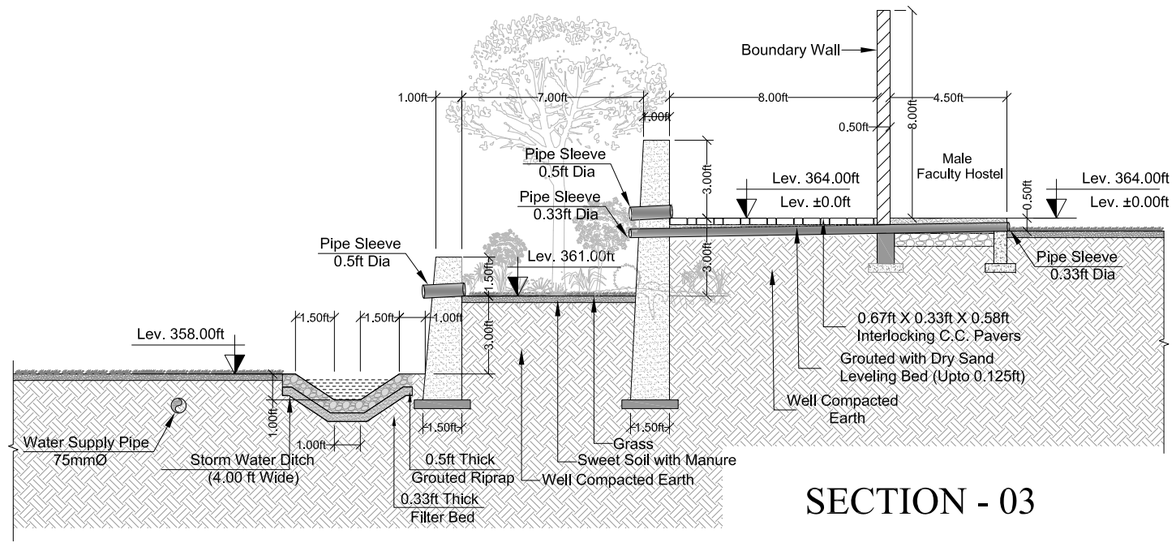
Drawing No. : EA-00986-SMIU-U-CS01



SECTION - 05



SECTION - 04



SECTION - 03

Client :

SINDH MADRESSATUL ISLAM UNIVERSITY
ENTRE TO LEARN GO FORTH TO SERVE
1885

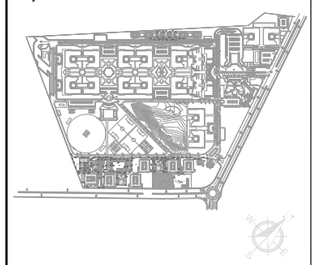
Consultant :

EA Consulting Pvt Ltd
AL-9,15th Lane,
Off Khayaban-e-Hilal,
DHA Phase 7,
Karachi, Pakistan 75500
PABX: +92-21-111-111-584,
Fax : +92-35841825
Email:www.eaworld.com

Project :

Development of Sindh Madressatul Islam University (SMIU) Campus At Education City, Malir Karachi (P H A S E - I)

Key Plan :



No.	DATE	DESCRIPTION
00	Aprll, 2024	ISSUED FOR TENDER

REVISIONS

Note:

1. All Dimensions are in feet unless otherwise stated.
2. For Storm water drain layout plan refer Dwg. No. EA-986-SMIU-U-D303, D305 TO D316.

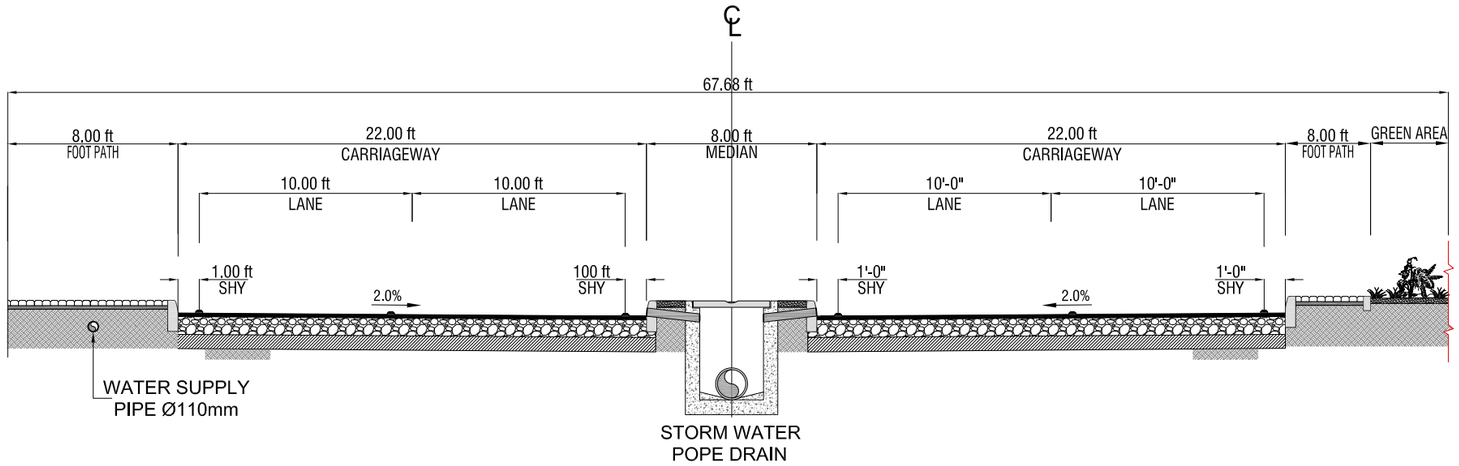
Date of Issue	April, 2024
Issued To	Client
Issued For	Tender

Status: TENDER

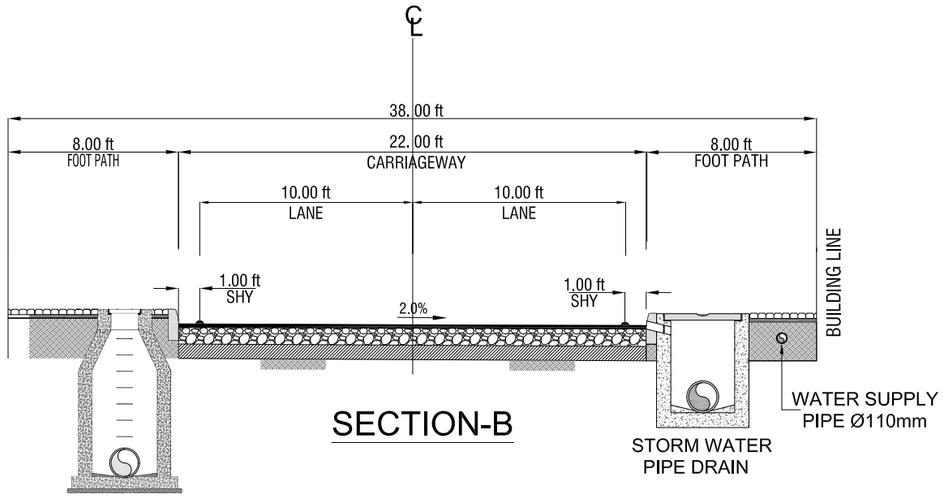
Drawing Title : ROAD CROSS SECTIONS 03 , 04 & 5

Designed :	Checked :	Approved :
Bilal	Fahad	Fahad
Drawn :	Date :	Scale / Sheet :
Furqan	April,2024	1:3(1/3"=1'-0") A-1
Project Code : 00986		Rev. : 0

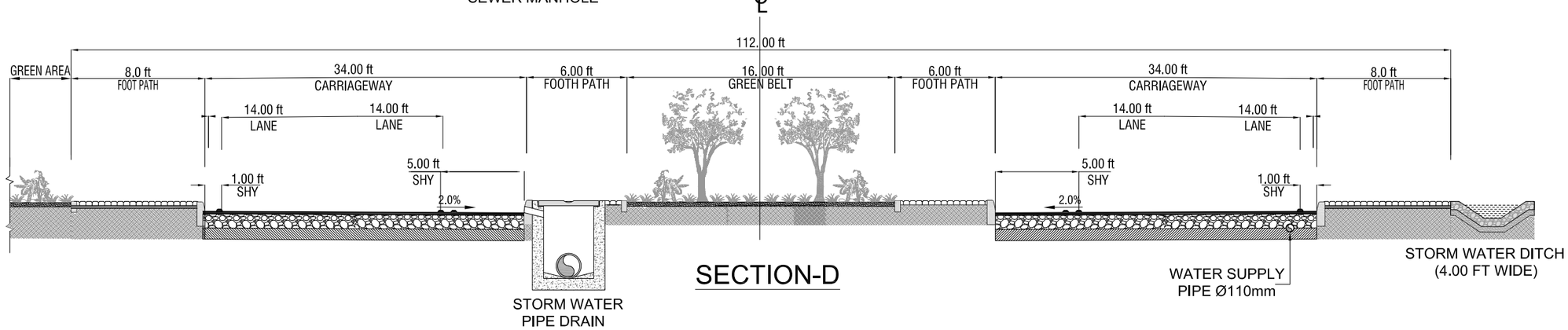
Drawing No. : EA-00986-SMIU-U-CS02



SECTION-A



SECTION-B



SECTION-D

Client :

SINDH MADRESSATUL ISLAM UNIVERSITY
ENTRE TO LEARN
GO FORTH TO SERVE
1885

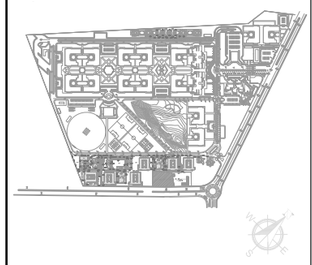
Consultant :

EA Consulting Pvt Ltd
AL-9,15th Lane,
Off Khayaban-e-Hilal,
DHA Phase 7,
Karachi, Pakistan 75500
PABX: +92-21-111-111-584,
Fax : +92-35841825
Email:www.eaworld.com

Project :

Development of Sindh Madressatul Islam University (SMIU) Campus At Education City, Malir Karachi (P H A S E - I)

Key Plan :



No.	DATE	DESCRIPTION
00	Aprll, 2024	ISSUED FOR TENDER

REVISIONS

Note:

1. All Dimensions are in feet unless otherwise stated.
2. For Storm water drain layout plan refer Dwg. No. EA-986-SMIU-U-D303, D305 TO D316.
3. For Sewerage system layout plan refer Dwg. No. EA-986-SMIU-U-S203, S205 TO S209 AND S213 TO S216.
4. For Water supply system layout plan refer Dwg. No. EA-986-SMIU-U-W103,

Date of Issue	April, 2024
Issued To	Client
Issued For	Tender

Status: TENDER

Drawing Title : ROAD CROSS SECTIONS 03 , 04 & 5

Designed :	Checked :	Approved :
Bilal	Fahad	Fahad
Drawn :	Date :	Scale / Sheet :
Furqan	April,2024	1:3(1/3"=1'-0") A-1
Project Code :		Rev. :
00986		0

Drawing No. : EA-00986-SMIU-U-CS03